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

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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 (≥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.

INTRODUCTION

Hypertensive disorders in pregnancy (HDPs) complicate 5.2% to 8.2% of pregnancies worldwide. They affect one in ten pregnancies in sub-Saharan Africa, with higher prevalence in Central and Western regions. They are also responsible for 70,000 maternal deaths globally, killing a woman every 11 minutes. 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%. Other reviews showed that a significant proportion of deaths from severe cases of HDPs occurred in the postpartum period. 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. 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.8–10

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.3,11,12 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.1,9,13–15 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.16 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.17 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.

![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.](image)

**Materials and Methods**

**Study Design**

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

- **Chronic hypertension** in pregnancy: Any hypertension (systolic blood pressure [sBP] ≥ 140 mmHg and/or diastolic blood pressure [dBP] ≥ 90 mmHg) that was present prepregnancy or diagnosed before the 20th week of pregnancy.
- **Gestational hypertension**: Any hypertension (sBP ≥ 140 mmHg and/or dBP ≥ 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 ≥ 140 mmHg and/or dBP ≥ 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 ≥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, the International Federation of Gynecologists and Obstetricians, the National Institute for Health and Care Excellence, International Society for the Study of Hypertension in Pregnancy, WHO, and the Royal College of Obstetricians and Gynecologists. 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.
- Measurement of BP at least once between days three and five after birth in women with all forms of HDPs.
- Whether women with PE were asked about severe headache or epigastric pain any time BP is measured.
- Whether health care providers targeted a BP value of less than 140/90 mmHg after delivery in women with HDPs.
- Continuation of antihypertensive treatment for women who remained hypertensive.
- Offering (specialist) medical review for women with gestational hypertension and PE who remain on antihypertensive treatment two weeks after discharge from hospital.
- Offering (specialist) medical review to women with any form of HDPs between six and eight weeks postpartum.
- Offering specialist assessment for women with gestational hypertension and PE who still required antihypertensive treatment six to eight weeks after delivery.
- Whether platelets, transaminases, and serum creatinine were measured 48 to 72 hours after delivery in women who had PE.
- Whether urine protein estimation using urine dipsticks was performed at six to eight weeks after birth in women who had PE.
- 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/m²).14

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

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 question-
naire-based interviews conducted confidentially by
trained research assistants at the ninth week postpartum.
The research assistants were hospital administrative
(nonmedical) personnel who corroborated the sociode-
mographic data and some of the above indicators, parti-
cularly those relating to providers’ inquiring about
severe headaches or epigastric pains prior to BP mea-
surements, counseling on BMI and early ANC attend-
dance 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.1,2 This includes a 10% potential nonresponse (at
a 5% alpha level and power of 80%). The following
formula was used:

\[ n = \left( z^2 \right) \frac{p(1-p)}{d^2}, \]

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 inci-
dence 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 partici-
pants. 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 visua-
lize trends in adherence to the management of BP dur-
ing the postpartum period. Finally, univariate and multi-
variate regression analyses were performed to assess
whether some theory-based determinants (HDP type,
ANC registration, gestational age at ANC registra-
tion, 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
25.0.18

**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 multi-
parous (55%), relatively overweight with a mean BMI of
28.8 kg/m² (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 mea-
sured in only about a third of all women between post-
partum 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).

Table 1. Baseline Characteristics of Study Participants.

| Variables                              | Records Reviewed (N = 366) | Number (%) | Mean (SD) | Chronic Hypertension | Gestational Hypertension | Preeclampsia | Eclampsia |
|-----------------------------------------|----------------------------|-------------|-----------|----------------------|--------------------------|--------------|-----------|
| HD types, n (%)                         |                            |             |           |                      |                          |              |           |
| Mean age (SD)                           |                            | 28.7 (6.4)  | 35.2 (6.8)| 33.3 (28.9)          | 28.4 (5.7)               |              |           |
| Mean BMI at booking (SD)                |                            | 28.8 (7.7)  | 31.7 (11.7)| 31.6 (8.5)          | 27.7 (6.2)               |              |           |
| Parity, n (%)                           |                            |             |           |                      |                          |              |           |
| Gestational age at ANC registration     |                            |             |           |                      |                          |              |           |
| ≤12 weeks                               |                            | 78 (21.3)   | 1 (1.3)   | 9 (11.5)             | 45 (57.7)                | 23 (29.5)    |           |
| 13–20 weeks                             |                            | 200 (54.6)  | 14 (7.0)  | 51 (25.5)            | 108 (54.0)               | 27 (13.5)    |           |
| ≥20 weeks                               |                            | 87 (23.7)   | 18 (20.7) | 15 (17.2)            | 47 (54.0)                | 7 (8.0)      |           |
| 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 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)    |           |
| 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)    |           |
| 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 α-methyldopa.19

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

| Indicators                                                                 | 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 ≥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. 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. 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. 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.

**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.

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. 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.

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.

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**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.

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