



## Adherence to Guidelines in Postpartum Management of Hypertensive Disorders in Pregnancy in Tertiary Health Facilities in Nigeria: A Multi-centre Study

Lawal Oyeneyin, Salisu Ishaku, Onyebuchi Azubuiké, Innocent Agbo, Lamarin Dattijo, Aminu Baffah, Gbenga Kayode, Olorunfemi Owa, Patience Odusolu, Karima Tunau, Jamilu Tukur, Charlotte Warren, Hannifa Abubakar, Musa Abdulkarim, Arie Franx, Diederick Grobbee & Joyce Browne

To cite this article: Lawal Oyeneyin, Salisu Ishaku, Onyebuchi Azubuiké, Innocent Agbo, Lamarin Dattijo, Aminu Baffah, Gbenga Kayode, Olorunfemi Owa, Patience Odusolu, Karima Tunau, Jamilu Tukur, Charlotte Warren, Hannifa Abubakar, Musa Abdulkarim, Arie Franx, Diederick Grobbee & Joyce Browne (2021) Adherence to Guidelines in Postpartum Management of Hypertensive Disorders in Pregnancy in Tertiary Health Facilities in Nigeria: A Multi-centre Study, *Health Systems & Reform*, 7:1, e1932229, DOI: [10.1080/23288604.2021.1932229](https://doi.org/10.1080/23288604.2021.1932229)

To link to this article: <https://doi.org/10.1080/23288604.2021.1932229>



© 2021 The Author(s). Published with license by Taylor & Francis Group, LLC.



Published online: 31 Jul 2021.



Submit your article to this journal [↗](#)



Article views: 900



View related articles [↗](#)



View Crossmark data [↗](#)

RESEARCH ARTICLE



## Adherence to Guidelines in Postpartum Management of Hypertensive Disorders in Pregnancy in Tertiary Health Facilities in Nigeria: A Multi-centre Study

Lawal Oyeneyin<sup>a</sup>, Salisu Ishaku<sup>b,c</sup>, Onyebuchi Azubuiké<sup>d</sup>, Innocent Agbo<sup>b</sup>, Lamaran Dattijo<sup>e</sup>, Aminu Baffah<sup>e</sup>, Gbenga Kayode<sup>c,f</sup>, Olorunfemi Owa<sup>g</sup>, Patience Odusolu<sup>h</sup>, Karima Tunau<sup>i</sup>, Jamilu Tukur<sup>j</sup>, Charlotte Warren<sup>k</sup>, Hannifa Abubakar<sup>l</sup>, Musa Abdulkarim<sup>m</sup>, Arie Franx<sup>n</sup>, Diederick Grobbee<sup>c</sup>, and Joyce Browne<sup>l</sup>

<sup>a</sup>Department of Obstetrics and Gynaecology, University of Medical Sciences Teaching Hospital, Nigeria, Ondo; <sup>b</sup>Population Council Nigeria, Abuja, Nigeria; <sup>c</sup>Julius Global Health, Julius Center for Health Science and Primary Care, UMC Utrecht, Utrecht University, Utrecht, The Netherlands; <sup>d</sup>Department of Obstetrics and Gynaecology, Federal Teaching Hospital, Abakaliki, Nigeria; <sup>e</sup>Department of Obstetrics and Gynaecology, Abubakar Tafawa Balewa University Teaching Hospital, Nigeria, Bauchi; <sup>f</sup>Institute of Human Virology, Abuja, Nigeria; <sup>g</sup>Department of Obstetrics and Gynaecology, Mother and Child Hospital, Akure, Nigeria; <sup>h</sup>Department of Obstetrics and Gynaecology, University of Calabar Teaching Hospital, Calabar, Nigeria; <sup>i</sup>Department of Obstetrics and Gynaecology, Usmanu DanFodio University Teaching Hospital, Sokoto, Nigeria; <sup>j</sup>Department of Obstetrics and Gynaecology, Bayero University/Aminu Kano Teaching Hospital Kano, Kano, Nigeria; <sup>k</sup>Population Council, Population Council, Washington, DC, USA; <sup>l</sup>Department of Obstetrics and Gynaecology, Muhammad Abdullahi Wase Teaching Hospital, Kano, Nigeria; <sup>m</sup>Department of Obstetrics and Gynaecology, Federal Medical Center, Lokoja, Nigeria; <sup>n</sup>Department of Obstetrics and Gynaecology, Erasmus Medical Center, University Medical Center, Rotterdam, The Netherlands

### ABSTRACT

Hypertensive disorders in pregnancy (HDPs) are a leading cause of maternal morbidity and mortality. Available guidelines for their postpartum management are expected to be optimally utilized. This study aimed to determine adherence to guidelines in selected Nigerian tertiary hospitals. It was nested in a cohort of women with HDPs who delivered in eight facilities between October 2017 and June 2018. Nine weeks after delivery, their cases were evaluated on prespecified indicators and supplemented with interviews. The level of adherence to the guidelines was determined using descriptive analyses, including frequencies, percentages, means, and standard deviations, as well as charts. Of the 366 participants, 33 (9%), 75 (20%), 200 (55%), and 58 (16%) had chronic hypertension, gestational hypertension, preeclampsia, and eclampsia, respectively. Only about a third had their blood pressure measured between postpartum days three and five. Similarly, a third of those with persistent hypertension ( $\geq 140/90$  mmHg) were not on antihypertensive medications within the first week postpartum. In addition, 37% and 42% of participants were not counseled on contraceptives and early subsequent antenatal visits, respectively. Among those with preeclampsia/eclampsia, 93% were not offered postpartum screening for thromboprophylaxis. Although all women with preeclampsia/eclampsia remained hypertensive two weeks after discharge, only 24% had medical reviews. Overall, only 58% and 44% of indicators were adhered to among all HDPs and preeclampsia/eclampsia-specific indicators, respectively. Level of adherence to guidelines on postpartum management of HDPs in Nigerian tertiary hospitals is poor. It is recommended that institutionalization of guidelines be prioritized and linked to the entire continuum from preconception through longer term postpartum care.

