

MODE OF DELIVERY IN WOMEN WITH HYPERTENSIVE DISORDERS OF PREGNANCY

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ABSTRACT

Backgrounds: Hypertensive disorders of pregnancy (HDP) including chronic hypertension, gestational hypertension, preeclampsia, and eclampsia are among the major conditions that raise the risk of death and complications for both the mother and the unborn child. The purpose of this study is to characterize the delivery technique used in HDP women.

Methods: A descriptive observational study of medical records was conducted with a cross-sectional design at Prof. Dr. I. G. N. G. Ngoerah General Hospital in 2021-2022 which met the criteria and was analyzed through SPSS.

Results: Of the 86 HDP patients in the study, most of the women had preeclampsia (73.3%), were between the ages of 20 and 34 (72.09%), had a BMI of 25–30 kg/m² (39.53%), and were multigravida (60.46%) and multiparity (56.97%). The majority of deliveries (79.06%) were cesarean sections, whilst only 20.93% were vaginal, and some required forceps assistance (4.65%). 58.13% of term babies were born with a perinatal mortality of 9.3%.

Conclusions: This study finds that cesarean sections as the mode of delivery are more common in pregnant women with hypertensive disorders than spontaneous vaginal birth, and both the moms and the newborn babies who are impacted have been described in this study.

Keywords : Hypertensive Disorders of Pregnancy, Mode of Delivery, Pregnancy Hypertension

INTRODUCTION

Hypertension disorders of pregnancy (HDP) are defined as a blood pressure disorder exceeding 140/90 mmHg which also includes the term chronic hypertension, gestational hypertension, preeclampsia/eclampsia, and chronic hypertension with superimposed preeclampsia (superimposed preeclampsia).¹ HDP cases globally continue to increase with an estimated incidence of around 18.08 million people in 2019.² In 2018, as many as 3.3% of 80,646 pregnant women in Indonesia experienced HDP, ranking third in complications experienced during pregnancy nationally.³ HDP also causes high mortality and multimorbidity in women and babies^{1,2} which is why its impacts on women and newborns need to be further explored.

HDP impacts decision-making in the mode of delivery. Spontaneous vaginal delivery is the safest delivery if the gestational age is sufficient, 37 weeks to 42 weeks.⁴ Spontaneous vaginal delivery in Indonesia still has the highest prevalence at 81.5% compared to operative delivery and others.³ But compared to operative vaginal delivery such as forceps extraction (FE) and vacuum extraction (VE), the quality of recovery from spontaneous delivery without tools is better. In addition, if done properly, spontaneous labor has better obstetric outcomes characterized by a lower risk of bleeding and genital lacerations. The risk to the baby such as head bruising is also low compared to forceps and vacuum.⁵ Spontaneous labor overall has a lower risk of birth side effects than operative vaginal delivery and

intrapartum cesarean section.⁶ Vaginal delivery that has certain indications can be assisted with forceps or vacuum.

VE and FE have their advantages and disadvantages. In general, VE is safer than FE for the mother, but conversely, FE is safer than VE for the baby.⁷ Not all VEs and FEs can be successful, which is where emergency or planned cesarean section needs to be considered.^{7,8} With the development of health facilities and accessibility, the use of vacuum and forceps has decreased and CS has increased. In Indonesia, the increase in the percentage of CS was seen significantly from 9.8% in 2013 to 17.7% in 2017.^{3,9,10} In some clinical indications, CS needs to be performed such as failed operative vaginal delivery, previous history of CS, and other inflexible indications.⁸ Even so, CS is more invasive than VE and FE¹¹. CS also increased the risk of infection and longer healing time.^{8,12} However, CS has a lower incidence of urinary incontinence and pelvic organ prolapse.¹³

Delivery of baby is still the definitive therapy for gestational hypertension, preeclampsia, and eclampsia. Maternal symptoms mostly resolve immediately after delivery. HDP patients with abnormal fetal findings also have indications for early delivery.¹⁴ In HDP deliveries, Preterm birth is also one of the highest adverse outcomes¹⁵ which CS is more often chosen as a mode of delivery.¹⁶ Preeclampsia/eclampsia has a high risk of CS, although preeclampsia/eclampsia is not an indication for CS.¹⁷ However, vaginal birth still needs to be attempted in HDP patients, re-examining the maternal and infant conditions.¹⁸ In

