

## MODE OF DELIVERY AND CAESAREAN INDICATIONS AMONG WOMEN WITH HYPERTENSIVE DISORDERS IN PREGNANCY AT KORLE BU TEACHING HOSPITAL

Adu-Bonsaffoh K<sup>1,2</sup>; Seffah JD<sup>2</sup>

<sup>1</sup>Department of Obstetrics and Gynaecology, School of Medicine and Dentistry, University of Ghana, Accra, Ghana.

<sup>2</sup>Department of Physiology, School of Allied and Biomedical Sciences, University of Ghana, Accra, Ghana.

### Abstract

**Objective:** To determine the relative proportions of vaginal and caesarean deliveries, and the common caesarean indications among women with hypertensive disorders in pregnancy (HDP).

**Materials and methods:** A cross sectional study conducted at the Maternity unit of Korle Bu Teaching Hospital in Accra from 1<sup>st</sup> January to 28<sup>th</sup> February 2013.

**Results:** A total of 368 women with HDP were recruited with 168 (45.7%) and 200 (54.3%) having caesarean and vaginal deliveries respectively. Regarding the caesarean delivery, 31 (18.5%) had gone into labour prior to the surgery while 137 (81.5%) were not in labour. Among the 368 women 68 (18.5%) had induction of labour out of which 46 (67.6%) achieved vaginal delivery. The risk of caesarean section was significantly higher in preeclampsia [(adjusted odds ratio 2.898 (1.741-4.824),

p-value <0.001] and chronic hypertension [(adjusted odds ratio 2.474 (1.194-5.128), p-value =0.015] with reference to gestational hypertension. The Common caesarean indications among women with HDP were previous caesarean birth (26.2%), unfavourable cervix (22.6%), fetal distress (14.9%), failure to progress (10.7%), fetal malpresentation (9.5%), failed induction (7.1%) and placental abruption (3.0%). A total of 65 (17.7%) women with HDP had had a prior caesarean birth.

**Conclusion:** This study has determined a high caesarean birth rate in women with HDP with the highest and lowest caesarean rates occurring in chronic hypertension and gestational hypertension respectively. The common caesarean indications among women with HDP were previous caesarean birth, unfavourable cervix, fetal distress, failure to progress, fetal malpresentation, failed induction of labour and placental abruption.

**Key Words:** Caesarean indications, preeclampsia, eclampsia, chronic hypertension.

### Introduction

Hypertensive disorders are common medical complications in pregnancy and a significant cause of maternal-perinatal morbidity and mortality globally<sup>1-3</sup>. In Korle Bu Teaching Hospital (KBTH), where the current study was conducted, HDP are the leading cause of maternal deaths<sup>4</sup>. The management of these complications requires specialized care with consultant involvement to optimize both maternal and fetal outcomes because of their characteristic unpredictable nature and the potential for poor outcomes<sup>2</sup>. The mainstay of treatment of HDP involves close antenatal supervision of the maternal and fetal parameters with timely delivery to prevent progressive deterioration and

subsequent morbidity and mortality<sup>2</sup>.

However, the timing and optimal mode of delivery in women with HDP including severe preeclampsia remain a major obstetric issue with varied opinions especially in preterm gestations<sup>5,6</sup>.

Most international guidelines recommend vaginal delivery for preeclampsia at term<sup>1,7</sup> and recent studies recommend induction of labour (IOL) for these obstetric subgroup<sup>6,8</sup>. However, other researchers have demonstrated increased risk of failed induction of labour and caesarean section (CS) in preeclampsia<sup>9</sup>. Due to the controversies regarding the timing and optimal mode of delivery in women with HDP, varied caesarean rates with as high as 100% in preeclampsia have been reported<sup>5</sup>. Although CS is safer in modern obstetrics, it is associated with higher risks compared to vaginal delivery. Caesarean section is recommended when there is specific obstetric indication based on maternal or fetal factors and the decision for abdominal delivery should be individualized<sup>1</sup>. Common caesarean indications among women with HDP undergoing caesarean birth have previously been reported with varying frequencies and these include fetal distress, arrest of labour, previous caesarean birth and fetal malpresentation<sup>6,10</sup>.

Initial attempt at achieving vaginal delivery is usually encouraged and recommended to avoid maternal

**Corresponding Author: Dr. Kwame Adu-Bonsaffoh**

Department of Obstetrics and Gynaecology, School of Medicine and Dentistry, University of Ghana, Accra, Ghana.

