TO DETERMINE THE PATHOGENESIS AND PREVENTIVE STRATEGIES OF HYPERTENSION-INDUCED KIDNEY FAILURE AMONG HYPERTENSIVE PATIENTS IN THE TAMALE TEACHING HOSPITAL, GHANA

ABSTRACT.

Background: Blood pressure is the force used by circulating blood, against the walls of the major blood vessels in the human body. High blood pressure or hypertension is when the pressure in the blood is elevated [1]. Each year an estimated 41 million people die from non-communicable diseases (NCDs) accounting for about 70% of all deaths globally [2]. A predicted number of 1.13 billion individuals worldwide have hypertension with about two-thirds being those living in the low- and middle-income countries [1].

Objective: The aim of this study was to unravel the pathogenesis and preventive strategies of hypertension-induced kidney failure among hypertensive patients in the Tamale Teaching Hospital, Ghana.

Methods: The study employed the Analytical cross-sectional study with quantitative method approach of data collection. A convenience sampling technique was used to select the 200 study participants who were diagnosed of hypertension for more than 6 months. The data was collected within 3 weeks, using a structured questionnaire. Data were examined using the SPSS program IBM version 24. Descriptive statistics, including proportions, frequencies, and cross-tabulations, were used to summarize the study variables. Logistic regression analysis was used to identify factors associated with hypertension-induced kidney failure. A p value of <0.05 was considered statistically significant.

Results: A total of 200 respondents were included in the analysis and there were more men 126(63.0%) than women 74(37.0%). A total number of 38**(**19.0%), participants have been diagnosed hypertension-induced kidney failure. 49(24.5%) indicated that they have family history of Kidney disease. The common risk factors in developing hypertension-induced kidney failure identified by the participants were; Aging 150 (75.0%), poor eating habits 141 (70.5%), smoking 120 (60.0%), and excessive alcohol consumption 95 (45.5%). Significant association between hypertension-induced kidney failure and age group was observed ($p < 0.002$).

Conclusion: Increasing age, obesity, level of education and physical activity were found to be significantly associated with hypertension-induced kidney failure, indicating opportunities for health

education and other prevention measures. Sincere efforts are needed to increase the awareness of hypertension through continuous group education courses in the primary health care centers and hospitals.

Key word: Hypertension , Kidney Failure , blood pressure , Kidney Disease

INTRODUCTION

Hypertension is detected when there is a sustained elevation of the blood pressure usually with the systolic above 140mmhg and or diastolic above 90mmhg taken at least two different times and at least 6hour interval [1]. It is sometimes called the silent killer because people who have it mostly do not show symptoms and when they do, the effect of the continuous rise in pressure is seen on the target organs of the body such as the heart, kidneys, eyes and brain [2]. According to Staessen, Wang, Bianchi & Birkenhager, [3], Hypertension is estimated to affect more than one-fourth of the world's adult population. The incidence and prevalence of chronic kidney disease (CKD) is also on the rise with more than 20 million people being affected in the United States alone as reported by World Health Organization [1]. Most patients with Chronic Kidney Disease or renal failure have hypertension [4].

Levey et al. [5] defined "CKD as a reduced kidney function characterized by an eGFR of 60ml/min per 1.73m2 or a urinary albumin-to- creatinine ratio of 430mg/g, and, classified into 5 stages of renal function from mild to end-stage renal disease"[5]. "As kidney function deteriorates, it leads to a build-up of large amounts of waste in the blood and increases the risk of problems such as anaemia, hypertension, nerve damage and weak bones, according to the National Kidney Foundation" [6]. "In studies from the United States, Europe, Asia, and Australia chronic kidney disease (CKD) affects between 5% and 15% of the adult population, making this a major public health problem" [7]. "The more severe stages of CKD are a major risk factor for cardiovascular disease as well as for more severe renal failure (CKD stages 4 and 5)" [8]. "Although CKD is common in tropical Africa, there are few data on predictors of the disease and little is known about progression in patients with this disease" [9]. "Africa has the considerable prevalence of hypertension-associated CKD (estimated glomerular filtration rate [eGFR] < 60 ml/min) globally with West Africa being the most affected region (15%) compared to Southern Africa (3%)" [10]. "Amongst people with hypertension of African ethnicity, West Africans have also been found to be at highest risk of ESRD" [11]. "On the African

continent, major factors contributing to CKD progression include genetic predisposition and other co-morbidities such as hypertension and Diabetes, which affects approximately 14%-17 %" [12]. African (blacks) with hypertension more commonly develop renal insufficiency compared to Caucasians this was highlighted in a study conducted in West Africa by World Health Organization in the year 2018.