Canada, HDP patients were found to have a higher presentation of VE, FE, and CS when compared to non-HDP.¹⁹ Until now, there have been no studies describing the mode of deliveries recorded for all types of HDP in Indonesia that are known to the author. Recent studies have also not been able to further describe the types of vaginal deliveries taken. Considering the high prevalence of HDP, it is crucial to understand the distribution of delivery methods to enhance decision-making processes and assess outcomes for women with HDP. This paper aims to characterize the delivery methods employed in women with HDP, based on the urgency of the condition.

METHODOLOGY

This study utilized a descriptive observational research method adopting a cross-sectional study design and was conducted at the Medical Records Department of Prof. Dr. I. G. N. G. Ngoerah General Hospital, Denpasar, Bali, from January to October 2024. Total sampling are applied from available records during 2021-2022 period in the form of paper medical records. Inclusion criteria include all pregnant women with hypertensive disorders in pregnancy (HDP) who delivered at Prof. Dr. I. G. N. G. Ngoerah General Hospital, during the 2021-2022 period. Medical records with incomplete information are excluded. Data were cleaned and systematically organized in Microsoft Excel 2021. Subsequently, the data were processed using SPSS version 26.

RESULTS

Through total sampling, 94 cases of hypertension in pregnancy were identified during the 2021-2022 period. After applying criteria, 86 cases remained.

Women with HDP Characteristics

The characteristics of women with HDP in this study were also described in Table 2. The most common maternal age group for HDP was 20-35 years, with 62 cases (72.09%), while the <20 years age group had the fewest cases (3 cases, 3.48%). The mean maternal age was 30.26 ± 6.83 years.

BMI was recorded before delivery and categorized. The most common BMI range among HDP women was 25-30 kg/m² (n=34, 39.53%), while the least common was 18-25 kg/m² (n=23, 26.74%). The mean BMI among women with HDP was 28.86 ± 5.74 kg/m². The mean maternal weight was 70.76 ± 15.67 kg, and the mean height was 1.56 ± 0.05 meters. The highest mean age, BMI, and weight were observed in cases of chronic hypertension with superimposed preeclampsia.

Four women (4.65%) had a history of preterm delivery, and 14 women (16.27%) had a history of miscarriage. Among pregnancies, 34 cases (39.53%) were primigravida, and 52 cases (60.46%) were multigravida. Multigravida cases were more common across all types of HDP except for chronic hypertension. Regarding parity, 49 women (56.97%) had at least one child or multiparous (parity 1-4), including the delivery at that time. Among these, preeclampsia was the most frequent (n=33, 67.3%). A total of 37 women (43.02%) were primiparous. No cases of grand multiparous (parity ≥5) were recorded.

Mode of Deliveries

The characteristics of delivery methods in this study are outlined in Table 5.3. The most common delivery method was CS, accounting for 68 cases (79.06%). Spontaneous vaginal deliveries were less frequent, with 18 cases (20.93%). Among the spontaneous vaginal deliveries, instrumental assistance was used in 4 cases (4.65%) with forceps, while no cases required vacuum assistance during the second stage of labor. CS was the most frequently employed delivery method across all types of HDP. It was highest in preeclampsia, with 50 cases (73.5%), followed by chronic hypertension with superimposed preeclampsia (n=9, 13.2%), gestational hypertension (n=5, 7.4%), eclampsia (n=3, 4.4%), and chronic hypertension (n=1, 1.5%). Spontaneous vaginal deliveries occurred only in two types of HDP: preeclampsia, with 13 cases (72.2%), and gestational hypertension, with 5 cases (27.8%).

