

postpartum  
follow up

**ENDING  
Eclampsia**

# Assessing Quality of Care and Outcomes for Women and Their Infants in Nigeria After Pregnancies Complicated by Hypertensive Disorders

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## List of Acronyms

<b>AKTH</b>	<b>Aminu Kano Teaching Hospital</b>
<b>ATBTH</b>	<b>Abubakar Tafawa Balewa Teaching Hospital</b>
<b>BMI</b>	<b>Body Mass Index</b>
<b>BP</b>	<b>Blood Pressure</b>
<b>CH</b>	<b>Chronic Hypertension</b>
<b>FMC</b>	<b>Federal Medical Center</b>
<b>FMoH</b>	<b>Federal Ministry of Health</b>
<b>FTHA</b>	<b>Federal Teaching Hospital Abakaliki</b>
<b>GH</b>	<b>Gestational Hypertension</b>
<b>HDP</b>	<b>Hypertensive Disorder in Pregnancy</b>
<b>NICE</b>	<b>National Institute for Clinical Excellence</b>
<b>PE</b>	<b>Pre-Eclampsia</b>
<b>PE/E</b>	<b>Pre-Eclampsia/Eclampsia</b>
<b>PNC</b>	<b>Postnatal Care</b>
<b>UCTH</b>	<b>University of Calabar Teaching Hospital</b>
<b>UDUTH</b>	<b>Usman Danfodio University Teaching Hospital</b>
<b>UK</b>	<b>United Kingdom</b>
<b>USAID</b>	<b>United States Agency for International Development</b>
<b>VTE</b>	<b>Venous Thromboembolism</b>
<b>WHO</b>	<b>World Health Organization</b>

## Executive Summary

Hypertensive disorders in pregnancy (HDPs) including pre-eclampsia and eclampsia (PE/E) are responsible for 70,000 maternal deaths globally, killing a woman every 11 minutes. HDPs are the leading cause of maternal mortality in Nigeria, according to a 2015 World Health Organization mortality surveillance from 42 tertiary hospitals, in which HDPs comprised over 23 percent of direct causes of maternal mortality—now killing more women in Nigeria than postpartum hemorrhage. Various factors, including lack of capacity among lower level health care providers to detect, manage, and refer complications, have been indicated as reasons for most of these avoidable deaths.

A landscape analysis of PE/E in Nigeria identified a lack of further information after delivery about the women who experienced HDPs, including their long term health outcomes. Some women with HDPs may not require anti-hypertensive treatment during pregnancy but do in the postnatal period. In fact, about 45 percent of eclampsia occurs in the immediate postnatal period, mostly within the first four days. This study, therefore, investigated gaps in appropriate care for women with HDPs in Nigeria and the natural history of their recovery (and of their infants), along with their health outcomes in the first year after delivery. Key findings include:

- Health care providers at all levels, especially those who treat pregnant women, should know the importance of continuous measurement and tracking of blood pressure in women after delivery: Blood pressure should be checked, at least once a day for first three days after delivery, and at least once during the third through fifth days postnatal. In this study, only 38 percent of women with HDPs had their blood pressure checked by the fifth day.
- Not all hypertension resolves following childbirth. Vigilance in monitoring all women, following childbirth, until their hypertension is resolved or referred for further management, is necessary.
- Early antenatal care and screening for pre-eclampsia is recommended.
- Women with pre-eclampsia and chronic hypertension should be encouraged to deliver at a facility with a neonatal support system for premature and low birthweight infants, to prevent needless morbidities and mortalities associated with prematurity.
- Screening for the development of metabolic syndromes following pre-eclampsia-complicated pregnancies should be routine in Nigeria, given their association with future cardio-metabolic disease risks.
- Specific, local guidelines for postnatal management of women with HDPs should be developed and made widely available throughout the country's health system for obstetricians, nurses, and midwives who care for pregnant women.
- Achieving and sustaining healthy body weight before and after pregnancy should be promoted, to help decrease the incidence and burden of HDPs in addition to its wide-ranging implications for long term maternal and child health.
- Only 1.5 percent of women registered their pregnancies for antenatal care within their first trimester in this study, suggesting that more advocacy and health education programs are required to encourage early antenatal care registration, as pregnancy complications are better prevented and managed the earlier care begins.
- Both gestational hypertension and chronic hypertension in pregnancy are not as mild as they may seem, and all HDP categories should be treated with equal care and support.

## Introduction

Hypertensive disorders in pregnancy (HDPs) are responsible for 70,000 maternal deaths globally; killing a woman every 11 minutes<sup>1</sup>. HDPs are the leading cause of maternal mortality in Nigeria, according to a 2015 World Health Organization (WHO) mortality surveillance in 42 tertiary hospitals across the country<sup>2</sup>. In that survey, HDPs constituted over 23 percent of direct causes of maternal mortality, now killing more women in Nigeria than postpartum hemorrhage<sup>2</sup>. Various factors including lack of capacities of lower level health care providers for detecting, monitoring, and referring of cases of HDPs early, from secondary hospitals and primary health care centers, have been cited as reasons for most of these avoidable deaths.

Through the Ending Eclampsia project, the Population Council conducted a baseline landscape analysis of health care facilities' readiness and their care providers' competencies for detecting and managing HDPs in seven states of Nigeria's six geo-political zones in 2015. That study revealed gaps in care for women with HDPs during the antenatal period. Analysis also identified a dearth of information about the effects on the long term health of women who experienced HDP, with no reliable information after delivery, into the first year postnatal and thereafter.

The United Kingdom's National Institute for Clinical Excellence (NICE) guidelines recommend frequent blood pressure (BP) measurement in the early days after delivery, as BP peaks around three to five days following delivery, with a comprehensive medical review six to eight weeks after delivery<sup>3</sup>. In addition, some women with HDPs who did not require anti-hypertensive treatment during pregnancy may require it the postnatal period<sup>4</sup>, as about 45 percent of eclampsia occurs in the immediate postnatal period, mostly within the first four days after delivery, but may occur up to four weeks postnatal<sup>5</sup>. Meticulous and consistent BP measurement after delivery is highly recommended.

It has also been documented that about 25 percent of women with HDPs, especially those with a severe condition, experience a deterioration of end organs functions during puerperium (i.e. 6 to 8 weeks after delivery, during which pregnancy changes return to baseline)<sup>6</sup>. Similarly, pre-eclampsia early in pregnancy (<34 weeks' gestation), or its presentation in a severe form, or persistence of proteinuria beyond three to six months postnatal, suggests possible chronic hypertension or renal disease<sup>7</sup>. Women with pre-eclampsia are also at increased risk for venous thromboembolism (VTE) in the postnatal period, and these women should receive thrombo-prophylaxis after delivery until they are fully mobile, usually between four and six weeks<sup>7</sup>. Similarly, women with pre-term pre-eclampsia and gestational hypertension have been found to develop persistent cardiovascular impairment a year after delivery, as well as other chronic diseases such as hypertension, stroke, renal disease, diabetes mellitus, and ischemic heart diseases, in contrast to normotensive women<sup>8</sup>. Infants born to women with HDPs also require special attention in the immediate postnatal period due to a combination of short- and long term health risks.