### ARTICLE HISTORY

Received 23 September 2020  
Revised 9 May 2021  
Accepted 17 May 2021

### KEYWORDS

hypertensive disorders in pregnancy; Nigerian tertiary hospitals; postpartum management; quality of care

## Introduction

Hypertensive disorders in pregnancy (HDPs) complicate 5.2% to 8.2% of pregnancies worldwide.<sup>1</sup> They affect one in ten pregnancies in sub-Saharan Africa, with higher prevalence in Central and Western regions.<sup>2</sup> They are also responsible for 70,000 maternal deaths globally, killing a woman every 11 minutes.<sup>1,2</sup> A 2015 survey sponsored by the World Health Organization (WHO) and conducted in 42 tertiary hospitals across Nigeria revealed HDPs as the leading cause of maternal deaths, accounting for 23%.<sup>3</sup> Other reviews showed that a significant proportion of deaths from severe cases of HDPs occurred in the

postpartum period.<sup>4-6</sup> These deaths were mostly related to lack of adherence to recommended practices, especially poor control of postpartum blood pressure.

In addition, about 25% of women with HDPs, particularly those with a severe condition, experience a deterioration of end organ functions during puerperium, which is the period spanning six to eight weeks after delivery when pregnancy changes regress.<sup>7</sup> Other studies also showed that chronic diseases such as hypertension, stroke, diabetes mellitus, and renal and ischemic heart diseases, as well as venous thromboembolism (VTE), could develop from severe gestational hypertension, early onset preeclampsia (PE; <34 weeks of

gestation), and persistent proteinuria beyond three to six months after delivery.<sup>8–10</sup>

Lack of capacity, knowledge, and skills among health care providers for early detection, monitoring, and management, as well as referral of severe forms of HDPs such as PE and eclampsia (E), has been implicated in these avoidable deaths.<sup>3,11,12</sup> In addition to antenatal and intrapartum outcomes, maternal outcomes in HDPs are influenced by the quality of postpartum care. Specifically, women with HDPs need monitoring in the immediate postpartum period and beyond. Toward this end, international guidelines are widely available for health care providers.<sup>1,9,13–15</sup> Implementation of these guidelines enables strict monitoring of signs and symptoms and prompt identification and management of postpartum complications such as eclampsia, cerebrovascular accident, thromboembolism, and renal impairment. Nigeria's Federal Ministry of Health (FMOH) in collaboration with the Population Council pioneered the development of a service delivery manual on the management of women with HDPs, including during the immediate postpartum period, relevant for use by the cadre of health workers at primary and secondary levels of care.<sup>16</sup> This manual is only available in hard and electronic copies as of the time of writing of this article.

To the best of our knowledge, no study has examined the level of adherence to clinical guidelines in postpartum management of HDPs in sub-Saharan Africa. It can therefore be assumed that postpartum management is varied and might be at the discretion of individual specialists or facilities. A Bangladeshi report on quality of care assessment for women and their babies following HDPs is, however, available.<sup>17</sup> Tertiary hospitals, as referral centers, are expected to provide the best form of quality of health care services pertaining to all medical conditions, including HDPs. This study therefore aimed to determine the level of adherence to standard guidelines in postpartum management of HDPs at selected tertiary hospitals in Nigeria.

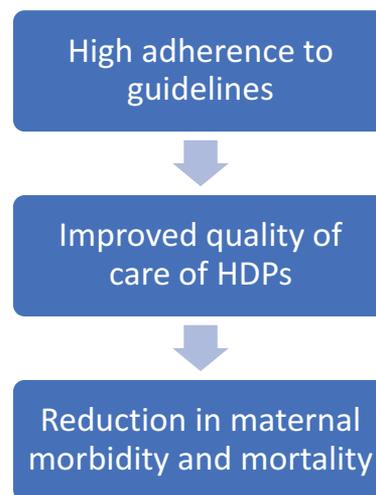
### Conceptual Framework

This study presupposes that high levels of adherence to recommended guidelines result in improved quality of care in postpartum management of women with HDPs, which will in turn reduce the maternal morbidity and mortality associated with the condition. This is illustrated in Figure 1.

## Materials and Methods

### Study Design

This study was nested in a cohort of women with HDPs who delivered and received postpartum care (including



**Figure 1.** Conceptual Framework Depicting Pathways from Adherence to Guidelines Recommendations for HDP Management through Improved Quality of Care and Reduction in Morbidity and Mortality.

a minimum of five days as inpatients) at tertiary health facilities in Nigeria. After discharge, they were followed up on an outpatient basis until full recovery. Data collection was conducted at nine weeks after delivery between October 2017 and June 2018. The choice of the ninth week postpartum as a data collection point was to allow the usual six- to eight-week postpartum visit period to elapse.

### Study Setting

The study was conducted in eight tertiary hospitals with similar maternity operations across the six geopolitical zones of Nigeria. The hospitals were purposefully selected to reflect diversity in the country in terms of ethnicity and socioeconomic status. The following states (and hospitals) participated: Bauchi State (Abubakar Tafawa Balewa University Teaching Hospital), Cross River State (University of Calabar Teaching Hospital), Ebonyi State (Federal Teaching Hospital Abakaliki), Kogi State (Federal Medical Center, Lokoja), Kano State (Aminu Kano Teaching Hospital), Ondo State (Mother and Child Hospital Akure and University of Medical Sciences Teaching Hospital), and Sokoto State (Usmanu Danfodio University Teaching Hospital).