Table 2. Characteristics of women with hypertensive disorders in pregnancy (HDP) at Prof. I. G. N. G. Ngoerah General Hospital in 2021-2022

	Hypertension disorders of pregnancy types										Total	
	Preeclampsia		Eclampsia		Gestational hypertension		Superimposed preeclampsia		Chronic hypertension		N	%
	n	%	n	%	n	%	n	%	n	%		
Age (years)	29.65 ± 5.87		28.33 ± 7.57		29.50 ± 10.53		36.78 ± 5.47		23 ± 0		30.26 ± 6.83	
<20	2	66,7	0	0	1	33,3	0	0	0	0	3	3,48
20 - <35	50	80,6	2	3,2	5	8,1	4	6,5	1	1,6	62	72,09
≥35	11	52,4	1	4,8	4	19	5	23,8	0	0	21	24,41
BMI (kg/m²)	29.02 ± 5.08		30.20 ± 7.56		24.47 ± 2.85		32.69 ± 9.10		24.03 ± 0		28.86 ± 5.74	
18,5 - <25	13	56,5	1	4,3	6	26,1	2	8,7	1	4,3	23	26,74
25 - <30	28	82,4	0	0	4	11,8	2	5,9	0	0	34	39,53
≥30	22	75,9	2	6,9	0	0	5	17,2	0	0	29	33,72
Weight (kg)	71.1 ± 14.47		78.67 ± 21.5		58.30 ± 9.31		80.78 ± 20.66		60 ± 0		70.76 ± 15.67	
Height (m)	1.56 ± 0.05		1.61 ± 0.03		1.54 ± 0.06		1.58 ± 0.04		1.58 ± 0		1.56 ± 0.05	

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Preterm delivery history (n)	2	50	0	0	0	0	2	50	0	0	4	4.65
Abortion history (n)	10	71	0	0	2	14.3	2	14.3	0	0	14	16.27
Gravida (n)												
Primigravida	29	85.3	1	2.9	2	5.9	1	2.9	1	2.9	34	39.53
Multigravida	34	65.4	2	3.8	8	15.4	8	15.4	0	0	52	60.46
Parity (n)												
0	30	81.1	2	5.4	3	8.1	1	2.7	1	2.7	37	43.02
1 – 4	33	67.3	1	2	7	14.3	8	16.3	0	0	49	56.97
≥5	0	0	0	0	0	0	0	0	0	0	0	0
Total	63	73.3	3	3.5	10	11.6	9	10.5	1	1.2	86	100

Table 3. Mode of deliveries on women with hypertensive disorders in pregnancy (HDP) at Prof. I. G. N. G. Ngoerah General Hospital in 2021–2022

	Hypertension disorders of pregnancy types										Total	
	Preeclampsia		Eclampsia		Gestational hypertension		Superimposed preeclampsia		Chronic hypertension		n	%
	n	%	n	%	n	%	n	%	n	%		
Cesarean section	50	73.5	3	4.4	5	7.4	9	13.2	1	1.5	68	79.06
Spontaneous vaginal	13	72.2	0	0	5	27.8	0	0	0	0	18	20.93
Forceps (FE)	4	100	0	0	0	0	0	0	0	0	4	4.65
Vacuum (VE)	0	0	0	0	0	0	0	0	0	0	0	0
Induced vaginal	0	0	0	0	0	0	0	0	0	0	0	0
Total	63	73.3	3	3.5	10	11.6	9	10.5	1	1.2	86	100

Newborn Characteristics

The characteristics of the newborns can be seen in Table 3. The majority of the newborns were male, with 46 cases (53.48%), followed by females with 40 cases (46.51%). Term newborns were more prevalent than preterm or post-term newborns, with a total of 50 term infants (58.13%), the highest number being associated with preeclampsia (37 cases, 74%). Preterm births also

contributed significantly, with 33 cases (38.37%). Preterm births were most frequently observed in mothers with preeclampsia, accounting for 23 cases (69.7%). Post-term births were rare, with only 3 cases, all of which were associated with preeclampsia. Among the 86 newborns, the majority, 78 infants (90.69%), survived. However, 8 infants (9.3%) did not survive.