P. O. Box KB783 Korle Bu, Accra, Ghana

Email Address: [kadu-bonsaffoh@ug.edu.gh](mailto:kadu-bonsaffoh@ug.edu.gh)

Tel: +233206300840

Conflict of Interest: None Declared

risks from CS, even in women with severe PE or eclampsia. It is important to emphasize that an immediate cure does not instantaneously follow delivery by any route, but severe morbidity is less common during the puerperium in women who achieve vaginal delivery<sup>11</sup>. Coppage and Polzin remarked that immediate caesarean delivery confers no benefit to women with severe preeclampsia and that no morbidity was minimized by abdominal delivery. They determined that gestational age and Bishop score assessment of the cervix did not influence the success rate for IOL in this high risk group<sup>12</sup>. Although prematurity may be of great concern in these patients Alanis et al did not find any adverse outcomes in preterm neonates following induction of labour<sup>8</sup>. In preeclampsia, delivery is always an appropriate therapy for the mother regardless of its severity or the duration of gestation but it may not be beneficial to the fetus. In determining the optimal mode of delivery in women with HDP especially severe preeclampsia it is, therefore, important to consider both maternal and fetal wellbeing to optimize the obstetric outcomes<sup>1</sup>.

In Ghana, the differential mode of delivery and common indications for CS among women with hypertensive disorders in pregnancy have not yet been documented but clinical experience suggests relatively high caesarean rates among this obstetric subset. It was therefore imperative that the relative proportions of vaginal and caesarean deliveries as well as the common caesarean indications in women with HDP be studied in our indigenous clinical environment. The findings of this study would serve as evidence for implementation of appropriate guidelines to improve the obstetric outcomes of HDP in Ghana and other countries with similar clinical settings.

## Subjects and Methods

This was a cross sectional study conducted at the Maternity unit of Korle Bu Teaching Hospital (KBTH), in Accra, Ghana from 1st January to 28th February 2013. This was part of a larger study to determine the maternal morbidity of hypertensive disorders in pregnancy<sup>13</sup>. Korle Bu Teaching Hospital is the largest tertiary hospital in Ghana and serves a population of approximately three million inhabitants. The Maternity unit conducts approximately 10,000 deliveries annually.

The inclusion criteria for the study consisted of all women with pregnancies complicated with hypertensive disorders receiving maternity services at KBTH. We excluded women with hypertensive disorders who delivered at a peripheral health centre, hospital or maternity home prior to the referral to KBTH. Multiple gestations were also excluded from the analysis to avoid their potential confounding effect on the mode of delivery.

The data collection was performed by the principal investigator and two other research assistants. The first part of the study involved baseline data collection on all the obstetric patients delivering at Maternity unit in

KBTH. The baseline data collection involved identification of all women delivering at the two labour wards every morning from the admission and discharge books. The baseline data collection on all obstetric patients delivering at KBTH each morning was necessary to identify women whose pregnancies were complicated by HDP. The second part of the study involved tracing the women with HDP who had been admitted to the various maternity wards after delivery to extract the needed information from their medical records after delivery. In this study we report the results from initial part of the data collection which involved extraction of the required data from the medical records of the patients. The data obtained included socio-demographic and basic obstetric information such as parity and mode of delivery, gestational age at delivery and blood pressure at diagnosis of preeclampsia and gestational hypertension.

In this study, HDP were classified according to the classification system described by the International Society for the study of hypertension in pregnancy (ISSHP) including preeclampsia, gestational hypertension, chronic hypertension and preeclampsia superimposed on chronic hypertension<sup>7</sup>. Hypertension in pregnancy was defined as systolic blood pressure (BP)  $\geq 140$  mmHg and/or a diastolic BP  $\geq 90$  mmHg respectively. Proteinuria was determined using a semi-quantitative dipstick testing and proteinuria of 1+ was considered significant<sup>1,14</sup>. We obtained approval for study from the Ethical and Protocol Review Committee of the University of Ghana School of Medicine and Dentistry. Written informed consent was obtained from all the study participants prior to data collection.

The data obtained were entered into an Excel spread sheet (Microsoft company, USA) and analyzed using SPSS version 20.0 (IBM, Armonk, NY, USA). Descriptive analysis was done and appropriate measures of centrality (mean) and dispersion (standard deviation) were calculated as well as percentages where appropriate. Cross tabulation was done to determine the percentages of the caesarean indications with respect to the various categories of hypertensive disorders in pregnancy. Logistic regression analysis was performed involving caesarean section and the hypertensive disorders to determine the odds ratio for caesarean delivery using gestational hypertension as a reference. A p-value of less than 0.05 was considered significant.