Currently, there is no locally available guideline in Nigeria that directs care for women with HDPs during the postnatal period. WHO guidelines for pre-eclampsia prevention and management also omit the postnatal period<sup>9</sup>. Nothing much is known of the type and content of care women with HDPs in Nigeria received, or of any associated morbidities they suffered.

In this prognostic study, the Ending Eclampsia project recruited women with HDPs around the time of childbirth, and prospectively followed them for up to one year postpartum. This study evaluated the content of care these women received during the first six to eight weeks after delivery, for both themselves and their infants. Health statuses were assessed, and any patterns of morbidity were identified, in the ensuing year after these deliveries. The magnitude of the gaps in care during the postnatal period, for both women and their infants who experienced HDP, is evaluated, along with an examination of the pattern of morbidities and mortalities in this cohort of women during the one year of monitoring.

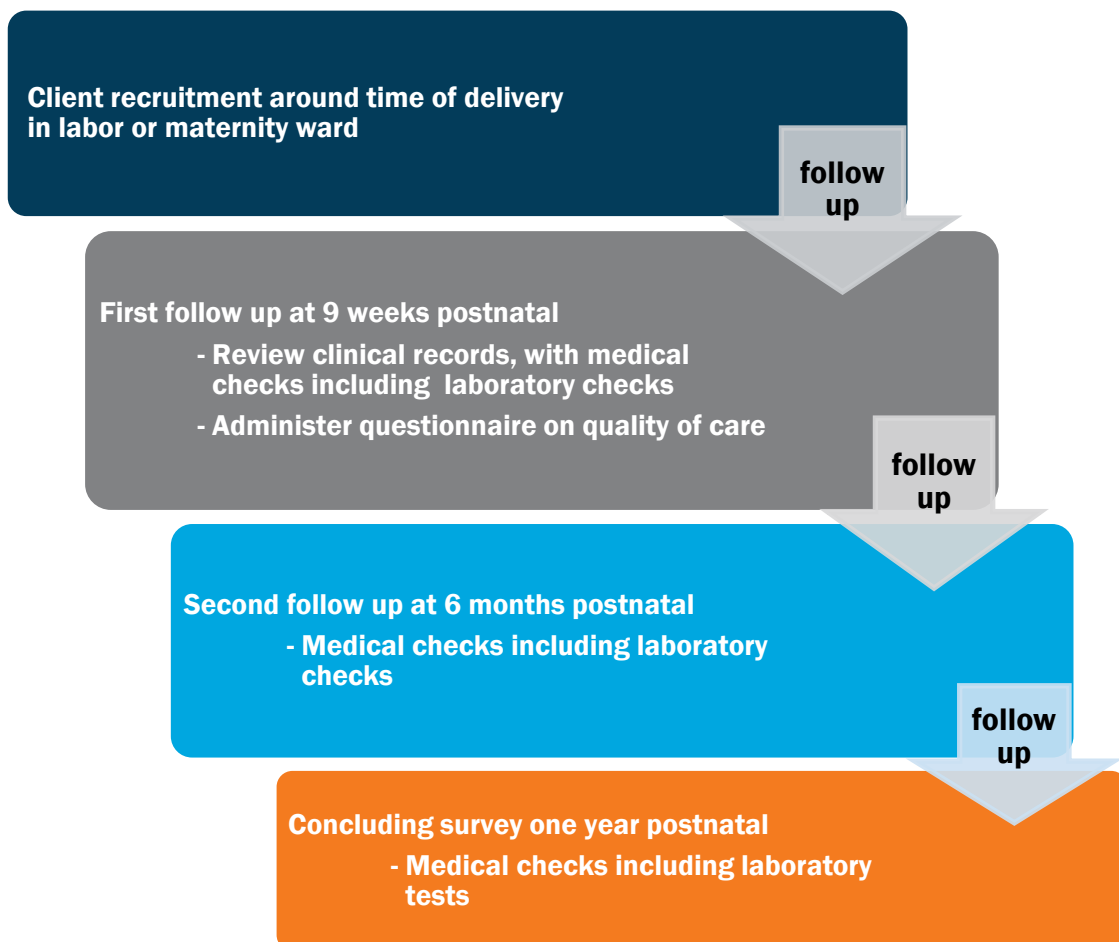
# Methodology

## Study Design

This prospective cohort study involved postnatal women (and their infants) who experienced HDPs in the indexed pregnancies. Pregnant women with any HDP—chronic hypertension, gestational hypertension, or pre-eclampsia/eclampsia (PE/E)—were informed of the study either at antenatal care clinics (if they had registered their pregnancies at the study health facilities) or upon their admission to a labor and maternity wards (in the early stage of labor). Those willing to participate were enrolled within 24 hours of delivery or before discharge from the hospital, after duly obtained informed consent. Women’s bio-demographic and obstetric information were obtained upon enrollment.

After their enrollment, participating women’s baseline medical status and a blood sample for laboratory tests were obtained. Medical information was also obtained for their infants. These women and their infants were then prospectively surveyed nine weeks, six months, and one year later, with the baseline clinical and laboratory assessments then replicated. In addition, information on these women’s quality of care during the six to eight weeks after their deliveries was retrieved from their clinical records, which was complemented by personal interviews at nine weeks postnatal.

The study commenced concurrently in all facilities in April 2017. The last client to be enrolled exited the study on 31 March 2019. To improve the follow up rate, participating women were asked to provide their physical addresses and mobile phone numbers (or of their partners) for ease of renewed contact at the designated time period. The diagram below summarizes the data collection activities and related timelines.





## Study Settings

Women were registered for antenatal care (ANC) or presented for delivery care at one of eight tertiary hospital in seven states of Nigeria's six geo-political zones:

- Abubakar Tafawa Balewa Teaching Hospital (ATBTH), Bauchi state
- Aminu Kano Teaching Hospital (AKTH), Kano state
- University of Calabar Teaching Hospital (UCTH), Cross River state
- Federal Teaching Hospital Abakaliki (FTHA), Ebonyi state
- Federal Medical Center (FMC) in Lokokja, Kogi state
- Mother and Child Hospital in Akure, Ondo state
- Mother and Child Hospital in Ondo town, Ondo state, and
- Usman DanFodio University Teaching Hospital (UDUTH) in Sokoto, Sokoto state.

These facilities are high volume sites with relatively high functioning ANC clinics, delivery rooms, postnatal care (PNC) clinics, supportive laboratory services, with good data management systems. The facilities' central locations (within each state) allowed easy access for these women and aided follow up assessments and interviews.

## Sample Size

The study was designed to recruit and follow as many women as possible within the specified period. Due to the fact that five percent to 10 percent of pregnant women develop HDP, it was estimated that 138 women were required for this study, and considering a potential 10 percent non-response rate, 152 women were necessary to show a difference. Eventually 407 women (and their infants) with HDPs were recruited.