Table 4. Characteristics of newborns from women with hypertensive disorders in pregnancy (HDP) at Prof. I. G. N. G. Ngoerah General Hospital in 2021–2022

	Hypertension disorders of pregnancy types										Total	
	Preeclampsia		Eclampsia		Gestational hypertension		Superimposed preeclampsia		Chronic hypertension		n	%
	n	%	n	%	n	%	n	%	n	%		
Sex (n)												
Female	26	65	3	7.5	7	17.5	4	10	0	0	40	46.51
Male	37	80.4	0	0	3	6.5	5	10.9	1	2.2	46	53.48
Gestational age (days)	257.89 ± 27.23		246.33 ± 40.28		253.6 ± 30		254.56 ± 17.33		283 ± 0		256.93 ± 26.78	
Premature (<37 weeks)	23	69,7	1	3	4	12,1	5	15,2	0	0	33	38,37
Term (37-40 weeks)	37	74	2	4	6	12	4	8	1	2	50	58,13
Post-term (≥41 weeks)	3	100	0	0	0	0	0	0	0	0	3	3,48
Height (cm)	46.95 ± 4.23		43.67 ± 7.57		46 ± 5,56		45.78 ± 3.53		49 ± 0		46.63 ± 4.4	
Weight (gram)	2610.32 ± 799.92		2196.67 ± 945.64		2554 ± 933.17		2248.89 ± 642.41		3910 ± 0		2566.63 ± 810.55	
Mortality (n)												
Stillbirth	6	75	0	0	1	12.5	1	12.5	0	0	8	9.3
Alive	57	73.07	3	3.84	9	11.53	8	10.25	1	1.28	78	90.69
Total	63	73.3	3	3.5	10	11.6	9	10.5	1	1.2	86	100

The mean gestational age was 256.93 ± 26.78 days. The highest mean gestational age was observed in cases of chronic hypertension (283 ± 0 days), followed by preeclampsia (257.89 ± 27.23 days). The overall mean body length and birth weight were 46.63 ± 4.4 cm and 2566.63 ± 810.55 grams, respectively.

DISCUSSION

Women with HDP Characteristics

The average maternal age for HDP in this study was 30.26 ± 6.83 years, older than the average reported in a study from Ethiopia.²⁰ The highest incidence of HDP occurred in the 20–35 years age group ($n=62$; 72.09%), followed by those aged ≥ 35 years ($n=21$; 24.41%). Similarly, preeclampsia, eclampsia, gestational hypertension, and chronic hypertension were more prevalent in the 20–35 years age group. This finding aligns with studies indicating that women aged 20–29 years have higher preeclampsia rates, followed by those aged 30–39.²¹ This pattern is consistent with several other studies, including global research.^{2,22,23}

The average maternal BMI at delivery in this study was 28.86 ± 5.74 kg/m², higher than in a Polish study, which reported an average BMI of 27.1 ± 3.6 kg/m².²⁴ This difference may be attributed to population differences. Most mothers in this study had BMIs in the overweight ($25 < 30$ kg/m²; $n=34$; 39.53%) or obese (≥ 30 kg/m²; $n=29$; 33.72%) categories, compared to those in the normal BMI range ($18.5 < 25$ kg/m²; $n=23$; 26.74%). This shift may be due to weight gain during pregnancy. Higher BMIs at delivery are associated with an increased risk of HDP and cesarean delivery²⁵, consistent with this study's findings, where 33.72% were classified as obese. Recommendations on weight gain ranges based on pre-pregnancy BMI: 11.5–16 kg for normal weight, 7.0–11.5 kg for overweight, and 5–9 kg for obese women.²⁶ Pre-pregnancy obesity and excessive weight gain increase HDP risks, particularly gestational hypertension and preeclampsia.²⁷ Unfortunately, this study did not examine pre-pregnancy BMI or gestational weight gain.

In this study, 4 HDP mothers (4.65%) had a history of preterm birth. Although only 4.65% of HDP mothers had this history, preterm birth has been identified as a risk factor for HDP in other studies^{28,29}. Chronic hypertension exacerbated by preeclampsia may explain this history. However, preterm birth is often an indicator or consequence of HDP, making it a potential confounder. Abortions, both spontaneous and induced, were reported in 14 mothers (16.27%). Induced abortions may reduce HDP risk due to prior exposure to paternal antigens, which can help prevent HDP development.³⁰ However, other studies have shown a higher HDP risk in subsequent pregnancies following abortion.^{20,31} Gravidity showed that multigravida mothers were more prevalent than primigravida mothers, consistent with previous research.^{32,33} However, other studies found primigravida mothers more common.^{20,34} Primigravida mothers face higher risks of HDP due to difficulties in physiological and immunological adaptation during pregnancy.³⁵ Despite this, multigravida mothers which mostly consists of older women, face elevated HDP risks because of older age as risk factor.