Due to the geographical spread, women who received care in these facilities were considered a good representation of the diversity in the country. The selected tertiary health facilities were high-volume sites with well-functioning ante- and postnatal clinics, delivery rooms, and laboratory services, with combined annual deliveries averaging 38,400.

Prior to this study, cases of HDPs were essentially diagnosed the same way across the facilities. However, individual treatment and follow-up regimens appeared to be the prerogative of managing units or obstetricians. Most patients with HDPs were placed on extended admissions beyond the routine period when compared to normotensive patients. Compliance with outpatient follow-up visits was not enforced but was usually left to the patient's discretion.

### Participants

Women eligible to participate in this study were at least 18 years old, diagnosed with HDPs, and delivered and received postpartum care at these facilities (regardless of where they received antenatal care). Those newly diagnosed postpartum were not recruited.

### Exposure Variables

The main exposure of interest was the presence of any of the HDP subtypes, including chronic hypertension, gestational hypertension, and PE/E as defined by the International Society for the Study of Hypertension in Pregnancy<sup>13</sup>:

- *Chronic hypertension* in pregnancy: Any hypertension (systolic blood pressure [sBP]  $\geq 140$  mmHg and or diastolic blood pressure [dBP]  $\geq 90$  mmHg) that was present prepregnancy or diagnosed before the 20th week of pregnancy.
- *Gestational hypertension*: Any hypertension (sBP  $\geq 140$  mmHg and or dBP  $\geq 90$  mmHg) that appears for the first time after the 20th week of pregnancy without significant proteinuria, fetal growth restriction, or evidence of biochemical and hematological abnormalities.
- *PE/E*: Any hypertension (sBP  $\geq 140$  mmHg and or dBP  $\geq 90$  mmHg) that appears for the first time after the 20th week of pregnancy associated with significant proteinuria, fetal growth restriction, or any biochemical and hematological abnormalities. If a client with PE experienced tonic-clonic convulsions in the absence of a neurological cause, it was regarded as eclampsia.
- *Significant protein in urine* (proteinuria): Protein excretion in urine of  $\geq 2++$  using urine dipstick measurement.

### Outcome Variables

The level of adherence was assessed by prespecified indicators that were selected from guidelines on postpartum management for women with HDPs. The

guidelines include those developed by the FMOH,<sup>16</sup> the International Federation of Gynecologists and Obstetricians,<sup>1</sup> the National Institute for Health and Care Excellence,<sup>14</sup> International Society for the Study of Hypertension in Pregnancy,<sup>13</sup> WHO,<sup>15</sup> and the Royal College of Obstetricians and Gynecologists.<sup>9</sup> Although there is no consensus across guidelines, the 14 study indicators were based on agreed-on minimal care components or treatments for women with HDPs during the postpartum period. Treatment regimens in the study sites were recorded and measured against the prespecified indicators to determine level of adherence. None of the facilities had adopted a particular guideline prior to selection for the study and only health care services that were available within Nigeria's system were selected for evaluation. These include the following:

- Daily BP measurement in the first two days postpartum for women with chronic and gestational hypertension and measurement of BP four times a day in the first two days postpartum for women with PE.<sup>13,14,16</sup>
- Measurement of BP at least once between days three and five after birth in women with all forms of HDPs.<sup>1,4,16</sup>
- Whether women with PE were asked about severe headache or epigastric pain any time BP is measured.<sup>13,14,16</sup>
- Whether health care providers targeted a BP value of less than 140/90 mmHg after delivery in women with HDPs.<sup>15,16</sup>
- Continuation of antihypertensive treatment for women who remained hypertensive.<sup>14,15</sup>
- Offering (specialist) medical review for women with gestational hypertension and PE who remain on antihypertensive treatment two weeks after discharge from hospital.<sup>14</sup>
- Offering (specialist) medical review to women with any form of HDPs between six and eight weeks postpartum.<sup>14,16</sup>
- Offering specialist assessment for women with gestational hypertension and PE who still required antihypertensive treatment six to eight weeks after delivery.<sup>14</sup>
- Whether platelets, transaminases, and serum creatinine were measured 48 to 72 hours after delivery in women who had PE.<sup>13,14</sup>
- Whether urine protein estimation using urine dipsticks was performed at six to eight weeks after birth in women who had PE.<sup>14</sup>
- If desirous of another pregnancy, women with PE were advised to achieve and maintain a body

mass index (BMI) within a healthy range (18.5–24.9 kg/m<sup>2</sup>).<sup>14</sup>

- Had PE/E in isolation or with additional risk factor for thrombosis (e.g., age >35, obesity, and parity ≥3, etc.) and received thromboprophylaxis at any point after delivery.<sup>9</sup>
- Whether women were counseled to attend antenatal care (ANC) early in the next pregnancy.<sup>16</sup>
- Whether women were counseled on family planning at any time before or after delivery.<sup>16</sup>

In addition, information on participants' obstetric and demographic characteristics including age, parity, BMI, and host health care facilities was collected.

### Data Source/measurements

Participants' health records were evaluated and data were retrieved, supplemented with in-person questionnaire-based interviews conducted confidentially by trained research assistants at the ninth week postpartum. The research assistants were hospital administrative (nonmedical) personnel who corroborated the sociodemographic data and some of the above indicators, particularly those relating to providers' inquiring about severe headaches or epigastric pains prior to BP measurements, counseling on BMI and early ANC attendance in the next pregnancy, and providing family planning advice.