"In Ghana, Chronic non-communicable diseases have become major causes of disability and deaths" [13]. "Hypertension and renal diseases represent a significant proportion of the non-communicable disease burden. Urban hypertension prevalence was at 32.3%, while rural prevalence, 27%" [14]. "Prevalence rates of major risk factors for non-communicable diseases especially poor diets, overweight/obesity, physical inactivity and alcohol over-consumption are high" [15]. "Available records indicate that hypertension-related Kidney failure prevalence has been rising with the spate of rural–urban migration and associated changes to lifestyle and dietary choices" [16]. "A number of factors such as positive perception of obesity, more sedentary lifestyles, excessive consumption of high-calorie diets, genetic predisposition, high intake of salt, and increasing life-expectancy have been cited for this disturbing trend" [17]. "Without urgent attention, the current epidemic of hypertension-related CKD in the country is expected to worsen" [18]. It is therefore against this background that this study was done to unravel the pathogenesis and preventive strategies of Hypertension-induced Kidney Failure among hypertensive patients in the Tamale Teaching Hospital, Ghana.

METHODS

Study Location and Setting

The study was conducted in the Tamale Teaching hospital in Tamale. The Tamale Metropolis was established under legislative instrument (L.I) 1801 of 2004. It is one of the six Metropolitan Assemblies in the country and the only Metropolis in the Northern part of Ghana. It is also the capital of the Northern region. The Tamale Metropolis is one of the 26 districts in the Northern Region of Ghana. The Metropolis has a total estimated land size of 646.90180sqkm [19]. There are 115 communities in the metropolis. The population of Tamale Metropolis, according to the 2010 Population and Housing Census, is 233,252 representing 9.4 percent of the region's population. Males constitute 49.7 percent and females represent 50.3 percent [19].

Study Design

Cross-sectional study design was employed for this study, using the quantitative approach, alongside retrospective information that were retrieved from folders.

Target population and Sample size

The target population of study were adults, both males and females from 18 years and above, residing in Tamale, Ghana with diagnosis of hypertension. This study was a cross-sectional survey of hypertensive patients aged over 18 attending Tamale Teaching Hospital in Tamale, Ghana. The required sample size was determined using the formula for sample size in sampling for proportions [20] with the following assumptions: 95% confidence level, 5% margin of error, 13% hypertension-induced kidney failure prevalence rate in Ghana [18], and a corresponding undiagnosed rate of 87%. With 10% of the sample size for non-response or incompleteness of questionnaire. Thus, an estimated 200 participants were recruited into the study.

Inclusion/Exclusion criteria

The study included all out and inpatients diagnosed with Hypertension or CKD, and are aged 18 and above. This is because the study is focused on adult CKD patients. Males and females who were below the age of 18 years, the physically disabled, pregnant and breastfeeding women, critically sick patients were excluded from the study.

Sampling procedure

Simple random sampling was employed in the study. The sampling technique was used to recruit hypertensive patients at the Outpatient department, Medical ward and the renal unit of the Tamale Teaching Hospital.

Data collection technique

Interviews were conducted by using a semi-structured questionnaires that contained both closed and open-ended questions. The questionnaire was initially pre-tested and refined to enhance accuracy and completeness of data collected. The questionnaire consisted of four parts and numbered alphabetically (A, B, C and D). The first part collected data on study population's socio-demographic characteristics. The second contained questions on hypertension-induced Kidney Failure prevalence.

The third part looked at pathogenesis of the hypertension-induced Kidney Failure and the fourth part was on preventive measures related to hypertension-induced Kidney Failure. In addition, clinical and anthropometric information were obtained from the folders of respondents including, glomerular filtrate rates, serum creatinine levels, blood pressure readings.

At the beginning of each interview, each participant was allowed to read and fill the information sheet. This enabled the researcher to gain some knowledge about the respondent, which helped the researcher to interact with respondents in the best way possible. The questions were clear, simple and suited the developmental age and comprehension ability of the respondents. The use of open ended questions were also employed, allowing respondents the opportunity to express themselves in details. The questions were reframed or the respondents redirected where necessary which helped to achieve the objectives for the research.

Data analysis and presentation

The data obtained through the questionnaires was checked for accuracy and entered immediately into the computer using Microsoft® Excel® software. Data was cleaned and managed using SPSS version 24.

Descriptive statistics such as means, cross-tabulations, and frequencies were used to describe demographic characteristics of the study participants with 95% confidence intervals (CI). The results were presented using tables, charts and graphs. Reviewing both parametric and non-parametric models for statistical analysis and inferences, the researcher used proven statistical methods to test for association between dependent and independent variables. Specifically, suitable statistical test such as Chi-square test which are proven non parametric models was used to test the association between categorical independent and dependent variables. Multiple logistic regression analysis was used to identify predictors of hypertension-related Kidney Failure. Finally, a P-value of <0.05 was considered statistically significant.

