

**The Burden of Past Hypertensive Disorders of Pregnancy in Females With CKD at Connaught Hospital, Freetown, Sierra Leone**

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**ABSTRACT**

**Background:** Hypertensive disorders of pregnancy (HDP) pose a significant long-term burden on maternal and fetal health globally and it is associated with an increased risk of developing chronic kidney disease (CKD) later in life. The objectives of this study include; The burden of past hypertensive disorders of pregnancy in females with CKD, to determine the relationship between hypertensive disorders of pregnancies and the development of CKD and to identify the risk factors for progression to CKD in patients with history of Hypertensive Disorders of Pregnancy (HDP).

**Methods:** This study was conducted at Connaught hospital. It is a cross-sectional study of females with CKD, using a structured and pretested questionnaire. Chronic kidney disease is defined as abnormalities of kidney structure or function, present for >3 months, with implications for health," and requires one of two criteria documented or inferred for >3 months: either GFR <60 ml/min/1.73 m<sup>2</sup> or markers of kidney damage, including albuminuria.

**Results:** A total of 30 female patients with CKD were recorded during this study for analysis. Of this cohort, the majority of participants (83.3%) were aged 36-65years. Obstetric data showed that 54.2% were diagnosed with HDP in their second trimester. A vast majority (52.2%) experienced HDP during their second and third pregnancy. Grand multiparity was also commonly seen (26.1%). A high burden of past HDP (76.6%) in CKD females was noted. Preeclampsia was the most common type of HDP (56.5%). Notably, most patients (90.0%) presented with advanced CKD (Stages 4 & 5) at diagnosis.

**Conclusion:** There is a significant burden of past history of HDP in females with CKD and preeclampsia is the most common type of HDP. Patients presented with advanced CKD.

**Key words:** Hypertensive disorders of pregnancy (HDP), Chronic kidney disease (CKD), Preeclampsia, Renal outcomes

## INTRODUCTION

An estimated 9.1% of people worldwide had chronic renal disease in 2017, which accounted for 697.5 million instances of all-stage CKD and almost 1.2 million deaths from the condition (Bikbov et al., 2017). However, because many sub-Saharan African nations lack renal registries, precise estimates of the prevalence of chronic kidney disease are unavailable (Naicker et al., 2013). In Sierra Leone the burden of renal admission is 2.7% with CKD as the leading cause (Coker et al., 2022).

Hypertensive disorder of pregnancy (HDP) is hypertension in pregnancy that occurs after 20 weeks of gestation in a woman with previously normal blood pressure (Sibai et al., 2024) and it includes gestational hypertension (without proteinuria), pre-eclampsia (with proteinuria), and eclampsia (pre-eclampsia with convulsions). Additionally, hypertensive disorders in pregnancy (HDP) complicate 5.2% to 8.2% of pregnancies and are linked to a higher risk of unfavorable outcomes for the fetus, newborn, and mother, such as premature birth, fetal growth restriction, intrauterine death, renal or hepatic failure, hemorrhage, and stroke (Umesawa et al 2017). The risk factors of HDP including older maternal age, early pregnancies, multiparity, maternal anemia and infections, and low socioeconomic status are highly prevalent in African women, suggesting a high prevalence of HDP in the region (Fokom-Domgue et al 2015). In 2016, HDP caused 16% of maternal deaths in Sierra Leone. A recent multicenter study reporting from ten low and middle-

income countries described the incidence of eclampsia in Freetown as the highest of all study sites with 142 cases per 10,000 births and a case fatality rate of 15.5 per 10,000 births. Hypertensive disorders during pregnancy, such as preeclampsia and gestational hypertension, are associated with long-term cardiovascular and renal complications. Women with a history of HDP are at an increased risk of developing CKD later in life, yet the burden of this association in female patients already diagnosed with CKD remains underexplored.

In Sierra Leone, there is limited research into the contribution of past hypertensive disorders of pregnancy on females suffering from CKD. Given that both CKD and HDP disproportionately affect women, especially during reproductive years, understanding the relationship between these conditions is critical for improving patient outcomes and developing tailored intervention.

The aim of this study is to determine the burden of past hypertensive disorders of pregnancy in females with CKD and to identify the risk factors for progression to CKD in patients with history of Hypertensive Disorders of Pregnancy (HDP).

## METHODS

### Study Design

This study was a cross-sectional study of females with CKD receiving care at Connaught hospital.