### Sample Size

Based on the existing knowledge that about 10% of pregnant women develop hypertensive disorders, it is estimated that 153 were required to participate in the study.<sup>1,2</sup> This includes a 10% potential nonresponse (at a 5% alpha level and power of 80%). The following formula was used:

$n = (z^2) p(1 - p)/d^2$ , where  $n$  is the required sample size,  $z$  is the  $z$  statistic for the level of confidence (1.96),  $p$  is the expected prevalence (10%), and  $d$  is the allowable error (0.0025).

Because this study conferred minimal risk to the participants, as many records as possible were reviewed. Out of an original number of 410 women identified with HDPs, 366 women who were followed up and available at the ninth week postpartum were recruited.

### Risk of Bias

To minimize measurement errors and misclassification bias, case identification and outcomes assessment were performed by specially trained midwives/nurses and

medical officers using standard diagnostic criteria. The information retrieved was entered into the electronic data capturing platform by trained research assistants as soon as the data were obtained to reduce the incidence of missing data. Hard copies of all records were retained as source documents at the facilities for future reference when necessary.

### Data Analysis

Descriptive statistics were performed to describe the obstetric and demographic characteristics of the participants. The level of adherence to standard guidelines in postpartum management of HDPs was expressed in terms of frequencies, percentages, means, and standard deviations. The overall adherence scores for all HDP-relevant and PE/E-specific indicators were obtained as mean scores. A compound bar chart was used to visualize trends in adherence to the management of BP during the postpartum period. Finally, univariate and multivariate regression analyses were performed to assess whether some theory-based determinants (HDP type, ANC registration, gestational age at ANC registration, gestational age at onset of HDP, mode of delivery, and severity of hypertension) predicted high adherence (a composite score of five or more out of the eight indicators) to recommended care for all women with HDPs. The data were analyzed using SPSS IBM version 25.0.<sup>18</sup>

### Results

Out of 366 women with HDPs evaluated at nine weeks postpartum, 33 (9%), 75 (20%), 200 (55%), and 58 (16%) had chronic hypertension, gestational hypertension, PE, and eclampsia, respectively. The majority were multiparous (55%), relatively overweight with a mean BMI of 28.8 kg/m<sup>2</sup> (SD = 7.7), and a mean maternal age of 28.7 years (SD = 6.4). About 40% (145) of all women did not receive ANC, and among those who did, only 3% (12) registered within the first trimester. The majority received the diagnosis of HDP at ≥34 weeks gestation ( $n = 235$ , 64%), delivered at term ( $n = 219$ , 60%), and had a Caesarean section ( $n = 195$ , 53%). Details of other obstetric and demographic variables are shown in Table 1.

Table 2 shows the distribution of adherence in the postpartum period in HDPs. Blood pressure was measured in only about a third of all women between postpartum days three and five (i.e., 6.7%, 16.4%, 59.7%, and 17.2% of women with chronic hypertension, gestational hypertension, PE, and eclampsia, respectively). Similarly, a third of women who had BP ≥140/90 mmHg were not

on antihypertensive medication within the first week of delivery. Only 63% and 58% were counseled on contraceptive services and early antenatal visits in subsequent pregnancies, respectively. Fifty-four percent were not offered medical review six to eight weeks postpartum. The overall adherence to the recommended indicators for all women with HDPs was 58% (i.e., 8.6%, 16%, 56.5%, and 18.7% of women with chronic hypertension, gestational hypertension, PE, and eclampsia, respectively).

Though about 83% of patients with PE/E were offered urine protein estimation in the first week following delivery, only 42% had the same investigation between six and eight weeks postpartum. Ninety-three percent were not assessed for or administered thromboprophylaxis after delivery. Of those who remained hypertensive two weeks after discharge, only 24% were offered (specialist) medical review. Platelets, transaminases, and serum creatinine was not measured after delivery in any of the women with PE/E. The overall adherence to

**Table 1.** Baseline Characteristics of Study Participants.

Variables	Records Reviewed (N = 366)		Chronic Hypertension	Gestational hypertension	Preeclampsia	Eclampsia
	Number (%)	Mean (SD)				
HDP subtypes, n (%)			33 (9.0)	75 (20.5)	200 (54.6)	58 (15.8)
Mean age (SD)		28.7 (6.4)	35.2 (6.8)	33.3 (28.9)	28.4 (5.7)	24.6 (6.3)
Mean BMI at booking (SD)		28.8 (7.7)	31.7 (11.7)	31.6 (8.5)	27.7 (6.2)	24.9 (4.2)
Parity, n (%)						
Para 0	78 (21.3)		1 (1.3)	9 (11.5)	45 (57.7)	23 (29.5)
Para 1–3	200 (54.6)		14 (7.0)	51 (25.5)	108 (54.0)	27 (13.5)
≥Para 4	87 (23.7)		18 (20.7)	15 (17.2)	47 (54.0)	7 (8.0)
Missing	1 (0.3)					
ANC status, n (%)						
Registered	221 (60.4)		23 (10.4)	60 (27.2)	117 (52.9)	21 (9.5)
Not registered	145 (39.6)		10 (6.9)	16 (11.0)	83 (57.2)	36 (24.8)
Gestational age at ANC registration						
≤12 weeks	12 (3.3)		0 (0)	3 (25.0)	7 (58.3)	2 (16.7)
13–20 weeks	69 (18.9)		6 (8.7)	14 (20.3)	43 (62.3)	6 (8.7)
>20 weeks	284 (77.6)		27 (9.5)	58 (20.4)	150 (52.8)	49 (17.3)
Missing	1 (0.3)					
Gestational age at diagnosis of HDP						
<34 weeks	126 (34.4)		23 (18.3)	11 (8.7)	77 (61.1)	15 (11.9)
≥34 weeks	235 (64.2)		10 (4.3)	61 (26.0)	122 (51.9)	42 (17.9)
Missing	5 (1.4)					
Moderate/severe hypertension on treatment before delivery						
Yes	123 (33.4)		29 (23.6)	27 (22.0)	61 (49.6)	6 (4.9)
No	243 (66.6)		4 (1.6)	49 (20.2)	139 (57.2)	51 (21.0)
Gestational age at delivery						
<37 weeks	146 (39.9)		15 (10.3)	8 (5.5)	97 (66.4)	26 (17.8)
≥37 weeks	219 (59.8)		18 (8.2)	67 (30.6)	103 (47.0)	31 (14.2)
Missing	1 (0.3)					
Mode of delivery						
Spontaneous vaginal delivery	165 (45.1)		18 (10.9)	42 (25.5)	82 (49.7)	23 (13.9)
Assisted vaginal delivery	6 (1.6)		0 (0)	2 (33.3)	3 (50.0)	1 (16.7)
Caesarean section	195 (53.3)		15 (7.7)	31 (15.9)	115 (59.0)	34 (17.4)