RESULTS

Socio-demographic characteristics of respondents

A total of 200 respondents were included in the analysis and there were more men 126(63.0%) than women 74(37.0%). The mean age of the respondents was 59.8 (± 5.7) years and the largest

proportion (61.0%) aged 50-59 years with the majority (54.0%) being males. About 23.0% had never been married before. Of those who had married before, 68.0% were currently together, 7.0% have been separated and 2.0% were widowed. The majority 98(49.0%) of the sample had high school education (i.e. Junior high school and Senior high school) and the highest proportion (37%) were self-employed. Females were more likely to be unemployed compared to males. With respect to income status, the highest 65(32.5%) proportion of the participants indicated they earned GHC. 501.00 - GHC 1000.00 as their monthly income whereas the least of them 43(21.5%) earned GHC. 100.00 - GHC 500.00 monthly.

Table 1.0 Socio-demographic of respondents in Tamale Metropolis

Demographic characteristics		**Frequency (%)**
Sex	*Male*	126(63,0)
	Female	74(37.2)
Age (years)	19 – 29	18(9.0)
	30 – 39	31(15.5)
	40 – 49	44(22.0)
	50 – 59	85(42.5)
	60+	22(11.0)
Employment Status	Employed	63(31.1)
	Self-employed	91(45.5)
	Unemployed	46(23.0)
Marital status	Married	136(68.0)
	Single	42(21.0)
	Divorced	14(7.0)
	Co-habitating	4(2.0)
	Widow	4(2.0)
Religion	Christian	80(40.0)
	Muslim	109(54.5)
	Traditional	10(5.0)
	Other	1(0.5)
Educational status	None / Primary	50(25.0)
	JHS/SHS	98(49.0)
	Tertiary	52(26.0)
Monthly Income	GH₵ 100 – GH₵ 500	23(12.5)
	GH₵ 501 – GH₵ 1,000	65(32.5)
	GH₵ 1,001 - GH₵ 1,500	50(25.0)
	GH₵ 1,501- GH₵ 2,000	41(21.5)
	GH₵ >2,000	21(10.5)

A small proportion of the respondents 25(12.5%) were smokers, majority 13 of them indicated that they smoke two sticks per day. With regards to alcohol intake, more than two- third of the respondents 139 (69.5%) do not take alcohol. However, 50(25%) of the participants engage in daily exercise.

Shown in Table (2). In the study sample, 70(35%) were obese whereas 8(4%) underweight. This is shown in figure 1

Table 2.0 Lifestyle Characteristics among Respondents.

Lifestyle Characteristics	Status Yes n (%)	No n (%)	P-Value
Smokes	*25(12.5)*	*175(87.5)*	***< 0.013***
Alcohol	*61(30.5)*	*139(69.5)*	***< 0.003***
Exercise	*105(35.0)*	*195(65.0)*	***< 0.456***