## Results

Over the study period, 368 women with hypertensive disorders in pregnancy were included in the study out of which 168 were delivered via caesarean section resulting in a caesarean rate of 45.7%. Vaginal delivery occurred in 200 women representing 54.3%. Among those who had vaginal delivery 14 (7.0%) had instrumental (vacuum) delivery. Regarding caesarean delivery, 31 (18.5%) were in labour prior to the surgery while 137 (81.5%) had not gone into labour (Table 1). The mean arterial pressure at diagnosis ( $\pm$ SD) were

significantly higher in preeclampsia ( $127.15 \pm 16.27$  mmHg) compared to that of gestational hypertension ( $113.60 \pm 9.53$  mmHg),  $p < 0.001$ . Among the 368 women with HDP, 159 (43.2%) had severe hypertension at diagnosis (defined as systolic BP 160 mmHg or diastolic BP 110 mmHg) out of which 83 (52.2%) had caesarean delivery.

The mean maternal age (in years  $\pm$  SD) of women with HDP was  $30.03 \pm 5.95$ . The median gestational age (in weeks  $\pm$  IQR) at delivery among the women with gestational hypertension, preeclampsia, chronic hypertension and preeclampsia superimposed on chronic hypertension were 39.0 (IQR: 38.0-40.0), 38 (IQR 34.0-39.0), 39.0 (IQR 37.0-40.0) and 38.0 (IQR: 36.5-38.5) respectively. Most of the women with HDP (80.2%) were married and 284 (77.2%) had attained secondary education with 10.1% without any formal education.

The mean birth weights ( $\pm$  SD) of neonates born to mothers having preeclampsia, gestational hypertension, chronic hypertension and superimposed preeclampsia on chronic hypertension were  $2.55 \pm 0.80$  kg,  $3.06 \pm 0.69$  kg,  $3.40 \pm 0.77$  kg and  $2.94 \pm 1.02$  kg respectively. The differences in birth weight were statistically significant between preeclampsia and gestational hypertension ( $p$ -value  $< 0.001$ ), preeclampsia and chronic hypertension ( $p$ -value  $< 0.001$ ) but not between preeclampsia and superimposed preeclampsia ( $p$ -value  $> 0.5$ ) or gestational hypertension and superimposed preeclampsia ( $p$ -value  $> 0.5$ ).

Most of the women with HDP were between 25 to 34 years and the distribution was similar between the two modes of delivery (Table 2). Teenagers constituted 7.5% and 3.0% among the vaginal and caesarean delivery groups respectively whereas those who were 40 years or more accounted for 2.5% and 7.1% respectively. Also, caesarean birth rates were highest in women with hypertensive disorders who were 40 years and above although they constituted the smallest proportion. The lowest CS rate occurred in the younger age group ( $\leq 19$  years) who had vaginal delivery rate of 75% (Table 2).

Generally, more than a third of the women with HDP were nulliparous with a proportion of 38.0% and

32.1% in vaginal and caesarean delivery categories respectively. Caesarean section rate was highest and lowest in women who were para 3 and para 0 (nulliparous) respectively (Table 3). Among the 368 hypertensive women 68 (18.5%) had induction of labour out of which 46 (67.6%) achieved vaginal delivery (Table 4). Induction of labour was undertaken in 34 (24.3%), 25 (13.6%), 4 (17.4%), 5 (23.8%) women in preeclampsia, gestational hypertension, chronic hypertension and superimposed preeclampsia on chronic hypertension respectively.

The indications for caesarean delivery among all the hypertensive population are presented in Table 5. The common caesarean indications were previous caesarean birth (26.2%), unfavourable cervix (22.6%), fetal distress (14.9%), failure to progress (10.7%), abnormal presentation (9.5%), failed induction (7.1%) and placental abruption (3.0%).

Eclampsia occurred in 58 cases out of which 20 (34.5%) achieved vaginal delivery while 38 (65.5%) had caesarean section. Also, there were 16 cases of placental abruption with 11 (68.75%) and 5 (31.25%) delivering by vaginal and abdominal routes respectively. Regarding previous caesarean delivery, 21 (15.0%), 34 (18.5%), 6 (26.1%) and 4 (19.0%) women in the preeclampsia, gestational hypertension, chronic hypertension and preeclampsia superimposed on chronic hypertension groups respectively, had had a prior caesarean birth. Thus, a total of 65 women (17.7%) with HDP had a history of previous caesarean section.