**Table 2.** Proportion of Women with Any HDP Who Received Recommended Care and/or Counseling during Puerperium (Up to 8 Weeks after Delivery).

Indicators	(N = 366)				
	Number (%)	Chronic Hypertension	Gestational Hypertension	Preeclampsia	Eclampsia
Received information on danger signs (severe headache, blurring of vision, nausea or vomiting, epigastric pain) in the immediate postpartum period	197 (53.8)	15 (7.6)	35 (17.8)	106 (53.8)	41 (20.8)
Blood pressure checked at least once between days one and two after delivery	360 (98.4)	32 (8.9)	73 (20.3)	199 (55.3)	56 (15.6)
Blood pressure checked at least once between days three and five after delivery	134 (36.6)	9 (6.7)	22 (16.4)	80 (59.7)	23 (17.2)
Women with blood pressure measurement of ≥140/90 mmHg who were on antihypertensive within first week postpartum	234 (63.9)	20 (8.6)	36 (15.4)	138 (59.0)	40 (17.1)
Counseled on family planning at the six-week postnatal visit? Or at any time before or after delivery?	231 (63.1)	21 (9.1)	45 (19.5)	120 (52.0)	45 (19.5)
Counseled to attend ANC early in next pregnancy	213 (58.2)	20 (9.4)	30 (14.1)	121 (56.8)	42 (19.7)
Patient counseled on risk of recurrence of condition in subsequent pregnancy	198 (54.1)	20 (10.1)	21 (10.6)	117 (59.1)	40 (20.2)
Offered a review between six and eight weeks postpartum	168 (45.9)	16 (9.5)	22 (13.1)	93 (55.4)	37 (22.0)

the indicators was 44%. Details of the distribution of adherence among women with PE and eclampsia in the postpartum period are shown in Table 3.

There is a declining trend in measurement of urine protein and BP from the day of delivery until the fifth postpartum day among women with all HDP subtypes as illustrated in Figure 2. For instance, though these parameters were measured in 98% and 77% of women on day one, day five postpartum these parameters were measured in only 37% and 24% of women, respectively.

Finally, among the potential determinants for this study, only HDP type was a significant predictor of high adherence in the univariate analysis. This was not the case in the multivariate analysis. Table 4 provides details of these analyses.

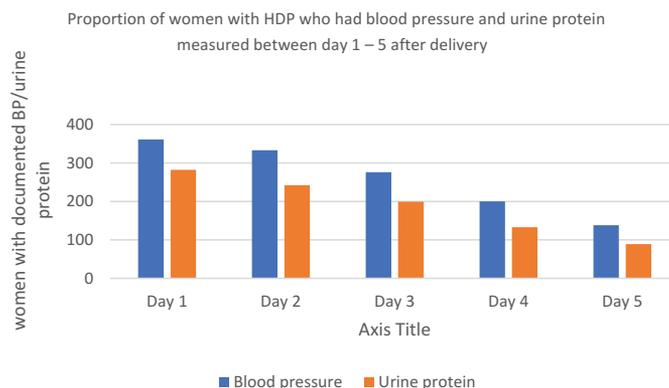
## Discussion

In general, the level of adherence to the recommended postpartum care of the participants was poor. Overall, only 58% and 44% of indicators were adhered to among all HDP and PE/E-specific indicators, respectively. It is important to measure BP in women with HDPs, because the values can rise unexpectedly to dangerously high levels, especially between the third and fifth days postpartum. During this period, BP was not measured in two-thirds (64%) of participants, putting them at risk of adverse cardiovascular outcomes.

Two-thirds of women with HDPs who had BP values above 140/90 mmHg were not on antihypertensive medications, despite the widespread local availability of effective, low-cost drugs like nifedipine and  $\alpha$ -methyl dopa.<sup>19</sup>

**Table 3.** Proportion of Women Who Had Preeclampsia/Eclampsia and Offered Recommended Treatment and Counseling at a Given Postpartum Period.