### Study Site

The study was conducted at the Connaught Hospital, University of Sierra Leone Teaching Hospitals Complex (USLTHC) situated in

Freetown, the capital city of Sierra Leone with about 312 bed capacity. The hospital departments include surgery, internal medicine, pharmacy, nursing, radiology, laboratory, ophthalmology, oral health and ear, nose and throat.

## Study Population

All females with CKD (> 18years) attending clinic at SOP or admitted at Connaught during the study period

## Study Period

1st January -30th March 2025 (3 months)

## Inclusion Criteria

Women aged 18years and above with a diagnosis of chronic kidney disease (CKD)

## Exclusion Criteria

- Females <18years
- Females with AKI

## Sample Size

All females with CKD present during the study period.

## Data Collection

The study was done using a structured and pre-tested interviews and questionnaire. The questionnaire comprised of three sections. Section A is focused on the socio-demographic characteristics of the participants which will include age, gender, marital status, religion, and education level. Section B will deal with the participant's past obstetric characteristics which contains ten questions. Section C will

provide information on the participant's current admission which includes twelve questions.

Chronic Hypertension was hypertension present before pregnancy or diagnosed before 20 weeks of pregnancy. Gestational Hypertension is hypertension that develops at or after 20 weeks of pregnancy without evidence of protein in the urine or other heart or kidney problems. Gestational hypertension usually improves after delivery. However, some women with gestational hypertension have a higher risk of developing chronic hypertension in the future. Preeclampsia occurs when a woman with previously normal blood pressure suddenly develops high blood pressure and protein in the urine or other problems (e.g., low platelet count, impaired liver function) after 20 weeks of pregnancy. Women who have chronic hypertension can also develop preeclampsia. Preeclampsia occurs in about 1 in 25 pregnancies in the United States of America. Eclampsia was defined as seizures occurring in a patient with pre-eclampsia. Hemolysis Elevated Liver Enzymes and Low Platelet Count (HELLP) Syndrome is a life-threatening condition that can occur during pregnancy or soon after delivery. It can cause high blood pressure and seizures, and can lead to a potentially fatal liver disorder or stroke if left untreated. CKD is defined as kidney damage or glomerular filtration rate (GFR) <60 mL/min/1.73 m<sup>2</sup> for 3 months or more, irrespective of cause.

## Data Management.

All data collected was cross-checked to avoid duplication and then entered into statistical package for social science (SPSS) version 26. Both numbers and percentages were entered for

categorical variables, and the data were graphically represented as bar chart and tables. In all analysis, a P-value  $<0.05$  was considered statistically significant. The descriptive analysis included calculating mean, median, standard deviation and range for continuous variables. For categorical variables, both numbers and percentages were presented. The data were graphically represented as bar chart and tables. In all statistical analysis, P-Values  $<0.05$  were considered statistically significant.

## RESULTS

Table 1 shows the sociodemographic characteristics of the study population. Overall, a total of 30 patients were recorded for the study period. Majority (83.3%) of women who presented with CKD were between the ages of 36 – 65 years. More than half (53.3%) of the study population were married and (83.3%) attained at least secondary or tertiary education.

Table 2 shows the Obstetrics Characteristics of the study population. Majority (54.2%) of the patients were diagnosed with HDP in their second trimester, (45.8%) were diagnosed with HDP in their third trimester. Also, data obtained for the study show that 6.7% of patients recorded were nulliparous, 20.0% were primiparous, 50.0% were multiparous and 23.3% of the total patients recorded were grand multiparous. It was also observed from the study population that majority (95.7%) of the women were diagnosed with HDP during their 1st, 2nd, 3rd and 5th pregnancy.

Figure 1 shows a bar chart representing the past history of Hypertensive Disorders of Pregnancy (HDP) in study participants. Majority (76.7%) of

female CKD patients had a history of Hypertensive Disorders of Pregnancy (HDP).

Table 3 shows the common types of HDP among women with CKD. Data from the result show that 6(26.1%) had chronic hypertension, 13(56.5%) had preeclampsia, and 4(17.4%) had eclampsia. Preeclampsia (56.5%) is the most prevalent HDP in the study population.

Table 4 shows the stages of CKD at diagnosis. From the result, it was observed that majority (90.0%) of the women in the study population present with stages 4 and 5 CKD (Advanced CKD).

Table 5 shows the relationship between types of HDP and stages of CKD of the study population. However, data from the result show that there is no significant relationship between the types of HDP and stages of CKD.