The risk of caesarean delivery was significantly higher in women with preeclampsia [unadjusted odds ratio with 95% CI: 2.701 (1.716-4.253),  $p$ -value  $< 0.001$ ] and chronic hypertension [(unadjusted odds ratio with 95% CI: 2.589 (1.324-5.061),  $p$ -value = 0.005] compared to those with gestational hypertension. The increased risk of caesarean section was still significant for preeclampsia [(adjusted odds ratio 2.898 (1.741-4.824),  $p$ -value  $< 0.001$ ] and chronic hypertension [(adjusted odds ratio 2.474 (1.194-5.128),  $p$ -value = 0.015] with reference to gestational hypertension after adjusting for maternal age, parity, gestational age at delivery, birth weight and previous caesarean birth.

**Table 1:** Distribution of caesarean births and gestational age at delivery among women with hypertensive disorders in pregnancy at KBTH

	Variable	PE n (%)	G-HPN n (%)	C-HPN n (%)	C-HPN+PE n (%)	Total n (%)
<b>Delivery mode</b>	Vaginal	59 (42.1)	122 (66.3)	9 (39.1)	10 (47.6)	200 (54.3)
	Caesarean	81 (57.9)	62 (33.7)	14 (60.9)	11 (52.4)	168 (45.7)
	Total	140 (38.0)	164 (50.0)	23 (6.3)	21 (5.7)	368 (100)
<b>Types of CS</b>	Emergency	9 (11.1)	16 (25.8)	4 (28.6)	2 (18.2)	31 (18.5)
	Non-emergency	72 (88.9)	46 (74.2)	10 (71.4)	9 (81.8)	137 (81.5)
	Total	81 (48.2)	62 (36.9)	14 (8.3)	11 (6.5)	168 (100)
<b>GA at delivery</b>	<34	31 (22.1)	11 (6.0)	0 (0.0)	3 (14.3)	45 (12.2)
	34-36	18 (12.9)	14 (7.6)	1 (4.3)	2 (9.5)	35 (9.5)
	37 and above	91 (65.0)	159 (86.4)	22 (95.7)	16 (76.2)	288 (78.3)
	Total	140 (38.0)	164 (50.0)	23 (6.3)	21 (5.7)	368 (100)

PE: preeclampsia, G-HPN: Gestational hypertension, C-HPN: Chronic hypertension, CHPN+PE; Preeclampsia superimposed on chronic Hypertension, CS: Caesarean section, GA: Gestational age. Emergency CS: Caesarean birth after onset of labour. Non-emergency CS: Caesarean delivery prior to onset of labour.

**Table 2:** Age distribution and mode of delivery among women with hypertensive disorders in pregnancy at KBTH

Age groups	Vaginal delivery n (%)	Caesarean delivery n (%)	Total n (%)	Vaginal birth rate (%)	Caesarean rate (%)
≤19	15 (7.5)	5 (3.0)	20 (5.5)	75.0	25.0
20-24	27 (13.5)	18 (10.7)	45 (12.2)	60.0	40.0
25-29	54 (27.0)	52 (31.0)	106 (28.8)	50.9	49.1
30-34	60 (30.0)	45 (26.8)	105 (28.5)	57.1	42.9
35-39	39 (19.5)	36 (21.4)	75 (20.4)	52.0	48.0
≥40	5 (2.5)	12 (7.1)	17 (4.6)	29.4	70.6
<b>total</b>	<b>200 (54.3)</b>	<b>168 (45.7)</b>	368 (100)	54.3	45.7

**Table 3:** Parity distribution and mode of delivery among women with hypertensive disorders in pregnancy at KBTH

Parity group	Vaginal delivery n (%)	Caesarean delivery n (%)	Total n (%)	Vaginal birth rate (%)	Caesarean rate (%)
0	76 (38.0)	54 (32.1)	130 (35.3)	58.5	41.5
1	39 (19.5)	39 (23.2)	78 (21.2)	50.0	50.0
2	41 (20.5)	31 (18.5)	72 (19.6)	56.9	43.1
3	22 (11.0)	26 (15.5)	48 (13.0)	45.8	54.2
4	13 (6.5)	10 (6.0)	23 (6.2)	56.5	43.5
≥5	9 (4.5)	8 (4.8)	17 (4.6)	52.9	47.1
<b>Total</b>	<b>200 (54.3)</b>	<b>168 (45.7)</b>	368 (100)	54.3	45.7