Indicators	Number (%)		
	Total 258 (100%)	Preeclampsia 200 (100%)	Eclampsia 58 (100%)
Had PE/E and offered urine protein estimation within one week of delivery	214 (82.9)	162 (81.0)	52 (89.7)
Had PE/E and offered urine protein estimation at six to eight weeks postpartum visits	109 (42.2)	74 (37.0)	35 (60.3)
Had PE/E and additional risk factor for thrombosis (e.g., age >35, obesity, and parity $\geq$ 3, etc.) and received thromboprophylaxis at any point after delivery	19 (7.4)	13 (6.5)	6 (10.3)
Had PE/E, planning for another pregnancy, counseled to maintain healthy BMI before next pregnancy	131 (50.8)	94 (47.0)	37 (63.8)
Had PE/E, remained hypertensive two weeks after discharge, offered medical review	62 (24.0)	42 (21.0)	10 (17.2)
Had PE/E and platelets, transaminases, and serum creatinine were measured 48 to 72 hours after delivery	0 (0)	0 (0)	0 (0)
Had PE/E and received a dose of magnesium sulfate	253 (98.0)	179 (89.5)	57 (98.3)



**Figure 2.** Proportion of Women with HDPs Whose BP and Urine Protein Were Measured between Days One and Five after Delivery.

**Table 4.** Univariate and Multivariate Logistic Regression Analyses of Determinants of Adherence to Recommended Postpartum Care Services for Women with HDPs.

Indicator	Univariate			Multivariate		
	Odd Ratio	P Value	Confidence Interval	Odd Ratio	P Value	Confidence Interval
HDP type	1.50	0.003	1.15–1.94	1.41	0.275	0.76–2.59
ANC registration	0.69	0.104	0.45–1.08	1.00	—	—
Gestational age at ANC registration	1.00	0.965	0.95–1.05	1.01	0.748	0.94–1.09
Gestational age at onset of HDP	1.00	0.827	0.98–1.03	0.90	0.063	0.81–1.01
Mode of delivery	1.15	0.066	0.99–1.33	0.98	0.899	0.67–1.39
Severity of hypertension	2.08	0.073	0.94–4.62	2.44	0.119	0.79–7.48

This represents an important missed opportunity to avert untoward clinical sequelae. Though it is standard practice to review all women at six to eight weeks postpartum, over half of those with HDPs in this study were not followed up. This gave rise to another missed opportunity for a smooth transition from obstetrics to specialist medical care in identifiable cases. These shortcomings could be attributed to ignorance as well as misleading perception of well-being in women who are free of significant symptoms during this period.

PE is a recognized risk factor for development of VTE, and guidelines recommend, at the very least, a risk assessment in the immediate postpartum period, followed by administration of thromboprophylaxis if indicated. Almost all women with PE in this study, the majority of whom had additional risk factors, were denied thromboprophylaxis after delivery. The near total lack of adherence to this recommendation suggests that VTE is not considered a priority in hospitals across the country. Some researchers have indeed put the annual prevalence of VTE in pregnancy and puerperium between 380 and 448 per 100,000 births.<sup>20</sup> The same study revealed that a quarter of patients at risk of VTE in Africa do not receive prophylaxis.

Contrary to guidelines, this study showed that only one-quarter of women with PE who remained hypertensive two weeks after delivery were offered (specialist) medical reviews. In addition, blood platelets, serum transaminase, and creatinine were not measured within 48 to 72 hours after delivery in any of the participants. This is another substandard inpatient care factor that may have to do with the cost implications and inconvenience of such reviews and tests. Despite the significance of the above results, some caution in interpretation is advised. For instance, observing a particular care component might not necessarily mean that a guideline was adhered to. Conversely, the absence of performing a care component might not represent nonadherence per se, as observed in situations where essential supplies or consumables might be unavailable, thereby preventing implementation. Of importance is that this study was conducted in tertiary hospitals with presumed better access to qualitative care and, as such, it is expected that levels of adherence to standard guidelines would likely be poorer at lower-level facilities. As the regression analyses suggest, the lapses in adherence to standard care are deeply rooted, because most of the theory-based predictors showed statistically insignificant effects.

Although the evaluation of care offered was mainly focused on the postpartum period, a pattern of substandard care that encompassed the entire maternity care continuum was observed. Up to 40% of women did not receive any form of ANC, and only 5% registered in their

first trimester. This is similar to the 37% ANC default rate reported by the most recent national demographic and health survey.<sup>21</sup> These findings are in sharp contrast to the WHO's vision that every pregnant woman receive quality care during pregnancy, childbirth, and puerperium, including a first ANC visit in the first trimester.<sup>22</sup> This is especially relevant to women who might later develop HDPs because ANC offers the opportunity for early detection and timely and appropriate management, with substantial maternal and perinatal health benefits.<sup>23,24</sup>

### **Study Limitations**

For this Nigerian study, indicators seldom available as postpartum services were not included, such as screening for causes of secondary hypertension in women with resistant hypertension, checking for resolution of biochemical changes in PE, and mental health support. Evaluation of the latter would have added value as a component of comprehensive postpartum care. This would be required in any population to support grievances and bereavement processes as a consequence of adverse fetal or newborn outcomes.<sup>25</sup>

In addition, the sample of patients included in this analysis was quite specific to a particular level of care. It comprised patients delivering in tertiary hospitals followed up for postpartum care and might therefore not represent typical experiences in lower-level settings.

Furthermore, reliance on in-person questionnaire-based interviews at the ninth week postpartum to assess adherence to some indicators is subject to recall bias. Because some assessments were based on chart reviews, they might also be subject to measurement bias.