Table 6 represents the risk factors for progression to CKD in patient with history of HDP. It was observed from the data obtained that there was no clear risk factor for progression to CKD due to small sample size which decreased the power of the study

## DISCUSSION

The summary of major findings from this study include, majority of the women in the study population with CKD are between the ages of 36 – 65 years. It is striking to note that 76.7% of the women in the study population with CKD had a history of HDP. Preeclampsia accounted for the most common type of HDP in the study population. Majority of the HDP incidence in the study population were diagnosed at the 2nd and 3rd trimester. CKD in women of the study

population mostly presented late at stages 4 and 5.

Socio-demographic data of the study population showed that majority of the patients were between the ages of 36 – 55 years. This finding is expected since the risk of CKD in women with history of HDP increases with age. This result is similar to a previous study done in Nigeria in which older maternal age independently increased the risk of postpartum CKD in women with history of HDP. (Ishaku S.M et al. 2021). Also, a systematic review on preeclampsia and CKD conducted in France showed that women aged  $\geq 35$  years at delivery had a significantly higher risk of developing CKD (Marie H. et al. 2025). Also, it was observed that the majority of women with CKD had a history of Hypertensive Disorders of Pregnancy (HDP). This may be due to the fact that renal injury from HDP combined with other comorbidities increases their risk of developing CKD. This is similar to a Swedish nationwide cohort study in which women with HDP face a significant increase risk of CKD (Peter M. Barrette et al 2020). A prospective cohort study conducted in Nigeria also revealed that HDP is a major clinical precursor for CKD in women (Ishaku S.M et al. 2021). Preeclampsia accounted for the most common type of HDP in the study population since majority of women with history of preeclampsia, had some form of renal injury. This is consistent with a study in China which noted preeclampsia as the most common and clinically significant HDP in women with pre-existing CKD (Li et al. 2023). A Swedish study also noted that preeclampsia increased CKD risk by 92% (Barrette et al. 2020).

From the result obtained, it was observed that majority of the HDP incidence in the study population were diagnosed in their second and third trimester. This may be due to the fact that the second trimester represents a critical window for HDP prediction due to the physiological BP nadir. This result is consistent with a previous Nigerian prospective cohort study which indicated that the HDP subtypes most strongly associated with CKD are diagnosed after 20 weeks of gestation (Ishaku S.M et al. 2021). A study conducted in France also noted that HDP was diagnosed in women with preexisting CKD after 20 weeks of gestation (Delphine et al. 2023).

Additionally, it was observed that CKD in women of the study population mostly presented late at stages 4 and 5. This is similar to a prospective cohort study done in Nigeria which showed that women with a history of HDP often present with late-stage CKD, including stages 4 and 5 (Ishaku S.M. et al. 2021). Similarly, an Indonesian retrospective cohort study indicated that HDP accelerates progression to advanced CKD (Ernawati et al. 2023)

## CONCLUSION

There is a significant burden of past history of HDP in females with CKD and preeclampsia is the most common type of HDP. Patients present at advanced CKD. There is no relationship between the stage of CKD and HDP. Common risk factors for HDP Progression to CKD did not show any statistical significance.

## COMPETING INTERESTS

All the authors involved in writing the content of this manuscript and disclosed no conflicts of interest whatsoever.

## REFERENCES

- Barrett, P. M., McCarthy, F. P., Kublickiene, K., Cormican, S., Judge, C., Evans, M., & Kublickas, M. (2020). Adverse pregnancy outcomes and long-term maternal kidney disease: a systematic review and meta-analysis. *Journal of Clinical Medicine*, 9(3), 815.
- Bikbov, B., Purcell, C. A., Levey, A. S., Smith, M., Abdoli, A., Abebe, M., ... & Murray, C. J. L. (2020). Global, regional, and national burden of chronic kidney disease, 1990–2017: A systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*, 395(10225), 709–733.
- Coker, J., Kamara, A., Sesay, M., & James, F. (2022). The Burden of Renal Disease at Connaught Hospital: A Retrospective Review. *Sierra Leone Medical Journal*, 21(1), 33–40.
- Ernawati, E., Aditiawarman, A., Rifdah, S. N., & Sulistyono, A. (2023). The risk of persistent hypertension and chronic kidney disease in early and late-onset preeclampsia, a report from a low middle income country. *Pharmacognosy Journal*, 15(2).
- Fokom-Domgue, J., Combescure, C., Fokom-Defo, V., Tebeu, P. M., Vassilakos, P., Kengne, A. P., & Petignat, P. (2015). Performance of alternative strategies for primary cervical cancer screening in sub-Saharan Africa: systematic review and meta-analysis of diagnostic test accuracy studies. *BMJ*, 351, h3084.
- Ishaku, S. M., et al. (2021). Prevalence and determinants of chronic kidney disease in women with hypertensive disorders in pregnancy in Nigeria: a cohort study. *BMC Nephrology*, 22, 1-10.
- Kervella, D., & Torreggiani, M. (2023). Baseline proteinuria level and adverse outcomes in pregnant women with chronic kidney disease: New evidence and a note of caution. *Clinical Kidney Journal*, 16(10), 1550–1552.
- Li, et al. (2023). Pregnancy outcomes in patients with chronic kidney disease: a Meta analysis.
- Marie, H., et al. (2025). The dilemma of chronic kidney disease and end-stage kidney disease following pre-eclampsia: a literature review and meta-analysis. *International Urology and Nephrology*, 57(12), 4131-4140.
- Naicker, S., et al. (2010). End-stage renal disease in Sub-Saharan Africa. *Kidney International Supplements*, 3(1), 161–163.
- Sibai, B. M. (2024). Hypertensive Disorders of Pregnancy. Medscape Reference. Updated October 29, 2024.
- Umesawa, M., & Kobashi, G. (2017). Epidemiology of hypertensive disorders in pregnancy: prevalence, risk factors, predictors and prognosis. *Hypertension Research*, 40(3), 213–220

