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Original Research Article

COMPARISON OF MATERNAL AND FETAL OUTCOMES FOLLOWING INTRAVENOUS LABETALOL AND ORAL NIFEDIPINE THERAPY IN SEVERE HYPERTENSION OF PREGNANCY

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Abstract

Background: Severe hypertension during pregnancy is associated with significant maternal and perinatal morbidity and mortality. Rapid blood pressure control is essential to prevent complications such as eclampsia, placental abruption, and fetal compromise. Intravenous labetalol and oral nifedipine are commonly used antihypertensive agents for acute management; however, evidence comparing their efficacy and safety remains limited.

Methods: This randomized comparative trial was conducted among 133 pregnant women with severe hypertension admitted to a tertiary care hospital. Participants were randomly allocated to receive either intravenous labetalol (n=66) or oral nifedipine (n=67). Baseline demographic and clinical characteristics, time to achieve target blood pressure, number of doses required, maternal outcomes, adverse drug effects, and fetal/neonatal outcomes were assessed and compared between the groups. Statistical analysis was performed using appropriate tests, and $p<0.05$ was considered statistically significant.

Results: Baseline demographic and obstetric characteristics were comparable between the groups. Oral nifedipine achieved target blood pressure significantly faster than intravenous labetalol (31.8 ± 14.7 vs 42.6 ± 16.4 minutes; $p<0.001$) and required fewer doses (1.9 ± 0.9 vs 2.4 ± 1.1; $p=0.006$). Successful blood pressure control within 60 minutes was observed in 94.0% of women receiving nifedipine and 89.4% receiving labetalol. Maternal outcomes including mode of delivery, progression to eclampsia, HELLP syndrome, postpartum hemorrhage, ICU admission, and hospital stay were comparable. Bradycardia was significantly higher with labetalol, whereas tachycardia, headache, flushing, dizziness, and palpitations were more common with nifedipine. Fetal and neonatal outcomes including birth weight, preterm delivery, Apgar scores, NICU admission, and perinatal mortality did not differ significantly between the groups.

Conclusion: Both intravenous labetalol and oral nifedipine were effective and safe for management of severe hypertension during pregnancy. Oral nifedipine provided more rapid blood pressure control with fewer doses, while intravenous labetalol demonstrated a comparatively favorable adverse effect profile.

Keywords: Preeclampsia; Intravenous Labetalol; Oral Nifedipine; Maternal Outcome; Fetal Outcome.

Introduction

Hypertensive disorders of pregnancy remain one of the leading causes of maternal and perinatal morbidity and mortality worldwide, complicating approximately 5–10% of all pregnancies [1]. Among these disorders, severe preeclampsia and eclampsia contribute substantially to adverse maternal and fetal outcomes, particularly in low- and middle-income countries where delayed diagnosis and limited access to tertiary care are common [2]. The condition is characterized by elevated blood pressure after 20 weeks of gestation, often associated with proteinuria and multisystem involvement affecting renal, hepatic, neurological, and hematological functions [3]. Severe hypertension in pregnancy, usually defined as systolic blood pressure ≥160 mmHg and/or diastolic blood pressure ≥110 mmHg, requires urgent treatment to prevent catastrophic complications such as intracranial hemorrhage, placental abruption, pulmonary edema, renal failure, disseminated intravascular coagulation, and maternal death [3]. Hypertensive emergencies during pregnancy also significantly compromise fetal wellbeing. Uteroplacental insufficiency

secondary to vasospasm and endothelial dysfunction may result in fetal growth restriction, oligohydramnios, prematurity, fetal distress, low birth weight, neonatal intensive care unit (NICU) admission, and increased perinatal mortality [4]. The incidence of preterm delivery is considerably higher among women with severe preeclampsia because definitive management often necessitates early termination of pregnancy to safeguard maternal health. Consequently, rapid and effective blood pressure control is considered a cornerstone in the management of severe hypertension during pregnancy [5].

An ideal antihypertensive agent in pregnancy should produce a prompt but controlled reduction in blood pressure without causing maternal hypotension or compromising uteroplacental blood flow. Intravenous labetalol and oral nifedipine are among the most commonly recommended first-line agents for acute blood pressure control in severe hypertension during pregnancy [6]. Labetalol is a combined selective α1- and non-selective β-adrenergic blocker that lowers systemic vascular resistance while maintaining maternal cardiac output and uteroplacental circulation [7]. Because of its rapid onset of action and favorable hemodynamic profile, intravenous labetalol has gained widespread acceptance in obstetric practice [8]. However, its use may be associated with adverse effects such as maternal bradycardia, hypotension, bronchospasm, nausea, scalp tingling, and fatigue [8].

Nifedipine, a calcium channel blocker, acts by inhibiting calcium influx into vascular smooth muscle, leading to peripheral vasodilatation and reduction in blood pressure. Oral nifedipine is inexpensive, easy to administer, readily available, and particularly useful in resource-limited settings where intravenous access or intensive monitoring facilities may not be immediately accessible [9]. The drug has a relatively rapid onset of action and has been shown to effectively reduce severe blood pressure elevations in pregnant women. Nevertheless, nifedipine may produce side effects including headache, flushing, tachycardia, dizziness, and maternal hypotension, which may potentially influence fetal perfusion [10].