## Definition of Exposure

A woman was considered "exposed" if her index pregnancy was complicated by any HDP:

**Chronic hypertension** in pregnancy: Any hypertension (sBP $\geq$ 140/dBP $\geq$ 90mmHg) prior to pregnancy or diagnosed before the 20<sup>th</sup> weeks of pregnancy

**Gestational hypertension:** Any hypertension (sBP $\geq$ 140/dBP $\geq$ 90mmHg) appearing for the first time after the 20<sup>th</sup> week of pregnancy

**Pre-Eclampsia/Eclampsia:** Any hypertension (sBP $\geq$ 140/dBP $\geq$ 90mmHg) appearing for the first time after the 20<sup>th</sup> week of pregnancy also associated with significant protein in urine; if a client with pre-eclampsia develops convulsions in the absence of any neurological cause, it is regarded as eclampsia, and

**Significant protein in urine (proteinuria):** Protein excretion in urine of  $\geq$ 2++ using urine dipstick measurement.

## Clinical and Laboratory Parameters

Examples of prescribed ongoing care that were monitored and evaluated in this study include:

- Measurement of blood pressure (BP) daily, for two days after childbirth for women with chronic and gestational hypertension, and four times daily for the first two days after childbirth for women with pre-eclampsia
- Measurement of BP, at least once between the third and fifth days following childbirth, in women with any form of HDP
- For women with pre-eclampsia, assessment for severe headache or epigastric pain any time BP was measured
- In women with HDPs, whether BP after birth was less than 150/100mmHg

- Continuation of anti-hypertensive treatment in appropriate cases
- Whether women with gestational hypertension and pre-eclampsia who remained on anti-hypertensive treatment two weeks after discharge from hospital were offered a medical review
- Whether women with any form of HDP were offered a medical review between six and eight weeks postpartum
- If women with gestational hypertension and pre-eclampsia still required anti-hypertensive treatment after six to eight weeks after birth
- If women with pre-eclampsia were transferred to community care (i.e. discharged) when there were no symptoms, BP was less than 150/100mmHg, and blood test results were stable or improving
- Whether women who suffered from pre-eclampsia had their platelets, transaminase, and serum creatinine measured 48 to 72 hours after delivery
- If women with pre-eclampsia had their urine protein estimated with urine dipsticks six to eight weeks following childbirth, and whether women with persistent proteinuria had a further review three months after childbirth to assess kidney function, for possible referral for specialist assessment, and
- If women who suffered from pre-eclampsia were advised to maintain a body mass index (BMI) within a healthy range (18.5 to 24.9kg/m<sup>2</sup>) before next pregnancy.

Medical complications monitored and evaluated among women who had suffered HDP included:

- Hypertension and its complications—stroke, cardiovascular disease
- Presence or absence of modifiable cardiovascular risk factors such as high blood glucose, cholesterol, and triglycerides
- Long term risk of end stage kidney disease—urea and creatinine—and
- Increased risk or occurrence of thrombosis.

## Study Goals and Objectives

The overall goal of this study was to evaluate service delivery gaps and establish patterns of morbidities associated with HDPs within one year of delivery.

The learning objectives and research questions were:

1. What appropriate care, using international guidelines as benchmark, do women whose pregnancies are complicated by HDP typically receive—both clinical and laboratory—in the immediate postnatal period, and up to one year following delivery?
2. What appropriate care (using international guidelines as benchmark) do infants of women whose pregnancies were complicated by HDP typically receive, immediately postnatal and in the extended postnatal period (up to one year)?
3. What proportion of women with gestational hypertension or pre-eclampsia develop chronic hypertension, including resistant hypertension or other chronic morbidities associated with HDP, within one year postnatal?
4. What are the experiences, expectations, and satisfaction with their services do women with HDP had both during and after pregnancies?

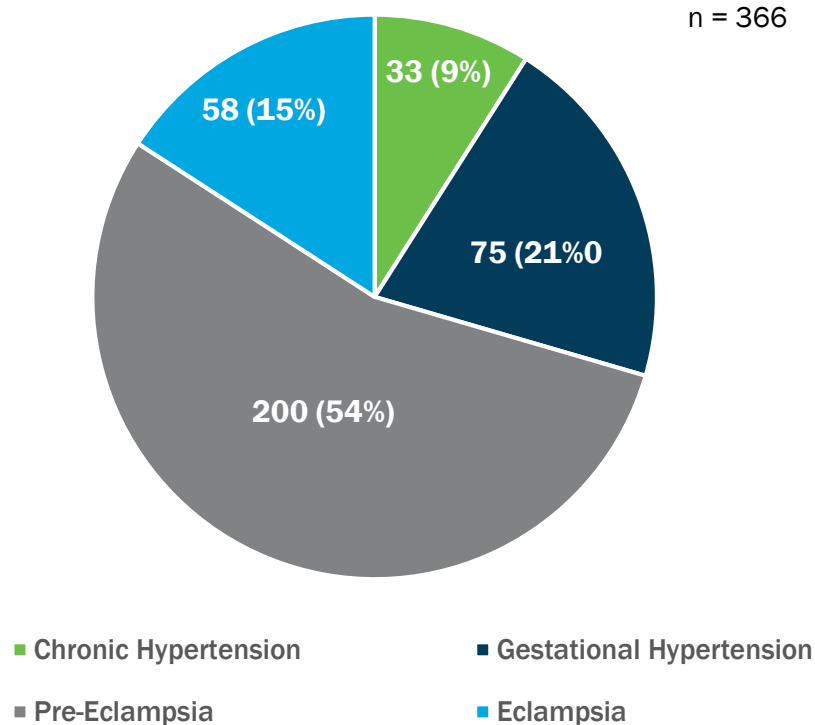
TABLE 1 Bio-demographic characteristics of women enrolled in the study		HDPs, n=410
<b>Women Enrolled</b>	<b>n</b>	<b>407</b>
	<b>Women with baseline medical and laboratory data</b>	<b>407 (99.3%)</b>
	<b>Women with medical and lab data at 9 weeks</b>	<b>263 (64.1%)</b>
	<b>Women with medical and lab data at 6 months</b>	<b>232 (56.6%)</b>
	<b>Women with medical and lab data at 1 year</b>	<b>278 (67.8%)</b>
<b>Age</b>		
	< 20	33 (8.1%)
	20 – 24	71 (17.3%)
	25 – 29	122 (29.8%)
	30 - 34	100 (24.4%)
	35 - 39	61 (14.9%)
	>= 40	23 (5.6%)
<b>Median Age</b>		<b>29 years</b>
<b>Parity</b>		
	Parity 0	86 (21.0%)
	Parity 1 – 3	226 (55.1%)
	Parity ≥4	98 (23.9%)
<b>ANC Registration Status of Indexed Pregnancy</b>		
	Registered	247 (60.2%)
	Unregistered	163 (39.8%)
<b>Height (in meters)</b>		
	< 1,52	22 (5.4%)
	≥ 1.52	388 (94.6%)
<b>BMI</b>		
	< 18	6 (1.5%)
	18 - 24	61 (14.9%)
	25 - 29	65 (15.9%)
	30 - 40	77 (18.8%)
	>40	201 (49.0%)
<b>Gestational Age</b>		
	< 12 weeks	6 (1.5%)
	12 – 20 weeks	40 (9.8%)
	>20 weeks	364 (88.8%)
<b>Birth Weight (kg)</b>		
	<2.5	157 (38.3%)
	2.5 – 4.0	238 (58.0%)
	>4.0	15 (3.7%)
<b>Birth Outcome</b>		
	Live birth	375 (91.5%)
	Still birth	29 (7.1%)
	Early newborn death	6 (1.5%)

For this study 410 women with HDPs consented to be evaluated, and 407 provided baseline medical and laboratory information. The proportions of those women who returned at nine weeks, six months, and one year for follow up were 64.1 percent, 56.6 percent, and 68.3 percent, respectively, resulting in a total follow up rate, from baseline to one year, among HDP clients of approximately 68 percent.