**Table 4:** Distribution of induction of labour (IOL) among women with hypertensive disorders in pregnancy at KBTH

Induction of labour	PE n (%)	G-HPN n (%)	C-HPN n (%)	C-HPN+PE n (%)	Total n (%)
Successful IOL	21 (61.8)	19 (76.0)	2 (50.0)	4 (80.0)	46 (67.6)
Failed IOL	13 (38.2)	6 (24.0)	2 (50.0)	1 (20)	22 (32.4)
Total	34 (50.0)	25 (36.8)	4 (5.9)	5 (7.4)	68 (100)

PE: preeclampsia, G-HPN: G gestational hypertension, C-HPN: Chronic hypertension, CHPN+PE; Preeclampsia superimposed on chronic Hypertension, IOL: Induction of labour

**Table 5:** Distribution of caesarean indications among women with various categories of hypertensive disorders in pregnancy at KBTH

Caesarean indications	PE n (%)	G-HPN n (%)	C-HPN n (%)	C-HPN + PE n (%)	Total n (%)
Abnormal presentation	4 (4.9)	9 (14.5)	2 (14.3)	1 (9.1)	16 (9.5)
Placental abruption	3 (3.7)	2 (3.2)	-	-	5 (3.0)
Failed induction	9 (11.1)	3 (4.8)	-	-	12 (7.1)
Failure to progress	6 (7.4)	9 (14.5)	1 (7.1)	2 (18.2)	18 (10.7)
Fetal distress	10 (12.4)	10 (16.1)	3 (21.4)	2 (18.2)	25 (14.9)
Unfavourable cervix	31 (19.8)	2 (3.2)	-	5 (45.4)	38 (22.6)
Previous caesarean	16 (38.3)	22 (35.5)	6 (42.9)	-	44 (26.2)
Others	2 (2.5)	5 (8.1)	2 (14.3)	1 (9.1)	10 (6.0)
<b>Total</b>	<b>81 (48.2)</b>	<b>62 (36.9)</b>	<b>14 (8.3)</b>	<b>11 (6.6)</b>	168 (100)

PE: preeclampsia, G-HPN: Gestational hypertension, C-HPN: Chronic hypertension, CHPN+PE; Preeclampsia superimposed on chronic Hypertension

## Discussion

The optimal mode of delivery in pregnant women with hypertensive disorders depends on both maternal and fetal factors. Generally, vaginal delivery is recommended unless there is an obstetric indication for CS.<sup>1,7</sup> In this study, 45.7% and 54.3% of the women with HDP delivered via caesarean and vaginal routes respectively. The caesarean rate determined in this study is higher than the 34% reported in Ethiopia but consistent with the rate of 45.8% determined by in Iran.<sup>15,16</sup> More recently, a higher caesarean rate of 90.8% among women with HDP was reported in Nigeria<sup>17</sup> whereas Pacher and colleagues reported 100% CS rate for women with preeclampsia<sup>5</sup>.

In the present study, caesarean birth rate was highest (60.9%) and lowest (33.7%) in those with chronic hypertension and gestational hypertension respectively. The increased caesarean rate remained significantly high for preeclampsia and chronic hypertension, in reference to gestational hypertension, after adjusting for possible confounding factors. However, other researchers noted that caesarean rate was lowest (48.3%) in chronic hypertensive women and highest (63.8%) in severe preeclampsia.<sup>10</sup> A recent study that assessed maternal nearmiss and quality of obstetric care at the same institution found a caesarean rate of 29.7% in pregnant women with no major obstetric complication whereas those with potentially life-threatening condition including severe preeclampsia recorded a rate of 49.6%.<sup>18</sup> In Ghana, the national caesarean rate is reported as 11%<sup>19</sup> which is within the 5-15% recommended by the WHO<sup>20</sup>. The wide disparity in caesarean birth rates across countries and continents might be attributable to different socio-economic and cultural characteristics as well as the high risk nature of HDP.

It is, however, difficult to determine whether all the indications for CS in these hypertensive women were medically justifiable in the midst of the current surge of

maternal request for caesarean birth in contemporary obstetrics. The main effective treatment for these disorders revolves around delivery of the fetus and placenta<sup>1</sup>. However, patients with severe hypertension, eclampsia and other complications need adequate peripartum stabilization and management in order to optimize obstetric outcomes. The postpartum period is a critical time for women with hypertensive disorders because of the residual possibility of complications such as eclampsia which might not be entirely eliminated by immediate delivery.