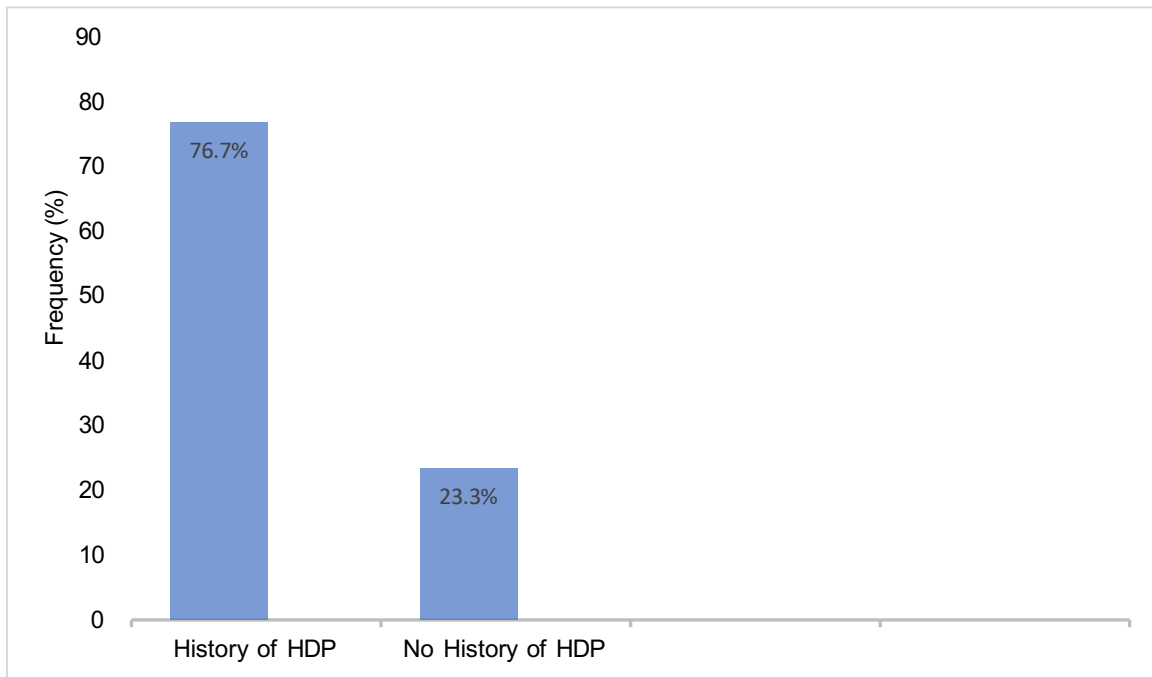


.Tale 1 – Sociodemographic Characteristics of the Study Population

Variable		Frequency (N)	Percentages (%)
Age (in Years)	15 – 25	2	6.7
	26 – 35	1	3.3
	36 – 45	7	23.3
	46 – 55	10	33.3
	56 – 65	8	26.7
	66 – 75	1	3.3
	76 – 85	1	3.3
	<b>Total</b>	<b>30</b>	<b>99.9</b>
Marital Status	Single	8	26.7
	Married	16	53.3
	Separated	6	20.0
	<b>Total</b>	<b>30</b>	<b>100.0</b>
Educational Level	None	5	16.7
	Primary	0	0.0
	Secondary/Tertiary	25	83.3
	<b>Total</b>	<b>30</b>	<b>100.0</b>
Religion	Christianity	15	50.0
	Islam	15	50.0
	Others	0	0.0
	<b>Total</b>	<b>30</b>	<b>100.0</b>