### **Program and Policy Implications**

The findings have significant program and policy implications in the global endeavor to reduce the burden of preventable maternal deaths in low- and middle-income countries like Nigeria. It is pertinent to emphasize that care for women with HDPs should be looked upon as a continuum from preconception, the antenatal period, and childbirth through the postpartum period.<sup>26–28</sup> This is especially in light of the very low early (less than 12 weeks gestation) ANC attendance among our study participants. Though, overall, early ANC attendance increased to 60% globally in 2013, pockets of inequality remain in low- and middle-income countries, with coverage estimated at less than 50% (25% for sub-Saharan Africa) compared to 85% in high-income countries.<sup>29</sup>

Implementation strategies to improve adherence to guidelines in Nigeria will involve the FMOH spearheading an initial development of a single, comprehensive,

and domesticated document extending from preconception care to at least eight weeks postpartum as recommended in this study that will be made available to all relevant stakeholders, especially those in tertiary health facilities. This should be followed up with organization of seminars and training workshops on the guidelines targeted particularly at health care professionals. Finally, a monitoring and evaluation system should be established at the facility level to ensure adherence and serve as a feedback mechanism.

## Conclusion

Level of adherence to guidelines on postpartum management of HDPs in tertiary hospitals in Nigeria is poor. Given the shortcomings observed, worse scenarios should be expected for secondary- and primary-level facilities.

Due to the increased risk of morbidity and mortality associated with HDPs in the postpartum period and beyond, it is recommended that institutionalization of these guidelines be prioritized and linked to the entire continuum of care beginning from preconception, pregnancy, childbirth, and the postpartum period to longer-term ongoing care by medical specialists whenever indicated.

## Acknowledgments

The authors hereby acknowledge the invaluable contributions of all supporting staff of the Population Council–Nigeria and the study hospital sites. In particular, the authors thank those at the Department of Obstetrics and Gynecology of the University of Medical Sciences Teaching Hospital, Ondo, namely, Dr. Temitope Ogedengbe (resident doctor), Patience Agbonmuserin (chief nursing officer), Bimpe Adeniyi (nursing officer), Bose Omodara (health information manager), and Adeola Awotale (research assistant).

## Author Contributions

OL and SI, as lead authors, contributed to all aspects of this article's production. OA, IA, LD, AB, OO, PO, KT, JT, CW, HA, and MA also contributed to its conceptualization and design. All aforementioned (except IA and CW) participated in data acquisition. IA and GK were instrumental to data analyses and interpretation. CW, AF, DG, and JB also contributed to the latter. All authors provided input for the multiple drafts and approved the final version.

## Data Availability Statement

The data analyzed are in the custody of Population Council–Nigeria. Hard copies of source documents are at individual study sites.

## Disclosure of Potential Conflicts of Interest

No potential conflict of interest was reported by the author(s).

## Ethics and Consent

The study was approved by the Population Council's institutional review board in New York (Protocol No. 810), National Health Research Ethics Committee (NHREC) at the Federal Ministry of Health, and the institutional review boards of all participating hospitals.

## Funding

This work was supported by the US Agency for International Development (USAID) under the terms of cooperative agreement number USAID APSOAA-14-000048. The study was also supported by the UMC Utrecht Global Health Fellowship Program. This article reflects the views of the authors and does not represent the views of the US Government.

## ORCID

Lawal Oyenevin  <http://orcid.org/0000-0003-2779-6400>  
Joyce Browne  <http://orcid.org/0000-0001-7048-3245>

## References

1. Magee LA, Von Dadelszen P, Stones W, Mathai M. The FIGO textbook of pregnancy hypertension: an evidence-based guide to monitoring, prevention and management. Carlisle: The Global Library of Women's Medicine; 2016. ISBN978-0-9927545-5-6.
2. Noubiap JJ, Bigna JJ, Nyaga UF, Jingi AM, Kaze AD, Nansseu JR, Domgue JF. The burden of hypertensive disorders of pregnancy in Africa: a systematic review and meta-analysis. *J Clin Hypertens*. 2019;21(4):479–88. doi:10.1111/jch.13514.
3. Oladapo OT, Adetoro OO, Ekele BA, Chama C, Etuk SJ, Aboyeji AP, Onah HE, Abasiattai AM, Adamu AN, Adegbola O, et al. Nigeria near-miss and maternal death surveillance network. When getting there is not enough: a nationwide cross-sectional study of 998 maternal deaths and 1451 near-misses in public tertiary hospitals in a low-income country. *BJOG*. 2016;123(6):928–38. doi:10.1111/1471-0528.13450.
4. Odum C, Akinkugbe A. The causes of maternal deaths in eclampsia in Lagos, Nigeria. *West Afr J Med*. 1991;10:371–76.
5. Keskinilic B, Engin Üstün Y, Sanisoglu S, Uygur D, Keskin H, Karaahmetoglu S, Özcan A, Esen M, Alkan A, Kabasakal A, et al. Maternal mortality due to hypertensive disorders in pregnancy, childbirth, and the puerperium between 2012 and 2015 in Turkey: a nation-based study. *J Turk Ger Gynecol Assoc*. 2017;18(1):20–25. doi:10.4274/jtgga.2016.0244.