Twenty one percent of women with HDPs were in their first pregnancy, and about 40 percent of women with HDP (39.8%) did not register for ANC until delivery. High abnormal body weight was common, with 60 percent of women either overweight or obese, of whom 49 percent could be classified as morbidly obese (BMI>40). Abnormal BMI is a major finding in this study, but it must be noted that only 1.5 percent of women with HDPs had ANC within the first trimester, when BMI measurements are normally made and most reliable. Prevalence of low birth weight (< 2.5 kg) and stillbirth among the women in this cohort were 38.3 percent and 7.1 percent, respectively.

## Results

Figure 1: Distribution of HDP types at enrollment



Most women with HDPs presented with pre-eclampsia (69%), of whom 22.5 percent subsequently experienced eclampsia (see Figure 1). Of the 258 women with pre-eclampsia, 36 percent had early onset pre-eclampsia (occurring at <34 weeks gestation), while the remaining 64 percent were late onset ( $\geq 34$  weeks gestation). For gestational hypertension, only 14.7 percent were classified as early onset disease, which means a disproportionately larger number of women develop early onset hypertension in pre-eclampsia (64%) than in gestational hypertension (14.7%), as described in Table 2 (following page).

Premature delivery is defined as childbirth before the start of the 37<sup>th</sup> week of pregnancy, when fetal lungs are immature for independent breathing extrauterine. In this study, the overall premature delivery rate was 16.4 percent, with gross variations by HDP sub-type: from 1.3 percent of women with gestational hypertension delivering prematurely, to 21 percent among women with PE/E. Although the overall stillbirth rate among women with HDPs was 7.1 percent, this varied by HDP sub-type, as shown in Table 2.

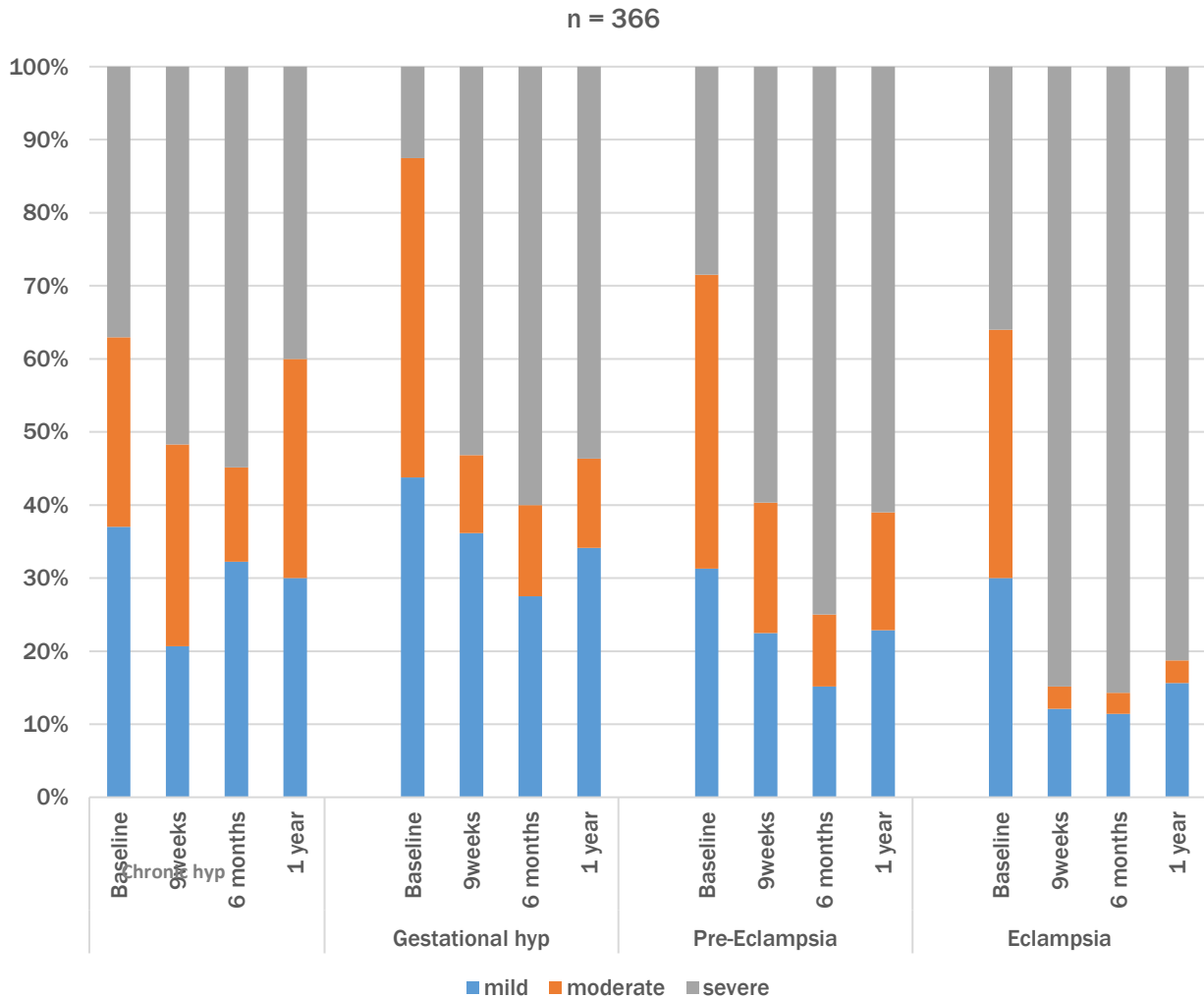
Similarly, distribution of low birth weight, less than 2.5 kilogram (kg), among infants of women with HDP ranged from 9.3 percent among infants of women with gestational hypertension, to 47 percent among infants of women whose pre-eclampsia subsequently developed into eclampsia. Chronic hypertension and PE/E result in low birth weight rates about five times greater than gestational hypertension does.