Among the women with HDP teenagers and women who were 40 years or more constituted 5.5% and 4.6% respectively. Caesarean birth rate was highest in those who were 40 years and above although they constituted the smallest proportion. The younger age group ( $\leq 19$  years) had the lowest CS rate with vaginal delivery rate of 75%. This is an interesting finding regarding their future reproductive performance especially in a developing country like Ghana with a high total fertility rate of 4.3, low modern contraceptive prevalent rate of 24% and high adolescent birth rate of 60 per 1000 births<sup>18</sup>. The above finding is encouraging because high CS among our teenagers has serious obstetric sequelae on their future reproductive outcome.

Among the hypertensive women who had vaginal delivery 7.0% had vacuum extraction and this was necessary to shorten the second stage of labour for both maternal and fetal benefits. Regarding those who had CS, 18.5% were in labour while 81.5% had not gone into labour. A recent study at KBTH determined that 50.5% of women underwent CS before the onset of labour compared to the 81.5% determined in the present study<sup>21</sup>. This variation might be partly attributable to the fact that the current study recruited high risk hypertensive women most of whom needed urgent delivery prior to the onset of labour to help control their blood pressures and avert the associated complications.

The current study also determined the rate of induction of labour (IOL) among the hypertensive mothers as 18.5% with a composite success rate of achieving vaginal delivery of 67.6%. This finding is consistent with that of Ben-Haroush and colleagues who reported successful IOL in approximately 75% of patients with hypertensive disorders and unfavourable cervix, without serious maternal or fetal complications<sup>6</sup>. However, the rate of IOL determined in this study was lower compared to the rate of 36% reported by Wolde et al in Ethiopia<sup>15</sup>. In our study, the tendency of being induced was highest in preeclampsia and preeclampsia superimposed on chronic hypertension groups but lowest in the women with gestational hypertension. The successful IOL rate, defined as achieving vaginal delivery as the endpoint, was highest in preeclampsia superimposed on chronic hypertension and lowest in uncomplicated chronic hypertension.

Trial of induction of labour is generally recommended regardless of cervical assessment findings in severe preeclampsia<sup>12</sup>. However, caesarean delivery should be considered if vaginal delivery cannot be achieved within a reasonable time frame<sup>1</sup>. This study has shown that IOL is a frequent obstetric intervention which averted the need for caesarean birth in a significant proportion of women with HDP at KBTH. Similarly, induction of labour after 37 weeks of gestation has been shown to be associated with improved maternal outcome with no cases of neonatal or maternal deaths or eclampsia among women with mild hypertensive disease<sup>22</sup>. Also, immediate delivery has been hypothesized to reduce the risk of adverse maternal outcomes in mild hypertensive disorders between 34-37 weeks of gestation but increases the risk of neonatal respiratory distress syndrome significantly<sup>23</sup>, and therefore expectant management is recommended until the clinical or biochemical parameters of the mother or fetus begin to deteriorate<sup>23,24</sup>.

In the present study, the common indications for CS determined among these cohorts of patients with HDP were previous caesarean birth (26.2%), unfavourable cervix (22.6%), fetal distress (14.9%), failure to progress (10.7%), abnormal presentation (9.5%), failed induction of labour (7.1%) and placental abruption (3.0%). In a study by Yucesoy and colleagues, a higher CS rate of 58.8% was reported with fetal distress being the most frequent indication (46%) followed previous caesarean section.<sup>10</sup> In the current study previous CS was the most common caesarean indication and this could be partly due to high rate of primary caesarean birth in these women with HDP. Women with chronic hypertension and gestational hypertension had the highest and lowest frequencies of prior CS as an indication for a repeat abdominal delivery respectively.

Intriguingly, none of the patients with preeclampsia superimposed on chronic hypertension had prior CS as an indication for repeat caesarean delivery compared to those with uncomplicated chronic hypertension. It is

important to recognize that among the study population, 17.7% had a background history of previous CS and that might partly explain the high caesarean rate among this population. To buttress this point, Obed and Aniteye studied the reproductive performance of women with prior history of eclampsia and noted that as high 54.2% had had CS in their previous pregnancies<sup>25</sup>. Generally, it is very important that the indication for primary CS be carefully reviewed in all cases to adequately ascertain the genuineness of the need for abdominal delivery to obviate serious obstetric consequences in future maternities. In the current study, 34.5% of the eclamptics achieved vaginal delivery while 65.5% had caesarean birth. Eclampsia is generally considered as variant of severe preeclampsia and in such conditions vaginal delivery is still the preferred mode of childbirth especially when maternal and fetal parameters are stable<sup>1</sup>.