HDP cases were most common among women with parity 1–4 ($n=49$; 56.97%), with preeclampsia cases being the highest in this group ($n=33$; 67.3%). This finding aligns with studies reporting higher HDP cases among multiparous women²⁰. However, discrepancies may arise from the limited scope of this study and pandemic-related influences. Despite these differences, nulliparity remains a consistent risk factor for HDP in various studies.^{36,37}

Mode of Deliveries

HDP is not considered an indication for CS³⁸. However, the findings of this study indicate that cesarean section (CS) was the most frequent mode of delivery ($n = 68$; 79.06%) compared to vaginal delivery ($n = 18$; 20.93%). This aligns with hospital-based studies showing higher rates of CS (75.6%) than spontaneous vaginal delivery (24.4%).³⁹ Furthermore, CS as a delivery method has been increasing annually in Indonesia, including Bali which risen from 17.3% in 2013 to 30.22% in 2018.^{40,41} CS is often chosen due to the potential worsening of HDP, especially preeclampsia and chronic hypertension with superimposed preeclampsia. Pregnancies with HDP may also have outcomes such as placental abruption, intrauterine growth restriction, and postpartum hemorrhage.³⁸ Additionally, HDP is a leading cause of maternal and neonatal mortality worldwide.⁴² Perinatal mortality associated with HDP is lower with CS compared to vaginal delivery for gestational ages ≥ 28 weeks⁴³, making CS a preferred mode in such cases.

Among vaginal deliveries in this study, 13 cases involved gestational hypertension and five involved chronic hypertension. Of these, four were FE, while none involved VE. The lower frequency of forceps or vacuum-assisted deliveries is consistent with national data showing instrument-assisted deliveries account for only 1.93% of all deliveries.⁴⁰ The rarity of such interventions may be due to medicolegal concerns, doubts about efficacy and safety, declining skills among healthcare providers, and reduced training opportunities in recent years.⁴⁴

Despite its decline, forceps delivery remains a valuable option due to its high efficacy and low maternal and neonatal complication rates.⁴⁵ However, vacuum extraction is generally more common than forceps, as it is easier to master and associated with lower risks of maternal perineal trauma.⁷ The choice of forceps over vacuum in this study might be related to fetal position, as forceps are preferred for assisting head rotation, particularly in occiput posterior presentations, while vacuum extraction is often used when no rotation is required.⁴⁶ Unfortunately, this study did not document fetal presentation or head position which could explain the preference for forceps.

Vaginal delivery offers several long-term advantages over CS, including reduced risks of miscarriage, placental abruption, and stillbirth in subsequent pregnancies. Children born via CS have an increased risk of asthma compared to those born vaginally.¹³ This increased risk might be due to reduced exposure to beneficial bacteria during delivery which could affect immune tolerance and lung development. Additionally, CS has been associated with increased DNA methylation in neonatal leukocytes, potentially influencing asthma susceptibility.⁴⁷

HDP also increases the risk of maternal hemorrhage, making major surgery like CS more hazardous. Vaginal delivery

should be considered only when maternal and fetal conditions are stable, adequate facilities are available, and competent healthcare professionals are present.⁴⁸ However, HDP often presents as an emergency. Consequently, CS is frequently chosen as the definitive management of HDP involves delivering the fetus, and delaying delivery may exacerbate maternal or fetal complications such as growth restriction. Interestingly, a cohort study found no difference in the likelihood of successful vaginal delivery after labor induction in pregnancies complicated by severe preeclampsia with or without fetal growth restriction when delivery occurred at ≤ 34 weeks.⁴⁹ This highlights the need to carefully evaluate delivery methods based on individual maternal and fetal conditions.