TABLE 2 Profiles of hypertensive women		n (total 366)	%
<b>Gestational Age at HDP Onset</b>			
<b>Pre-Eclampsia</b>		<b>200</b>	
	<34 weeks	78	39
	≥34 weeks	122	61
<b>Eclampsia</b>		<b>58</b>	
	<34 weeks	15	25.9
	≥34 weeks	43	74.1
<b>Gestational Hypertension</b>		<b>75</b>	
	<34 weeks	11	14.7
	≥34 weeks	64	85.3
<b>Gestational Age at Delivery</b>			
<b>Pre-Eclampsia</b>		<b>200</b>	
	< 28 weeks	5	2.5
	28 – 33 weeks	36	18
	≥34 weeks	159	79.5
<b>Eclampsia</b>		<b>58</b>	
	< 28 weeks	3	5.2
	28 – 33 weeks	9	15.5
	≥34 weeks	46	79.3
<b>Gestational Hypertension</b>		<b>75</b>	
	< 28 weeks	0	0.0
	28 – 33 weeks	1	1.3
	≥34 weeks	74	98.7
<b>Chronic Hypertension</b>		<b>33</b>	
	< 28 weeks	2	6.1
	28 – 33 weeks	4	12.1
	≥34 weeks	27	81.8
<b>HDP Category and Fetal Outcome</b>			
<b>Pre-Eclampsia</b>		<b>200</b>	
	Alive	170	85
	Dead	30	15
<b>Eclampsia</b>		<b>58</b>	
	Alive	51	87.9
	Dead	7	12.1
<b>Gestational Hypertension</b>		<b>75</b>	
	Alive	72	96
	Dead	3	4
<b>Chronic Hypertension</b>		<b>33</b>	
	Alive	29	87.9
	Dead	4	12.1
<b>HDP Category and Fetal Weight (kg)</b>			
<b>Chronic Hypertension</b>		<b>33</b>	
	<2.5	15	45.5
	2.5 – 4.0	15	45.5
	Missing data	3	
<b>Pre-Eclampsia</b>		<b>200</b>	
	<2.5	90	45
	2.5 – 4.0	104	52
	>4.0	6	3
<b>Eclampsia</b>		<b>58</b>	
	<2.5	27	46.6
	2.5 – 4.0	31	53.4
	>4.0	0	0.0
<b>Gestational Hypertension</b>		<b>75</b>	
	<2.5	7	9.3
	2.5 – 4.0	65	86.7
	>4.0	3	4

Although 410 women with HDP were enrolled, and baseline data were collected from 407, the enrolment form did not capture HDP categories—an oversight. Therefore, client review records were utilized to obtain this information. Unfortunately, by the time client reviews were conducted, at nine weeks after delivery, 41 clients’ clinical records were missing and could not be included in this analysis.

Figure 2 charts the distribution of BP severity among women with HDPs who remained hypertensive during the four check ups. When hypertension persists beyond nine weeks, it tends to be severe (systolic  $\geq 160$ mmHg and/or diastolic  $\geq 110$ mmHg) among women who had pre-eclampsia and eclampsia more than in women who had gestational hypertension.

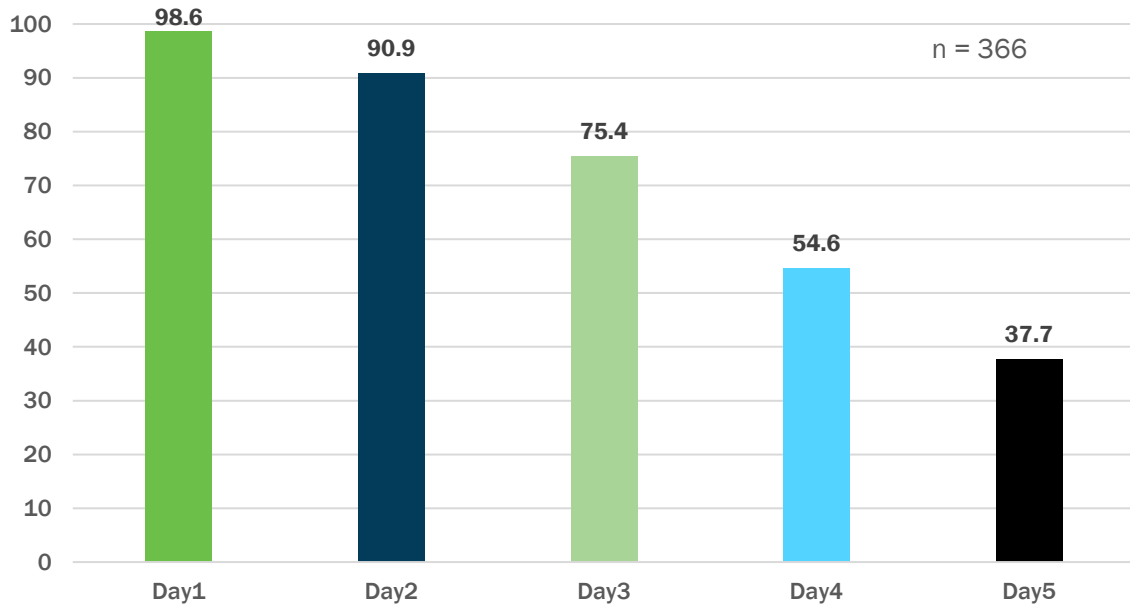
**Figure 2: Distribution of severity of hypertension across data collection period, based on HDP sub-types**



## Postpartum Quality of Care for Women and Their Infants

It is generally recommended that women with HDPs have BP checked at least once a day for the first three days after delivery and at least once more between the third and fifth days postpartum. In this study, up to 99 percent of women with HDPs had a BP check on the first day. The proportion of women with BP checks progressively declined from the first day through the fifth day, depicted in Figure 3 (following page). By the fifth day postpartum, up to 62 percent of women did not have a BP check.

**FIGURE 3: Proportion of women with HDPs whose BP were measured and documented (from day 1 to day 5 after delivery)**



It is also recommended that all women with HDPs should continue anti-hypertensive medications until BP is well-controlled. A target BP level is systolic less than 140mmHg and diastolic less than 90mmHg. This study assessed women’s medical records to determine the extent of compliance with this recommendation.

About 40 percent of women with pre-eclampsia with BP  $\geq 150/100$ mmHg were not on anti-hypertensive medication during their first week postnatal. The corresponding rates for chronic hypertension and gestational hypertension were 24.2 percent and 25.4 percent, respectively (Figure 4).

**FIGURE 4. Proportion of women with HDPs with BP >150/100mmHg within first week of delivery on anti-hypertensive treatment**