Unfavourable cervix was the second most common indication for CS among these women with HDP. It is possible that most of the caesarean deliveries due to unfavourable cervix could have been delivered vaginally via careful peripartum stabilization with a targeted blood pressure control followed by IOL and augmentation of labour. Fascinatingly, none of the patients with chronic hypertension had unfavourable cervix as an indication for CS in this study.

Failure to progress including cephalopelvic disproportion also constituted a significant indication for CS among the hypertensive mothers with the highest frequency occurring in the preeclampsia superimposed on chronic hypertension subgroup. In the current study, fetal malpresentation accounted for 9.5% of the caesarean births and this finding is consistent with the rate of 9.3% reported in Iran<sup>10</sup>. Also, placental abruption constituted 8% of caesarean indications in the Iranian study<sup>10</sup> compared to the 3% in our study. The possible reasons for the wide variation regarding placental abruption as caesarean indication might be varied. These include the differential favorability of the cervix for IOL in the midst of torrential antepartum hemorrhage with or without coagulopathy as well as the availability of blood products for transfusion. In situations of torrential antepartum hemorrhage immediate abdominal delivery is recommended unless the parturient is in second stage of labour when instrumental delivery is readily achievable. In this study there were 16 cases of placental abruption out of which 68.75% successfully achieved vaginal delivery with 31.25% delivering via CS. Vaginal delivery is generally preferred to CS in placental abruption because of the increased possibility of coagulopathy which might culminate in difficulty in securing hemostasis at surgery.

The limitations of the study include the short duration of the study with associated small numbers and lack of controls. Also, the study was conducted in a tertiary hospital setting where complicated cases of HDP are referred for specialist management and this might have distorted the numerator and denominator factors in

the equation. However, the findings of this study would serve as evidence for clinicians and policy makers in devising more appropriate guidelines for managing HDP. These findings will also stimulate a larger clinical study to better relate and determine the true population estimates regarding the mode of delivery and caesarean indications in women with HDP.

## Conclusion

The current study has determined that 45.7% and 54.3% of the women with HDP at KBTH achieved caesarean and vaginal births respectively. Caesarean birth rate was highest (60.9%) and lowest (33.7%) in chronic hypertension and gestational hypertension respectively. Induction of labour was found to be a frequent obstetric intervention which obviated the need for caesarean section in a significant number of women with HDP. The common caesarean indications among women with HDP determined in this study were previous caesarean birth, unfavourable cervix, fetal distress, failure to progress, fetal malpresentation, failed induction of labour and placental abruption.

## Acknowledgements

We are grateful to the Doctors and Midwives at the Maternity Unit of Korle Bu Teaching Hospital who managed our study participants through antenatal to the postnatal period. We are also grateful to Mr Godwin Binlinla and Abdul-Wahab Tommie for their immense contribution to the data collection. Finally, we are most grateful to our patients whose data were extracted for this work.

## Competing Interests

The authors declare that they have no competing interests.