6. Nyfløt LT, Ellingsen L, Yli BM, Øian P, Vangen S. Maternal deaths from hypertensive disorders: lessons learnt. *Acta Obstet Gynecol Scand.* 2018;97(8):976–87. doi:10.1111/aogs.13357.
7. Deruelle P, Coudoux E, Ego A, Houfflin-Debauge V, Codaccioni X, Subtil D. Risk factors for post-partum complications occurring after preeclampsia and HELLP syndrome. A study in 453 consecutive pregnancies. *Eur J Obstet Gynecol Reprod Biol.* 2006;125(1):59–65. doi:10.1016/j.ejogrb.2005.07.011.
8. Girsberger M, Muff C, Hösli I, Jan Dickenmann M. Short term sequelae of preeclampsia: a single center cohort study. *BMC Pregnancy Childbirth.* 2018;18(1):177. doi:10.1186/s12884-018-1796-z.
9. Royal College of Obstetricians & Gynaecologists. Green-top guideline 37a: reducing the risk of thrombosis and embolism during pregnancy and the puerperium. 2015. [accessed 2019 Jul 27] <https://www.rcog.org.uk/en/guidelines-research-services/guidelines>
10. Melchiorre K, Sutherland G, Liberati M, Thilaganathan B. Preeclampsia is associated with persistent postpartum cardiovascular impairment. *Hypertension.* 2011;58(4):709–15. doi:10.1161/HYPERTENSIONAHA.111.176537.
11. Salomon A, Ishaku S, Kirk K, Warren C. Detecting and managing hypertensive disorders in pregnancy: a cross-sectional analysis of the quality of antenatal care in Nigeria. *BMC Health Serv Res.* 2019;19(1):411. doi:10.1186/s12913-019-4217-8.
12. Ishaku S, Ahonsi B, Oginni A, Tukur J, Adoyi G. Obstetric knowledge of nurse educators in Nigeria: levels, regional differentials and their implications for maternal health delivery. *Health Educ J.* 2015;75:1–10. doi:10.1177/0017896915571763.
13. Brown MA, Magee LA, Kenny LC, Karumanchi SA, McCarthy FP, Saito S, Hall DR, Warren CE, Adoyi G, Ishaku S. Hypertensive disorders of pregnancy: ISSHP classification, diagnosis, and management recommendations for international practice. *Hypertension.* 2018;72(1):24–43. doi:10.1161/HYPERTENSIONAHA.117.10803.
14. National Institute for Health and Care Excellence (NICE) guideline. Hypertension in pregnancy: diagnosis and management. 2019. [accessed 2019 Jul 27] [www.nice.org.uk/guidance/ng133](http://www.nice.org.uk/guidance/ng133)
15. WHO recommendations for prevention and treatment of pre-eclampsia and eclampsia. Geneva (Switzerland): World Health Organization; 2011. ISBN 978 92 4 154833 5.
16. Population Council, Nigerian Federal Ministry of Health. National training manual on treatment of pre-eclampsia and eclampsia for doctors, nurses and midwives. Abuja (Nigeria): Population Council; 2017.
17. Hossain S, Sultana K, Rouf S, Akter R, Roy S, Anwar S, Kirk K, Warren C. Hypertensive disorders in pregnancy: assessing postnatal quality of care and outcomes for women and their infants in Bangladesh. Washington (DC): The Population Council, Inc; 2019.
18. IBM Corp. Released 2017. IBM SPSS Statistics for Windows, version 25.0. Armonk, NY: IBM Corp.
19. Oke O, Adedapo A. Antihypertensive drug utilization and blood pressure control in a Nigerian hypertensive population. *General Med.* 2015;3:1000169. doi:10.4172/2327-5146.1000169.
20. Danwang C, Temgoua MN, Agbor VN, Tankeu AT, Noubiap JJ. Epidemiology of venous thromboembolism in Africa: a systematic review. *J Thromb Haemost.* 2017;15(9):1770–81. doi:10.1111/jth.13769.
21. National Population Commission (NPC) [Nigeria] and ICF. Nigeria demographic and health survey 2018. Abuja (Nigeria, and Rockville, Maryland, USA): NPC and ICF; 2019.
22. World Health Organization. Recommendations on antenatal care for a positive pregnancy experience. Geneva (Switzerland); 2016. ISBN 978 92 4 154991 2.
23. Von Dadelszen P, Magee LA. Preventing deaths due to the hypertensive disorders of pregnancy. *Best Pract Res Clin Obstet Gynaecol.* 2016;36:83–102. doi:10.1016/j.bpobgyn.2016.05.005.
24. Moore N, Blouin B, Razuri H, Casapia M, Gyorkos TW, Montazeri A. Determinants of first trimester attendance at antenatal care clinics in the Amazon region of Peru: a case-control study. *PLoS ONE.* 2017;12(2):e0171136. doi:10.1371/journal.pone.0171136.
25. Simhi M, Sarid O, Cwikel J. Preferences for mental health treatment for post-partum depression among new mothers. *Isr J Health Policy Res.* 2019;8(1):84. doi:10.1186/s13584-019-0354-0.
26. Singh K, Story Wt, Moran AC. Assessing the continuum of care pathway for maternal health in South Asia and sub-Saharan Africa. *Matern Child Health J.* 2016;20(2):281–89. <https://doi:10.1007/s10995-015-1827-6>.
27. Iqbal S, Maqsood S, Zakar R, Zakar MZ, Fischer F. Continuum of care in maternal, newborn and child health in Pakistan: analysis of trends and determinants from 2006 to 2012. *BMC Health Serv Res.* 2017;17(1):189. doi:10.1186/s12913-017-2111-9.
28. Sakuma S, Yasuoka J, Phongluxa K, Jimba M, Oh J. Determinants of continuum of care for maternal, newborn, and child health services in rural Khammouane, Lao PDR. *PLoS One.* 2019;14(4):e0215635. doi:10.1371/journal.pone.0215635.
29. Moller A-B, Petzold M, Chou D, Say L. Early antenatal care visit: a systematic analysis of regional and global levels and trends of coverage from 1990 to 2013. *Lancet Glob Health.* 2017;5(10):e977–83. doi:10.1016/S2214-109X(17)30325-X.