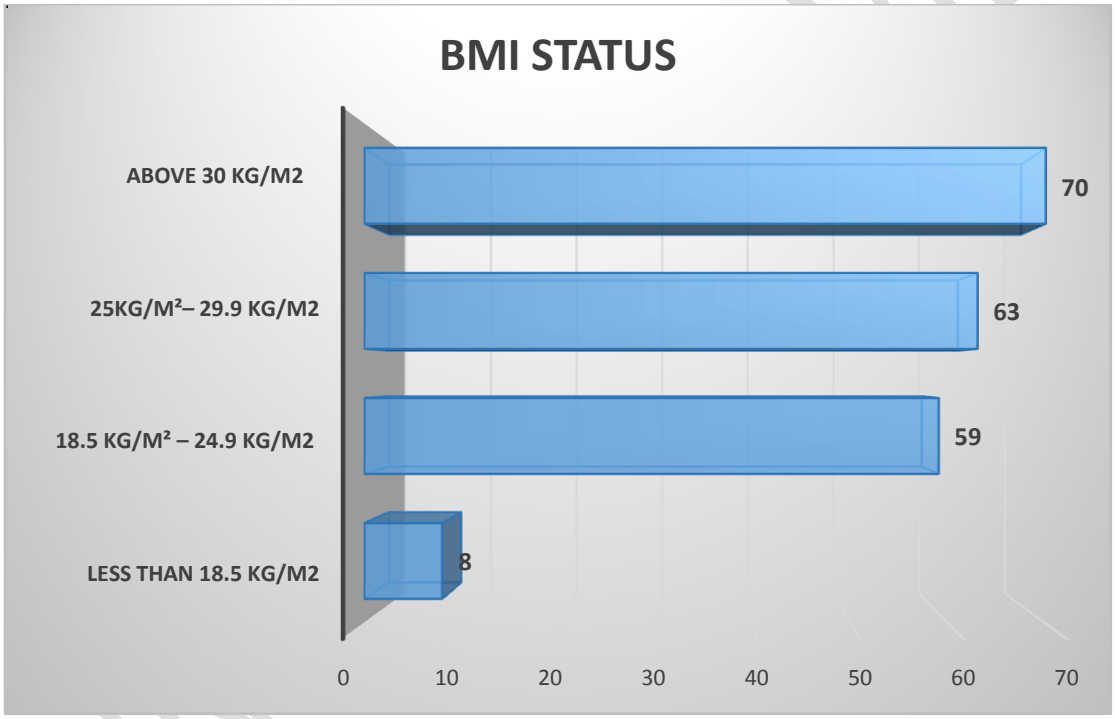

Fig 1.0 Prevalence of Hypertension-induced Kidney Failure among respondents.

The mean score for prevalence of hypertension-induced kidney failure among hypertensive patients in the Tamale Metropolis was 3.1, ± .45 SD. Majority 88(44.0%) of the respondents verbalized their hypertensive status as stage 3. Respondents were asked how long they have been battling with hypertension, majority 90(45.0%) of them reported between 5-10 years. Among the respondents interviewed, 38 (19.0%) has been diagnosed of hypertension-induced kidney failure. Among these

participants the highest proportion 20(52.6%) indicated that they were told by the doctor. Nearly half 18(47.3%) of the respondents with hypertensive-induced kidney failure verbalized that they were diagnosed in between 1 to 5 years. Majority 15(39.5%) of them reported their CKD status as stage 4. However only 6(15.8%) of the 38 respondents with hypertensive-induced kidney failure are on hemodialysis. The highest proportion 126(63.0%) of the individual have not heard about kidney transplant. Among those who have heard about it, majority 38(51.3%) of them have been diagnosed with hypertension-induced kidney failure. Respondents were asked about their family history with chronic kidney disease, 49(24.5%) indicated that they have family history of the disease however, 33(16.5%) did not know. Approximately 70% of the respondents think that Kidney Failure is a lifelong disease whiles 25(12.5%) did not know. Half of the participants believed that Kidney Failure has a cure.

Table 3.0 Prevalence of Hypertension-induced Kidney Failure.

Variables	Frequency N=200	Percent %
What is your hypertensive status		
Hypertensive Stage 1	14	7.0
Hypertensive Stage 2	57	28.5
Hypertensive Stage 3	88	44.0
Hypertensive Stage 4	41	20.5
For how long have you had hypertension		
Less than 1 year	13	6.5
1 to 5 years	42	21.5
5 to 10 years	90	45.0
More than 10years	55	27.5
Have you been told you have of hypertension-induced kidney failure?		
Yes	38	19.0
No	162	81.0
If Yes, Who told you about it	**N=38**	
Doctor	20	52.6
Pharmacist	9	23.7
Nurse	7	18.4
Other	2	5.2
If Yes, how many months/ years ago	**N=38**	
Less than 1 year	3	7.9
1 to 5 years	18	47.4
5 to 10 years	11	28.9
More than 10years	5	13.2
What is the name of the stage of CKD are you diagnosed of	**N=38**	

CKD Stage 1	7	18.4
CKD stage 2	4	10.5
CKD stage 3	8	21.1
CKD stage 4	15	39.5
CKD stage 5	4	10.5
Are you on Hemodialysis		
No	32	84.2
Yes	6	15.8
Do you think that Kidney Failure is a lifelong disease		
Don't know	35	17.5
No	25	12.5
Yes	140	70.0
Do you think that Kidney Failure has a cure		
Don't know	34	17.0
No	66	33.0
Yes	100	50.0
Have you heard of Kidney Transplant		
Don't know	54	27.0
No	106	53.0
Yes	40	20.0
Family History of Chronic Kidney Failure		
Don't know	33	16.5
No	118	49.0
Yes	49	24.5