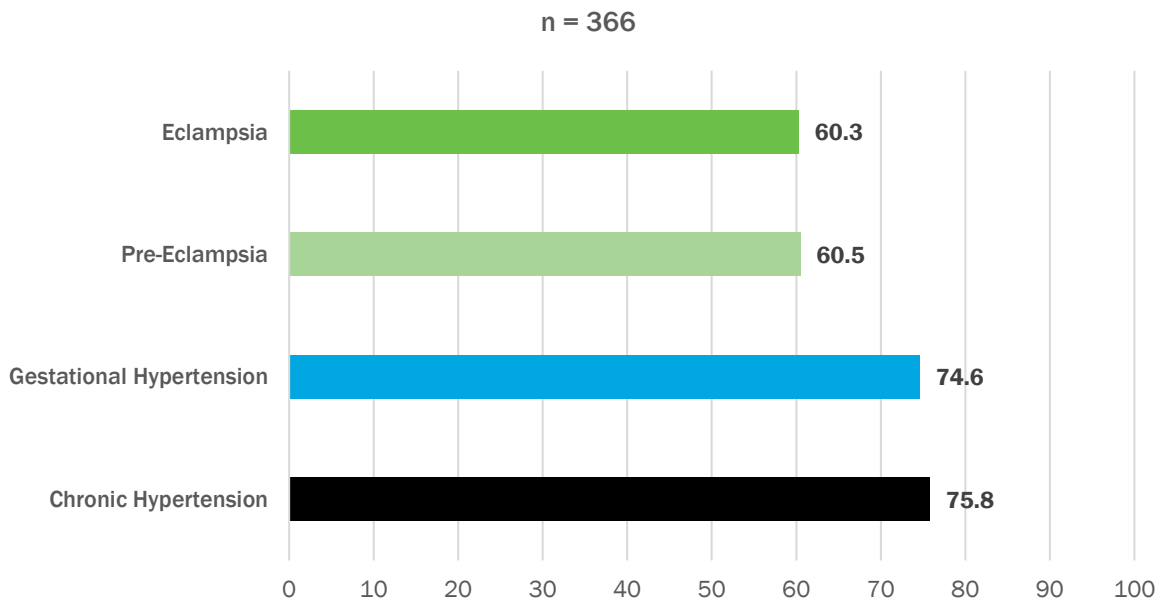


Table 3 lists the proportions of women with HDPs who received recommended care and counseling six to eight weeks postnatal. In general, quality of care was sub-optimal.

While it is recommended that women with HDPs who remain hypertensive two weeks after delivery should be given further medical reviews, only 19 percent of these women were. Thromboprophylaxis is also recommended for up to four weeks after delivery for women who had PE/E. In this study, only 7.3 percent of women with PE/E received thromboprophylaxis.

For all women with HDP, a medical review and urine protein estimation six to eight weeks postnatal are universally recommended. Less than half of these women (46%) were medically reviewed, and only 58 percent had urine protein estimated, six to eight weeks after delivery. Other standard care deficiencies are shown in Table 3.

**Table 3: Percentage of women with HDPs who received appropriate care and counseling after delivery**

Indicator	Yes (%)	No (%)	Total (n)
Received information on danger signs?	198 (54.1%)	168 (45.9%)	366
Remained hypertensive 2 weeks after discharge, offered medical review	72 (19.7%)	294 (80.3%)	366
Had PE/E and received thromboprophylaxis after delivery	19 (7.4%)	239 (92.6%)	258
Offered medical review at 6 to 8 week postpartum visits	169 (46.2%)	197 (53.8%)	364
Had PE/E and offered urine protein estimation at 6 to 8 weeks postpartum	149 (57.8%)	109 (42.3%)	258
Had pre-eclampsia, planning for another pregnancy, counseled to maintain health BMI before next pregnancy	131 (50.8%)	127 (49.2%)	258
Clinical wellbeing of infant assessed daily in the first 2 to 3 days after birth	209 (57.1%)	157 (42.9%)	366
Adequacy of her baby feeding assessed daily in the first 2 to 3 days after birth	210 (57.4%)	156 (42.6%)	366
Counseled on BP at the six weeks postnatal visit? Or at any time before or after delivery?	232 (63.4%)	134 (36.6%)	366
Counseled that she should attend ANC early in next pregnancy?	214 (58.5%)	152 (41.5%)	366
Patient counseled on the risk of recurrence of condition in subsequent pregnancy(ies)?	199 (54.4%)	167 (45.6%)	366
Was the baby received by a neonatologist?	202 (55.2%)	164 (44.8%)	366

## Experiences and Perceptions of Care of Pregnant Hypertensive Women

While evaluating the extent to which these women were offered recommended clinical and counseling services, it is also important to gauge their perceptions, satisfaction, and experiences of care. In general, over two thirds of women were satisfied and had favorable perceptions of their health care providers. As described in Table 4 (next page), 81 percent of women were informed, to their satisfaction, of the nature of their condition, 94 percent believe they were provided with the right care for their health problems, while 62 percent were given opportunities to ask questions for clarification.

While 96 percent of these women were interested in knowing how they could prevent hypertension in subsequent pregnancies, however, only 44 percent of them were provided this information.



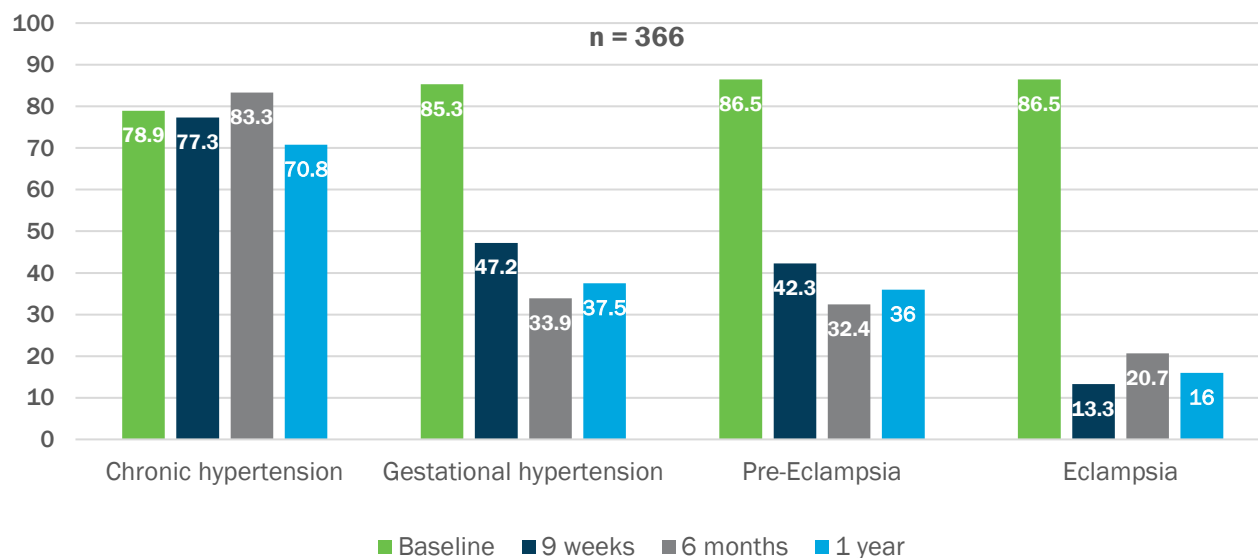
Table 4: Women's experiences and perceptions