Table 2 – Obstetrics Characteristics of the Study Population

Variable		Frequency (N)	Percentages (%)
<b>Gestational Age at HDP diagnosis (In Weeks)</b>	First Trimester	0	0.0
	Second Trimester	13	54.2
	Third Trimester	11	45.8
	<b>Total</b>	<b>24</b>	<b>100.0</b>
<b>Parity</b>	Nulliparous	2	6.7%
	Primiparous	6	20.0%
	Multiparous	15	50.0%
	Grandmultiparous	7	23.3%
	<b>Total</b>	<b>30</b>	<b>100.0%</b>
<b>Pregnancy in which HDP was diagnosed</b>	1 <sup>st</sup> Pregnancy	4	17.4
	2 <sup>nd</sup> Pregnancy	6	26.1
	3 <sup>rd</sup> Pregnancy	6	26.1
	4 <sup>th</sup> Pregnancy	1	4.3
	5 <sup>th</sup> Pregnancy	6	26.1
	<b>Total</b>	<b>23</b>	<b>100.0%</b>



**Figure 1: History of Hypertensive Disorders of Pregnancy (HDP) among Women with CKD**

**Table 3 – Types of HDP**

Variable		Frequency (N)	Percentages (%)
Type of HDP	Chronic hypertension	6	26.1
	Preeclampsia	13	56.5
	Eclampsia	4	17.4
	<b>Total</b>	<b>23</b>	<b>100.0</b>

Table 4 – Stages of CKD at Diagnosis

Variable		Frequency (N)	Percentages (%)
Stage of CKD at diagnosis	Stage 2	2	6.7
	Stage 3	1	3.3
	Stage 4	11	36.7
	Stage 5	16	53.3
	<b>Total</b>	<b>30</b>	<b>100.0</b>

Table 5 – Relationship between types of HDP and Stages of CKD

Variable	Stages of CKD				Test Statistics
	2N(%)	3N(%)	4N(%)	5N(%)	
Chronic Hypertension	1(50.0%)	1(100.0%)	2 (25.0%)	2(16.7%)	X <sup>2</sup> = 4.595 df = 2 p-value = 0.597
Preeclampsia	1(50.0%)	0(0.0%)	4(50.0%)	8(66.6%)	
Eclampsia	0(0.0%)	0(0.0%)	2(25.0%)	2(16.7%)	

**Table 6 – Risk factors for progression to CKD in patient with history of HDP**

Variable	Stage of CKD at Diagnosis					Total	p-Value
		2	3	4	5		
Age (in Years)	15 – 35	0(0.0%)	0(0.0%)	0(0.0%)	3(10.0%)	3(10.0%)	0.654
	36 – 45	0(0.0%)	0(0.0%)	4(13.3%)	3(10.0%)	7(23.3%)	
	46 – 55	1(3.3%)	1(3.3%)	4(13.3%)	4(13.3%)	10(33.3%)	
	56 – 85	1(3.3%)	0(0.0%)	3(10.0%)	6(20.0%)	10(33.3%)	
	<b>Total</b>						
HDP Sub-Type	Chronic Hypertension	1(50.0%)	1(100.0%)	2(25.0%)	2(16.7%)	6(26.1%)	0.597
	Preeclampsia	1(50.0%)	0(0.0%)	4(50.0%)	8(66.6%)	13 (56.5%)	
	Eclampsia	0(0.0%)	0(0.0%)	2(25.0%)	2(16.7%)	4(17.4%)	
	<b>Total</b>						
Parity	Nulliparous	0(0.0%)	0(0.0%)	0(0.0%)	2(6.7%)	2(6.7%)	0.102
	Primiparous	0(0.0%)	0(0.0%)	2(6.7%)	4(13.3%)	6(20.0%)	
	Multiparous	1(3.3%)	1(3.3%)	7(23.3%)	6(20.0%)	15(50.0%)	
	Grand-multiparous	1(3.3%)	0(0.0%)	2(6.7%)	4(13.3%)	7(23.3%)	
	<b>Total</b>						
Comorbidity	Diabetes Mellitus	2(6.7%)	0(0.0%)	2(6.7%)	4(13.3%)	<b>8(26.7%)</b>	0.293