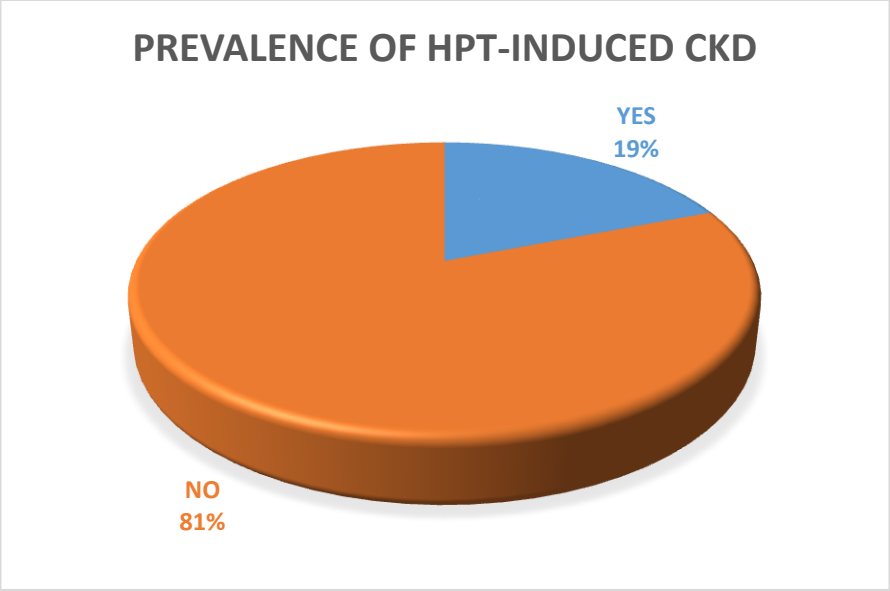

Fig 2.0 **Pathogenesis of hypertension-induced kidney failure.**

Regarding the pathogenesis of hypertension-induced kidney failure, half (50%) of the respondents strongly agreed that high blood pressure can constrict the blood vessels, in the kidneys, whiles 25% of them strongly disagreed to this statement. The narrowing of blood vessels reduces blood flow to the kidney, 151(75.5%) of the respondents were in agreement to this statement. More than two thirds 140(70.0%) of the participants agreed and strongly agreed that if your kidneys' blood vessels are damaged, they may no longer work properly. The highest proportion 150(75%) of the respondents were in support that poor treatment to hypertension may contribute to kidney failure. 145(72.5%) of them agreed that hypertension, and Diabetes are the major cause of Kidney failure.

Table 4.0 Pathogenesis of Hypertensive induced-kidney failure (likert scale).

Variable	SA	A	D	SD
High blood pressure can constrict the blood vessels, in the kidneys.	100(50.0%)	35(17.5%)	15(7.5%)	50(25.0%)
The narrowing of blood vessels reduces blood flow to the kidney.	95(45.5%)	56(28.0%)	39(19.0%)	10(20.0%)
If your kidneys' blood vessels are damaged, they may no longer work properly.	65(32.5%)	75(37.5%)	40(20.0%)	20(10.0%)
Poor treatment to hypertension may contribute to kidney failure.	110(55.0%)	40(20.0%)	25(12.5%)	25(12.5%)
Hypertension, and Diabetes are the major cause of Kidney failure.	80(40.0%)	65(32.5%)	30(15.5%)	25(12.5%)

SD= Strongly Agree, A= Agree, D=Disagree, SD= Strongly Disagree

Prevention strategies of hypertension-induced kidney failure.

Majority 115(57.5%) of the respondents affirmed that it is very important to take antihypertensive in order to keep the kidneys under control. More than half (58%) believe that changing lifestyle help to prevent Kidney Failure. Approximately 110(55.0%) believed that Kidney Failure is not avoidable part

of aging. Respondents were further asked of the measures to control hypertension-induced kidney failure. The highest proportion (62.5%) of the participants indicated regular exercise as the most important measure in controlling hypertension-induced kidney failure. Nearly two thirds (65.5%) of the participants indicated that taking medications regularly or managing hypertension also helps in controlling hypertension-induced kidney failure, however 62(31.0%) of the participants indicated that having enough rest, eating well 75(37.5%), not smoking 95(47.5%), avoiding alcohol 100(50.0%), regular check-ups 80(40.0%) are the preventive strategies for hypertensive-induced kidney failure.

Table 5. Awareness of the preventive strategies of Hypertension-induced Kidney Failure.

Variable	Responses	
	Frequency(N=176)	Percent (%)
How important do you think taking your antihypertensive is to keeping kidneys under control		
Yes	115	57.5
No	65	32.5
Don't Know	20	10.0
Can changing lifestyle help to prevent Kidney Failure		
Yes	116	58.0
No	74	37.0
Don't Know	10	5.0
Do you think Kidney Failure is an avoidable part of aging		
Yes	110	55.0
No	60	30.0
Don't Know	30	15.0
What are the most important factors in preventing Hypertension-induced Kidney failure		
Managing Hypertension		
Yes	166	83.0
No	34	17.0
Exercising		
Yes	156	78.0

No	44	22.0
Alcohol cessation		
Yes	150	75.0
No	50	25.0
Quitting Smoking		
Yes	140	70.0
No	60	30.0
Reduce salt intake		
Yes	136	68.0
No	64	32.0
Getting a regular check-up		
Yes	126	63.0
No	74	37.0

DISCUSSION

Two hundred participants were involved in this study. Males were more as compared to females. This results is similar to a study conducted in Nigeria which showed that, out of 240 participants, 52.5% were men. This trend could be attributed to male dominance and the zeal to partake in research study [21]. This study was conducted in advantaged urban area where formal education is high and more than two-thirds of the participants were educated beyond primary school. The population of the metropolis offers a pool of individuals from diverse backgrounds, race socioeconomic status, and ages.