Assessment	Yes (%)	No (%)	Total (n)
When you were told that you have one of the hypertensive conditions in pregnancy, did you understand what that meant?	246 (81.2%)	57 (18.8%)	303
Did the health provider find time to explain what the condition means and its implication for your health and that of your baby?	216 (71.3%)	87 (28.7%)	303
Were you given the opportunity to ask questions for clarification?	187 (61.7%)	116 (38.3%)	303
Is this the first time you are having this type condition in your pregnancy?	198 (65.6%)	104 (34.4%)	302
Has anyone in your family had this kind of condition in the past?	197 (65.2%)	105 (34.8%)	302
Did you have any concerns when you were informed that you developed hypertension in pregnancy?	205 (67.9%)	97 (32.1%)	302
Have you discussed this concern with your health care providers?	132 (64.4%)	73 (35.6%)	205
Did you receive satisfactory feedback from your service providers?	125 (94.7%)	7 (5.3%)	132
Do you think you have received the right care and information from you care providers during pregnancy with this condition?	283 (94.0%)	18 (6.0%)	301
Did you suffer any complication in this pregnancy due to this condition?	54 (17.8%)	249 (82.2%)	303
After giving birth, did your caregivers give you sufficient information about your future health, following a pregnancy with hypertension?	207 (69.2%)	92 (30.8%)	299
If you are planning another baby in the future, have you been counselled on how to prevent this condition in future pregnancy?	132 (44.1%)	167 (55.9%)	299
Is knowing how this condition can be prevented in pregnancy something you are particularly interested in?	286 (95.7%)	13 (4.3%)	299

## Clinical Courses of Hypertensive Disorders of Pregnancy

Figure 5 shows proportion of women with various HDP sub-types who remained hypertensive over the entire period of follow up. As expected, the BP of women with chronic hypertension remained high from baseline to one year after childbirth, but there was an exponential drop in BP for the three other sub-groups. One year after delivery, 38 percent, 36 percent, and 16 percent of women with gestational hypertension, pre-eclampsia, and eclampsia, respectively, remained hypertensive.

FIGURE 5: Proportion of women with persistent hypertension 6 months and 1 year after delivery, based on HDP sub-type (gestational hypertension, pre-eclampsia and eclampsia)



Women with HDPs continued to show marked deviation from the norm in their metabolic functions after delivery, and throughout the ensuing year (Table 5). At baseline, 5.2 percent of women had significant protein ( $\geq 2++$  on urine dipsticks tests) in their urine, and although this improved over time, 2.5 percent still had abnormal urine protein excretion at one year, possibly suggesting permanent kidney impairment. Similar patterns for persistent derangement were also observed for glucose intolerance, serum urea and creatinine, and liver enzyme abnormalities (alanine and aspartate transaminases). The proportion of women who were obese remained largely the same at baseline and a year later (22.4% and 23.8%, respectively). Persistently higher serum cholesterol and triglycerides were seen in this cohort of women.

**TABLE 5: Prevalence of metabolic disorders over 1 year since delivery among women with HDPs**

	9 weeks	6 months	1 year
Persistent proteinuria	5.2%	1.91%	2.5%
Glucose intolerance	9.3%	15%	5.7%
Obesity (BMI $\geq 30$ )	22.4%	14.8%	23.8%
High serum cholesterol	29.8%	18.9%	25.1%
High serum triglycerides	30.9%	25.7%	29%
Low platelets count	28.4%	29.2%	36.6%
High urea concentration	10.9%	5.7%	7.9%
High creatinine concentration	13.7%	6.3%	13.4%
Elevated aspartate transaminase	5.7%	10.1%	10.7%
Elevate alanine transaminase	15.3%	9.6%	18.9%

## Clinical Courses of Infants

**Table 6: Baseline characteristics (at birth) of infants of women with HDPs**

Characteristic	HDPs (%) n=297
<b>Fetal and neonatal deaths</b>	
Stillbirths	29 (7.1%)
Early neonatal deaths (< 7days postnatal)	6 (1.5%)
<b>Birth weight (kg)</b>	
<2.5	72 (24.2%)
2.5 - 4.0	149 (50.2%)
>4.0	76 (25.6%)
<b>Birth length (cm)</b>	
<45	106 (35.7%)
$\geq 45$	191 (64.3%)
<b>Head circumference (OFC/cm)</b>	
<32	17 (5.7%)
$\geq 32$	280 (94.3%)
<b>% of measured BP (mmHg)</b>	
	231 (77.8%)
Mean systolic BP (mmHg)	52.8
Mean diastolic BP (mmHg)	30.4
<b>Heart rate (beats/minutes)</b>	
<120	28 (9.4%)
120 - 160	176 (59.3%)
>160	93 (31%)

The prevalence of stillbirth and early neonatal death among infants of women with HDPs in this study was 7.1 percent and 1.5 percent, respectively. Besides the mortality pattern, many infants were restricted in growth. The proportion of infants born underweight (<2.5kg) was 24 percent, and the prevalence of smaller heads (circumference<32 cm) was about six percent, while about 31 percent of infants had abnormally high heart rates at birth (>160 beats per minute).

Table 7 shows the proportion of infants who achieved development milestones at the appropriate age. On average, normally developing infants should have achieved these respective milestones according to these timelines. As can be seen in Table 7, Less than 50 percent of the infants achieved every milestone at the expected time period.

**Table 7: Proportion of infants' who achieved relevant developmental milestone**

	<b>HDPs (%)</b>
<b>Social smile at 1 month</b>	<b>26 (8.8%)</b>
<b>Neck control at 3 months</b>	<b>95 (32%)</b>
<b>Sitting at 5 to 6 months</b>	<b>126 (42.4%)</b>
<b>Crawling at 6 months</b>	<b>88 (29.6%)</b>
<b>Standing with support at 9 months</b>	<b>16 (5.4%)</b>
<b>Standing without support at 1 year</b>	<b>24 (8.1%)</b>

## Discussion

### Baseline Characteristics

This was a prospective cohort study of women with HDPs, who were recruited and monitored for up to one year after delivery. At one year the follow up rate was approximately 68 percent, which is good for an African setting with weak communication infrastructure and subject traceability, along with low levels of education among resident women.

About 40 percent of women in this study did not register for ANC at all and only presented as an obstetric emergency at delivery. Failure to register for ANC is typically seen among pregnant women in rural Nigeria. This large number of women attending tertiary facilities in urban areas for delivery without prior ANC suggests it is a widespread phenomenon necessitating immediate attention. Even among women with pregnancies registered for ANC, only 1.5 percent did so in the first trimester, a further indictment of poor health care among pregnant women in Nigeria. For pregnant women to receive appropriate care for their infants as well as themselves, all pregnancies must be registered early in the first trimester, with four to seven subsequent ANC contacts, according to WHO's recommendations<sup>17</sup>.

Our findings also suggest obesity was a problem among this population. Although only 1.5 percent of women had ANC in the first trimester, when BMI estimation is more accurate, the overweight and obesity rate was 60 percent, with 49 percent morbidly obese (BMI>40). While weight gain in pregnancy could have inflated obesity rates, it persisted in 23 percent of women with HDPs a year after delivery. Future interventions should consider pre-conception and postnatal programs for body weight reduction among women intending to get pregnant, to prevent or reduce weight-related morbidities and mortalities.

HDPs are associated with underweight infants (<2.5kg), with a prevalence rate of 38.3 percent, often due to premature birth. It is noteworthy that underweight infants following chronic hypertension evince a rate similar to PE/E underweight births, suggesting that adequate BP control throughout pregnancy should be emphasized regardless of underlying HDP category. The need for timely and adequate BP control in pregnancy adds further impetus to the call for early ANC registration so appropriate preventive and curative interventions can be enacted.