## References

1. Report of the National High Blood Pressure Education Program (NHBPEP) Working Group on High Blood Pressure in Pregnancy. *Am J Obstet Gynecol.* 2000; 183, S I-S22.
2. McCarthy FP and Kenny LC. Hypertension in pregnancy. *Obstetrics, Gynaecology and Reproductive medicine* 2009; 19:136-141.
3. American College of Obstetricians and Gynecologists, ACOG. Diagnosis and management of preeclampsia and eclampsia. *ACOG Practice Bulletin* 2002; 33: 640-647. Washington D.C.
4. Adu-Bonsaffoh K, Samuel OA, Binlinla G, Samuel OA. Maternal deaths attributable to hypertensive disorders in a tertiary hospital in Ghana. *Int J Gynecol Obstet.* 2013;123, 110-113.
5. Pacher J, Brix E and Lehner R. The mode of delivery in patients with preeclampsia at term subject to elective or emergency Caesarean section. *Arch Gynecol Obstet* 2014; 289:263–267. DOI 10.1007/s00404-013-2936-3
6. Ben-Haroush A, Yogeve Y, Glickman H, Kaplan B, Hod M, Bar J. Mode of delivery in pregnant women with hypertensive disorders and unfavorable cervix following induction of labor with vaginal application of prostaglandin E. *Acta Obstet Gynecol Scand* 2005; 84:665–671
7. Brown MA, Hague WM, Higgins J et al The detection, investigation and management of hypertension in pregnancy: full consensus statement. *Aust N Z J Obstet Gynaecol* 2000; 40:139–155
8. Alanis MC, Robinson CJ, Hulsey TC, Ebeling M, Johnson DD Early-onset severe preeclampsia: induction of labor vs elective caesarean delivery and neonatal outcomes. *Am J Obstet Gynecol* 2008; 199: 262.e1–262.e6
9. Xenakis EM, Piper JM, Field M, Conway D, Langer O. Preeclampsia: is induction of labor more successful? *Obstet Gynecol* 1997;89:600-603.
10. Yucesoy G, Ozkan S, Bodur H, Tan T, Calışkan E, Vural B and Corakçi A. Maternal and perinatal outcome in pregnancies complicated with hypertensive disorder of pregnancy: a seven year experience of a tertiary care center. *Arch Gynecol Obstet.* 2005; 273:43-9.
11. Levano KJ and Cunningham FG. Management. In: Lindheimer MD, Roberts JM, Cunningham FG, editors. *Chesley's hypertensive disorders in pregnancy.* Stamford (CT): Elsevier Inc; 2009. p. 389-414.
12. Coppage KH, Polzin WJ. Severe preeclampsia and delivery outcomes: is immediate caesarean delivery beneficial? *Am J Obstet Gynecol* 2002; 186:921–923
13. Adu-Bonsaffoh K, Obed SA, Seffah JD. "Maternal outcomes of hypertensive disorders in pregnancy at Korle Bu Teaching Hospital, Ghana." *Int J Gynecol Obstet* 2014; 127: 238-242.
14. Brown MA, Lindheimer MD, de Swiet M, Van Assche A, Moutquin JM. The classification and diagnosis of the hypertensive disorders of pregnancy: statement from the International Society for the Study of Hypertension in Pregnancy (ISSHP). *Hypertens Pregnancy* 2001; 20: 9-14
15. Wolde Z, Segni H and Woldie M. Hypertensive disorders of pregnancy in Jimma university specialized hospital. *Ethiop J Health Sci.* 2011; 21: 147-153.
16. Zibaenezhad MJ, Ghodsi M, Arab P and Gholzom N. The Prevalence of Hypertensive Disorders of Pregnancy in Shiraz, Southern Iran. *Iranian Cardiovascular Research Journal.* 2010; 4:169-172
17. Olusanya BO and Solanke OA. Perinatal outcomes associated with maternal hypertensive disorders of

- pregnancy in a developing country. *Hypertens Pregnancy*. 2012; 31:120-30. doi: 10.3109/10641955.2010.525280.
18. Tunçalp O, Hindin MJ, Adu-Bonsaffoh K, Adanu RM. Assessment of maternal near-miss and quality of care in a hospital-based study in Accra, Ghana. *Int J Gynecol Obstet*. 2013; 123, 58-63.
  19. Ghana Statistical Service, 2011. Ghana Multiple Indicator Cluster Survey with an Enhanced Malaria Module and Biomarker, 2011, *Final Report*. Accra, Ghana.
  20. World Health Organization (WHO). Appropriate technology for birth. *Lancet*. 1985; 2(8452), 436-437
  21. Tunçalp O, Stanton C, Castro A, Adanu R, Heymann M, Adu-Bonsaffoh K, Lattof SR, Blanc A and Lange A. Measuring Coverage in MNCH: Validating Women's Self-Report of Emergency Caesarean Sections in Ghana and the Dominican Republic. *PLoS ONE* 2013; 8(5): e60761. doi:10.1371/journal.pone.0060761.
  22. Koopmans CM, Bijlenga D, Groen H, et al. Induction of labour versus expectant monitoring for gestational hypertension or mild preeclampsia after 36 weeks' gestation (HYPITAT): a multicentre, open-label randomised controlled trial. *Lancet*. 2009; 374:979-988.
  23. Broekhuijsen K, van Baaren GJ, van Pampus MG, et al. Immediate delivery versus expectant monitoring for hypertensive disorders of pregnancy between 34 and 37 weeks of gestation (HYPITAT-II): an open-label, randomised controlled trial. *Lancet* 2015; 385: 2492-501
  24. World Health Organization. World Health Organization recommendations for prevention and treatment of preeclampsia and eclampsia. Geneva: World Health Organization; 2011.
  25. Obed SA and Aniteye P. Pregnancy Following Eclampsia: A Longitudinal Study at Korle-Bu Teaching Hospital. *Ghana Med J*. 2007; 41:139-143
-