The prevalence of hypertension-induced kidney failure was 38(19.0%) among participants with hypertension, comparable to the national prevalence of 13.0% [18]. This finding is in line with other studies conducted among other populations [3, 7, 8]. Among participants who are hypertensive-induced kidney failure, majority (42.6%) were at the age of 60 years and above. This study is consistent a research study conducted by Agyeman and Ofori [13] in Ghana in the year 2019. Participants with hypertensive-induced kidney failure were significantly older than those without the disease in this study. Age has been shown to be an independent predictor of CKD [22]. Among the participants with CKD, majority were mainly males. There is evidence suggesting that males have a higher prediction for CKD. Male gender is also associated with faster progression of CKD as reported by Anderson and Brenner [22]. Chronic Kidney Disease was more prevalent among older people as

observed in this study. This is in line with a study conducted by Hales et al., [4] who reported that, the prevalent rate of hypertension and kidney disease increases with increasing age in all adults [4]. Clearly, hypertension-induced kidney failure prevalence increased with advancement in age and this aligns with what previous studies have shown [13; 23]. “About 1 in 10 people have some degree of CKD” [22]. “It can develop at any age and various conditions can lead to CKD. However, CKD becomes more common with increasing age. After the age of 40, kidney filtration begins to fall by approximately 1% per year” [22].

Even though hypertension-induced kidney failure prevalence reported in this study was relatively low, more than one-third (40%) were at CKD stage 4. This finding contrasts a study conducted by El-Nahas et. al., [8] in northern part of Tanzania, majority of the participants in the study were diagnosed of CKD stage 1[8]. “This indicates a high proportion of people that are at high risk of ESRD and possibly undergoing hemodialysis” [8]. “It is important to develop primary intervention strategies that target both the high and the low risk groups. Hypertension-induced kidney failure was also found to be more prevalent among those with higher wealth status and those living in urban areas. Research has shown that socioeconomic status may shape the lifestyles of individuals and which may predispose them to hypertension and possibly complications of the disease” [24]. “This is contrary to a meta-analysis, which showed that low socioeconomic status is associated with higher chronic kidney failure” [7]. High alcohol intake and smoking are risk factors of chronic kidney disease, in this study high proportion of the participants who smoke and take alcohol have high prevalence of hypertension-induced kidney failure. This study is congruent to a study conducted in Ghana by Awuah and others [24] and also in Nigeria by [10].

Regarding the pathogenesis of the condition as indicated by the participants, 67.5% of the participants were in agreement to the statement ‘high blood pressure can constrict the blood vessels, in the kidneys’, 70.5% of the participants also believed that narrowing of blood vessels reduces blood flow to the kidney. Majority of the participants in this current study also both agreed and strongly agreed that if your kidneys' blood vessels are damaged, they may no longer work properly. Poor treatment to hypertension may contribute to kidney failure was also affirmed by three-fourths of the participants. 72.5% of the participants indicated their agreement to the statement that hypertension, and Diabetes are the major cause of Kidney failure. These findings are in congruent to studies conducted in Ghana [13; 24], Nigeria [10] and USA [3]. “It is well known that the heart and kidneys are

intertwined, in which dysfunction in one organ may induce dysfunction and increase the risk of disease in the other" [3, 4]. "In the current study, several modifiable risk factors for chronic kidney disease in patients with hypertension were identified. We observed a higher risk of CKD in patients who were current smokers, patients with T2DM and patients with higher SBP. A previous study using general population cohorts found a relative risk for CKD in subjects who were current smokers to be very similar to our results" [15]. "This underlines the importance of encouraging smoking cessation for both prevention of cardiovascular and kidney outcomes. Also, T2DM and SBP showed similar associations with ESKD as in the general population, warranting close follow-up and treatment of these patients". [8, 21], Previous studies generally show obesity to be associated with increased risk of CKD [12, 27–29], but little is known about the pathophysiology behind this relation.