Newborn Characteristics

In this study, the proportion of male infants (53.48%) and female infants (46.51%) was nearly equal. A slightly higher number of male infants has also been reported in a Chinese cohort study, with 51.95% males compared to 48.04% females.⁵⁰ Fetal sex does not appear to be a predisposition for HDP or an increased risk of developing severe HDP.⁵¹ However, other studies suggest a slight association between gestational hypertension or preeclampsia and a decreased likelihood of delivering male infants.⁵⁰ A systematic review and meta-analysis further noted an association between male fetuses and all types of HDP, except for early-onset preeclampsia, which is more commonly associated with female fetuses.⁵² The findings of this study differ slightly, with a higher proportion of females in cases of eclampsia and gestational hypertension, possibly due to population variations. The association between male fetuses and HDP might be linked to higher uteroplacental resistance in pregnancies with male fetuses, potentially leading to suboptimal placentation.⁵³ However, much remains unknown about sexual dimorphism in pregnancy, necessitating further research.

In terms of outcomes, the majority of infants born to HDP mothers were delivered at term ($n=50$, 58.13%), compared to preterm deliveries ($n=33$, 38.37%) and post-term deliveries ($n=3$, 1.16%). The higher proportion of term births aligns with previous studies.⁵⁴ However, the same research highlights that preterm birth is significantly associated with HDP compared to non-HDP pregnancies. Preterm delivery is often an anticipated outcome in HDP management, particularly severe preeclampsia, as it can help mitigate worsening maternal conditions.^{1,55} This is reflected in the relatively high percentage of preterm births (38.87%) in this study. The average gestational age of infants born to HDP mothers was 256.93 days, falling within the preterm category and underscoring the association between HDP and preterm birth.

The perinatal mortality rate in this study was represented by the majority of infants surviving ($n=78$, 90.69%), while 8 infants (9.3%) did not survive. A larger study in India reported a higher perinatal mortality rate of 14.9% among HDP-related deliveries.³⁴ The lower rate in this study might reflect differences in healthcare facilities, quality of care, or the severity of HDP cases in the populations studied. However, a perinatal mortality rate of 9.3% remains significant, even in a single hospital study. Previous studies have shown a marked increase in perinatal mortality in HDP pregnancies compared to non-HDP pregnancies.^{17,56} This underscores the urgent need for further research on the prevention and management of HDP to reduce perinatal mortality rates.

CONCLUSION AND RECOMMENDATION

In 2021–2022, there were 86 cases of HDP at RSUP Prof. Dr. I. G. N. G. Ngoerah that met the inclusion and exclusion criteria. In this study, there are 63 cases (73.3%) preeclampsia, 10 cases (11.6%) gestational hypertension, 9 cases (10.5%) chronic hypertension with superimposed preeclampsia, 3 cases (3.5%) eclampsia, and 1 case (1.2%) chronic hypertension. The majority of women with HDP were aged 20 to <35 years ($n=62$; 72.09%) with an average age of 30.26 ± 6.83 years. Most women with HDP had a BMI in the range of 25 to <30 kg/m², with 34 women (39.53%) in this group and an average BMI of 28.86 kg/m². Additionally, most were multigravida ($n=52$; 60.46%) and multiparous ($n=49$; 56.97%). A total of 14 women (16.27%) had a history of miscarriage. In terms of delivery methods, most underwent cesarean section (SC), accounting for 68 cases (79.06%). Spontaneous vaginal delivery was performed in 18 cases (20.93%), with 4 cases (4.65%) assisted by forceps. Regarding neonatal outcomes, the majority were born at term (50 babies; 58.13%), followed by preterm births (33 babies; 38.37%). The perinatal mortality rate among women with HDP was 8 babies (9.3%).

This study underscores the high prevalence of cesarean sections in women with hypertensive disorders of pregnancy (HDP) and suggests further research in Indonesia to assess the feasibility of vaginal delivery as an alternative. It also highlights the lack of comprehensive studies comparing different HDP types. Limitations include a small sample size, particularly for chronic hypertension, and reduced healthcare access during the COVID-19 pandemic, which restrict the study's representativeness. Further research is recommended to address these gaps.

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