Nigerian women seem to develop pre-eclampsia earlier than in other populations. Most estimates of early onset pre-eclampsia (<34 weeks' gestation) range from five percent to 20 percent, depending upon the population<sup>10</sup>. Nigeria's 36 percent prevalence, in this study, is disproportionately high and potentially debilitating, given that morbidities and mortalities for these women and their infants are more strongly associated with early, as opposed to late, onset pre-elampsia<sup>10</sup>. Because early onset pre-eclampsia is more amenable to prophylactic antenatal aspirin than late onset pre-eclampsia<sup>9</sup>, routine prophylactic aspirin for at risk women should be encouraged and strengthened in Nigeria.

This study's observation that HDPs are associated with 16 percent premature deliveries is not new: Colleagues in Ghana report a prematurity rate of 21.7 percent for women with HDPs in tertiary facilities<sup>11</sup>. Just as chronic hypertension affects fetal weight with the same magnitude as PE/E, chronic hypertension in pregnancy is also an important factor in prematurity, with associated rate of 18 percent. Although pre-eclampsia is the most severe HDP, chronic hypertension in pregnancy is not a benign condition either.

### Quality of Care Concerns

This study reveals that quality of care for women with HDPs in Nigeria's tertiary facilities is generally sub-optimal. Clinical guidelines recommend daily BP measurement for the first three days after delivery for women who suffered HDP, and at least once between the third and fifth days<sup>3</sup>. While up to 99 percent of women had a BP check the day after childbirth, adherence progressively declined over the next four days, and by the fifth day postnatal, BP was not checked for 62 percent of women. This is a vital omission

in these women's care, as ominous outcomes such as adverse cardiovascular events tend to occur between the third and fifth days postpartum due to uncontrolled high BP<sup>3</sup>.

Anti-hypertensive coverage in the immediate postnatal period was grossly inadequate. Among women with pre-eclampsia requiring continuing anti-hypertensive coverage (BP $\geq$ 150/100mmHg), 40 percent were on no medication the first week postpartum; this was observed to a lesser extent among women with gestational hypertension and chronic hypertension (e.g. about one quarter for both). Low cost, highly effective anti-hypertensive drugs such as nifedipine are commonly available in Nigeria. (Methyldopa is also available but should not be given postnatally due to possible increase of postpartum depression.)

Besides insufficient attention to BP in the immediate postnatal period, there was poor adherence to clinical guidelines in other aspects of care. All women who suffered pre-eclampsia should receive thromboprophylaxis for four weeks after delivery<sup>3</sup>, but in this study 93 percent of pre-eclamptic women did not receive thromboprophylaxis, even for a day. This is of concern, especially because these women were at tertiary and teaching hospitals where high quality care is expected.

## Residual and Emerging Morbidities

Long term follow up of these women allowed the study of morbidities patterns hitherto not reported in Nigeria. Although HDPs, including gestational hypertension and pre-eclampsia, should typically resolve six to eight weeks after delivery, an increasing body of knowledge suggests that hypertension does not resolve in all cases, and remains persistent and chronic in some. In this study, hypertension persisted for a year in a large number of women who had gestational hypertension (38%) and PE/E (43%). This should certainly modify vigilance for these women, for years after pregnancies complicated by hypertensive disorders. As most guidelines recommend, all women who remain hypertensive after six weeks postnatal should be offered a comprehensive medical referral and review.

Other metabolic syndrome aspects were prevalent in these women. A year after delivery, proteinuria persisted in 2.5 percent, and glucose intolerance developed in 5.7 percent. In addition, women with HDPs showed evidence of altered serum lipids, urea and creatinine, and liver transaminases. Metabolic syndrome has been reported as a long term complication of pre-eclampsia and is considered a cardiovascular risk, with implications for women's cardiovascular health decades later<sup>12,13</sup>. While capacity and quality of care for women with HDPs increase in the immediate postnatal period, these women face additional future health risks for cardio-metabolic diseases such as heart disease, stroke, type II diabetes mellitus, and kidney impairment. As is the current practice in many places, women with a history of pre-eclampsia should be offered routine screening to detect any occurrence of metabolic syndromes early.

## Outlook for Infants

Apart from excess perinatal deaths and morbidities associated with HDPs, infants born of HDP-complicated pregnancies exhibited anthropometric failings. Infants born to women with HDPs are more likely to exhibit growth retardation with a smaller head circumference (p-value=0.03), although the influence of pre-term delivery on infants' anthropometrics should be accounted for before any firm conclusion is made about the association of HDPs and fetal birth weight outcomes. In addition, infants of women with HDPs have higher mean systolic and diastolic BP at birth.

Although growth-restricted infants are generally expected to improve after delivery, a life course perspective theory of chronic diseases describes a risk of adult chronic diseases related to previous exposure to stressful intra-uterine conditions such as HDPs<sup>14,15,16</sup>. General under-performance in physical and social development was observed among these infants during the year that they were observed. These observations may suggest that the effects of intra-uterine hypertension is beyond immediate perinatal and neonatal periods—but potentially lifelong, another area for future research.

# Conclusion and Recommendations

## Specific Recommendations

- Health care providers at all levels, especially those who treat pregnant women, should understand the importance of continuous blood pressure measurement and tracking in women after delivery. Blood pressure should be checked, at least daily for first three days, and once between the third and fifth days postnatal. In this study, only 38 percent of women with hypertensive disorders in pregnancy had their blood pressure checked by the fifth day after childbirth.
- Not all hypertension associated with hypertensive disorders in pregnancy resolves after delivery. Vigilant observation and care of these women must be maintained until their hypertension resolves or they are referred for medical attention, as appropriate.
- Screening for onset of pre-eclampsia among pregnant women in Nigeria should commence early, as Nigerian women seem to develop pre-eclampsia earlier, and early screening and detection of pre-eclampsia will ensure optimal management of the condition.
- Both pre-eclampsia and chronic hypertension should instigate proper arrangement for delivery at facilities with neonatal support systems to treat premature and low birthweight infants, to prevent needless morbidities and mortalities associated with prematurity.
- Screening for metabolic syndrome development following pre-eclampsia-complicated pregnancies should be routine in Nigeria, given its association with future cardio-metabolic disease risks.
- Local guidelines for the specific needs of the Nigerian health system's postnatal management of women with hypertensive disorders in pregnancy should be developed and made widely available to obstetricians, nurses, and midwives who care for pregnant women.

## General Recommendations

- In addition to sustained medical and clinical care during the antenatal and intrapartum periods, pre-conception and postnatal care should be actively promoted because significant health outcomes are also achieved in these extra-pregnancy phases of women's lives, when acute care is not necessary.
- Achieving and sustaining a healthy body weight before and after pregnancy should be promoted. In addition to decreasing the incidence and burden of hypertensive disorders in pregnancy, it has wide-ranging implications for maternal and child health.
- The fact that only 1.5 percent of women in this study registered their pregnancies for antenatal care within first trimester suggests that more advocacy and health education programs are necessary to encourage early antenatal care registration, as pregnancy complications are better prevented and managed if booking is earlier (preferably within the first trimester).
- Both gestational hypertension and chronic hypertension in pregnancy are not as mild as they may appear, and all hypertensive disorder in pregnancy categories should be treated with equal care and support.

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