Majority 115(57.5%) of the respondents affirmed that it is very important to take antihypertensive in order to keep the kidneys under control. They believe that one can protect his or her kidneys by preventing or managing health conditions that cause kidney damage, such as diabetes and high blood pressure. They also believe that changing lifestyle help to prevent Kidney Failure. Approximately 110(55.0%) believed that Kidney Failure is not avoidable part of aging. These findings are similar with those conducted in Ghana among patients with chronic kidney disease at the Komfo Anokye Teaching Hospital, Ghana by Agyemang & Ofori- Asenso [13]. However this finding contrasts a study conducted in rural area of Nigeria [7;10] where many of the participants did not know that managing disease like hypertension and Diabetes helps improve the health of the kidney and may prevent Chronic Kidney failure. More than half of the participants correctly identified preventive strategies for hypertension including managing hypertension (83.0%), exercising (78.0%), alcohol cessation (75.0%), quitting smoking (70.0%), reduce salt intake (68.0%), and regular check-ups (630%). These findings are in line with a research study conducted in Ghana by Ibrahim et al., [17] however in a study by He and Whelton [5], less than half of the participants were able to identify the preventive strategies for Kidney Failure. "Individuals, who are deemed at risk for CKD, may be able with awareness to slow down the stages of developing ESRD by researching proposed medical therapies to change the course of the disease. Primary Care Physicians play a major role in preventing the progression of CKD to ESRD by teaching the importance of controlling blood pressure through diet, exercise, and medication as well as monitoring the use of medication that may be labeled as being nephrotoxic (i.e. non-steroidal anti-inflammatory agents). Lifestyle changes may also

be modified to help slow down the progression of ESRD that include decreasing the body mass index to less than 24.9 and ceasing tobacco usage (i.e. smoking). Preventable risk of CKD that includes specific modifications is management of hypertension, diabetes and associated CVD by following medical treatment protocols as prescribed" [15]. "There are evidenced-based practices that have been identified as being successful in slowing down the progression of CKD to ESRD" [21]. "By controlling blood pressure through the use of an angiotensin-converting enzyme inhibitor (ACEI) or angiotensin receptor blocker (ARB), and by controlling glycemic levels, there is a significant decrease in the progression of the stages in CKD" [6]. "Physical activity is also considered an evidenced-based practice for individuals diagnosed with hypertension and diabetes" [14]. "Healthy lifestyle modification that includes eating the right diet, exercising and getting regular medical exams can help prevent chronic as well as non-communicable disease, reducing the health cost burden of individual" [22].

CONCLUSION AND RECOMMENDATION

This study observed 19.0% prevalent rate of hypertension-induced kidney failure, with nearly two-thirds identifying hypertension-induced kidney failure as lifelong disease. Majority of participants in the metropolis had high knowledge on risk hypertension-induced kidney failure. Age, obesity, physical activity, smoking and residence were found to be significantly associated with hypertension-induced kidney failure whiles gender, religion, occupation, ethnicity, residence, alcohol intake and smoking were not significantly associated with it.

The most vulnerable populations (e.g., African Americans) should be targeted for education to prevent the development of CKD. Sincere efforts are needed to increase the awareness of kidney failure through continuous group education courses in the primary health care centers and hospitals. Special health education and promotional programs through the media can play an important role in this aspect. Insufficient attention to health education by health care practitioners and lack of motivation for health education services should be addressed.

Ethical Approval and Consent

This study was first approved by the International department of medicine, Poltava state medical University, Germany. This study was first approved by the Head of Department of Public Health and subsequently reviewed by the project supervisor. Ethical clearance for commencement of the study

was obtained from the Committee on Human Research, Publication and Ethics (CHRPE), Kwame Nkrumah University of Science and Technology with clearance number CHRPE/AP/112/23 from the School of Medical Sciences (KNUST-SMS), & the Director of Health services Tamale, Ghana. In the current study, all participants were provided with detailed information specifying the nature and purpose of the study, and the benefits and potential risks. This occurred both verbally and in writing. In accordance with ethical requirements, research participants were also asked to acknowledge their informed consent on a consent form prior to data collection. The confidentiality and anonymity of participants were protected at all times.

LIMITATION OF THE STUDY

Conducting research on pathogenesis and preventive measures of hypertension-induced Kidney Failure among adults aged 18 years and above comes with some challenges which must be taken into account when interpreting the study finding. Cross sectional study has inherent limitation such as memory bias but the effect of this on the finding of the study was minimized by using probes to aid memory, future research should look into longitudinal study nature.

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QUESTIONNAIRE

A. SOCIODEMOGRAPHIC

1. Age (years): a) 19-29years [ ] b) 30-39years [ ] c) 40-49years [ ] d) 50-59years [ ] e). 60+years [ ]

2. Gender: [ ] Male [ ] Female

3. Religion: [ ] Christian [ ] Islam [ ]Traditional [ ] Others; specify_____

4. Ethnicity: _____

5. Place of residence: [ ] Rural [ ] Urban

6. Marital Status: [ ] Married [ ] Single [ ] Divorced [ ] Co-habitating [ ]Widow

7. Educational Level: [ ] Primary [ ] JHS [ ] Secondary/Technical/Vocational [ ] Tertiary [ ] None

8. Employment Status: [ ] Unemployed [ ] Self Employed [ ] Employed

9. Occupation: _____

10. Income: [ ]Ghc100- Ghs500 [ ] Ghc500 -Ghc1000 [ ]Ghc1000 – Ghc1500 [ ]Ghc1500-Ghs2000 [ ]>Ghc2000

11. Do you smoke cigarette? [ ] Yes [ ] No.

12. Do you take alcohol? [ ] Yes [ ] No.

13. Do you exercise? [ ] Yes [ ] No.

14. BMI Status……..

A). Less than 18.5 Kg/m^2 [ ] B). 18.5 – 24.9 Kg/m^2 [ ] C). 25-29.9 Kg/m^2 [ ]

D).Above 30 Kg/m^2 [ ]

15. High Salt intake [ ] Yes [ ] No.

SECTION B: PREVALENCE OF HYPERTENSIVE-INDUCED KIDNEY FAILURE

16. What is your hypertensive status? A). Stage 1 B). Stage 2 C). Stage 3

17. For how long have you had hypertension? A). Less than 1 year [ ] B). 1 to 5 years [ ] C). 5 to 10 years [ ] D). More than 10years [ ]

18. Have you ever been told that you have Kidney Failure? [ ] Yes [ ] No

19. If Yes, Who told you about it? A). Doctor B). Pharmacist C). Nurse D) other

20. If Yes, how many months/ years ago? A). Less than 1 year B). 1 to 5 years C). 5 to 10 years D). More than 10years

21. What is the name of the stage of CKD are you diagnosed of? CKD stage 1 [ ] CKD stage 2 [ ] CKD stage 3 [ ] CKD stage 4 [ ] CKD stage 5 [ ]

22. How dangerous is Kidney Failure to your health? [ ] Extremely [ ] Somewhat

[ ] Not At All [ ] Don't Know

23. Would lowering high blood pressure improve a person's health? [ ] Yes [ ]No

[ ] Somewhat [ ] Don't Know

24. Have you heard of Kidney Transplant? [ ] Yes [ ] No

25. Family History of Chronic Kidney Failure? YES [ ] NO [ ]

26. Do you think that Kidney Failure is a lifelong disease?

A. Yes [ ] B. No [ ] C. Don't Know [ ]

27. Do you think that Kidney Failure has a cure?

A. Yes [ ] B. No [ ] C. Don't Know [ ]

SECTION C: RISK FACTORS AND PATHOGENESIS OF HYPERTENSION-INDUCED CKD

28. Which of the following do you think may lead to hypertension-induced kidney failure. Tick [√] in the table below

RISK FACTOR	**YES**	**NO**	**DON'T KNOW**
Excessive alcohol consumption			
Excessive smoking			
Poor eating habits			
Physical inactivity			
Age of a person			
Other diseases like Diabetes			
Race of person (blacks)			

29. Which of the following do you think are the cause of hypertension-induced kidney failure? Tick [√] in the table below.

Pathogenesis /Causes	**SA**	**A**	**D**	**SD**
High blood pressure can constrict the blood				

vessels, in the kidneys.				
The narrowing of blood vessels reduces blood flow to the kidney.				
If your kidneys' blood vessels are damaged, they may no longer work properly.				
Poor treatment to hypertension may contribute to kidney failure.				
Hypertension, and Diabetes are the major cause of Kidney failure.				

D. PREVENTION OF HYPERTENSION-INDUCED CKD

30. How important do you think taking your antihypertensive is to keeping kidneys under control? [ ] Very Important [ ] Somewhat Important [ ] Not At All Important

31. Can changing lifestyle help to prevent Kidney Failure?

Yes [ ] No [ ] Don't Know [ ]

32. Do you think Kidney Failure is an avoidable part of aging?

Yes [ ] No [ ] Don't Know [ ]

33. What are the most important factors in preventing Kidney failure?

	Yes	No
Manage Hypertension /DM	[ ]	[ ]
Exercising	[ ]	[ ]
Alcohol cessation	[ ]	[ ]
Quitting Smoking	[ ]	[ ]
Reduce salt intake	[ ]	[ ]
Losing Weight	[ ]	[ ]
Getting a regular check-up	[ ]	[ ]