Several randomized and observational studies have compared intravenous labetalol and oral nifedipine for the management of severe hypertension in pregnancy, with varying results regarding efficacy, onset of action, dosing frequency, maternal tolerability, and fetal outcomes [11,12]. While some studies have demonstrated faster blood pressure control with nifedipine, others have reported superior hemodynamic stability and fewer maternal adverse effects with labetalol. In addition, concerns remain regarding neonatal outcomes, including Apgar scores, fetal distress, and NICU admissions associated with different antihypertensive regimens [11,12].Therefore, the present randomized trial was undertaken to compare the maternal and fetal outcomes as well as the adverse effect profiles of intravenous labetalol and oral nifedipine in pregnant women with severe hypertension.

Materials and Methods

Study Design and Setting: This prospective randomized comparative trial was conducted in the Department of Obstetrics and Gynecology of a tertiary care teaching hospital over a period of 24 months from June 2023 to May 2025. The study was designed to compare the efficacy, maternal and fetal outcomes, and adverse effects associated with intravenous labetalol and oral nifedipine in the management of severe hypertension during pregnancy. Institutional Ethics Committee approval was obtained prior to commencement of the study, and written informed consent was obtained from all participants before enrolment. The study was carried out in accordance with the ethical principles outlined in the Declaration of Helsinki.

Study Population and Sample Size: Pregnant women admitted to the labor room or antenatal ward with severe hypertension were screened for eligibility. Severe hypertension was defined as systolic blood pressure ≥160 mmHg and/or diastolic blood pressure ≥110 mmHg recorded on two occasions at least 15 minutes apart using a calibrated mercury sphygmomanometer or automated validated device with the patient in the left lateral or semi-recumbent position. Women with singleton pregnancies beyond 28 weeks of gestation diagnosed with severe preeclampsia, gestational hypertension with severe features, or chronic hypertension with superimposed preeclampsia were included in the study.

Women with known contraindications to either study drug such as bronchial asthma, congestive cardiac failure, heart block, severe bradycardia, hepatic dysfunction, allergy to labetalol or nifedipine, severe maternal hypotension, seizure disorders unrelated to eclampsia, and significant medical disorders requiring alternative antihypertensive therapy were excluded. Patients already receiving antihypertensive treatment before admission, multifetal gestation, severe fetal congenital anomalies, intrauterine fetal demise, and women unwilling to participate were also excluded from the study. A total of 133 pregnant women fulfilling the inclusion criteria were enrolled in the study.

Eligible participants were randomly allocated into two equal groups using a computer-generated randomization sequence. Allocation concealment was ensured using sequentially numbered opaque sealed envelopes opened only after recruitment of

the participant. Group A (n=67) received intravenous labetalol, whereas Group B (n=66) received oral nifedipine. Due to the difference in route of administration, blinding of the treating clinician was not feasible; however, outcome assessment and data analysis were performed objectively according to predefined criteria.

Clinical Assessment and Baseline Evaluation: Detailed demographic and obstetric information including maternal age, parity, gestational age, booking status, socioeconomic status, previous history of hypertension, and associated risk factors were recorded at admission. A complete general physical examination and obstetric evaluation were performed. Blood pressure was measured using standard protocol with appropriate cuff size after adequate rest. Baseline maternal investigations included complete blood count, liver function tests, renal function tests, urine albumin estimation, coagulation profile, platelet count, and serum electrolytes wherever indicated.

Fetal assessment at admission included fetal heart rate monitoring, ultrasonography for fetal growth and amniotic fluid assessment, and cardiotocography or non-stress test depending on gestational age and clinical condition. Severity of preeclampsia and maternal-fetal status were assessed prior to initiation of antihypertensive therapy.

Intervention Protocol: Women randomized to the intravenous labetalol group received an initial dose of 20 mg labetalol administered slowly intravenously over 2 minutes. If target blood pressure was not achieved, escalating doses of 40 mg, 80 mg, 80 mg, and 80 mg were administered at 20-minute intervals up to a maximum cumulative dose of 300 mg. Blood pressure and maternal pulse rate were monitored before each subsequent dose and every 15–20 minutes after administration.

Women allocated to the oral nifedipine group received 10 mg immediate-release nifedipine orally. If severe hypertension persisted after 20 minutes, repeat doses of 10 mg nifedipine were administered every 20 minutes up to a maximum of five doses or until target blood pressure was achieved. Patients were monitored closely for hypotension, tachycardia, headache, flushing, or other adverse effects. The target blood pressure in both groups was defined as systolic blood pressure between 140–150 mmHg and diastolic blood pressure between 90–100 mmHg. If adequate blood pressure control was not achieved with the maximum permissible dose, alternative antihypertensive therapy was initiated as per institutional protocol and the patient was categorized as treatment failure.

Maternal Monitoring and Outcome Assessment: Maternal monitoring included serial blood pressure recordings, pulse rate, respiratory rate, urine output, oxygen saturation, and neurological status throughout treatment. Magnesium sulphate prophylaxis or treatment for eclampsia was administered whenever indicated according to institutional guidelines. Patients were monitored for complications such as eclampsia, placental abruption, pulmonary edema, HELLP syndrome, postpartum hemorrhage, acute kidney injury, and maternal intensive care unit admission.

Primary maternal outcome measures included time required to achieve target blood pressure, number of doses required, and treatment success rate. Secondary maternal outcomes included mode of delivery, duration of hospital stay, progression to eclampsia, and incidence of drug-related adverse effects including maternal hypotension, bradycardia, tachycardia, headache, flushing, nausea, dizziness, and palpitations.

Fetal and Neonatal Outcome Assessment: Fetal monitoring during treatment included intermittent or continuous fetal heart rate surveillance depending on the severity of maternal condition and gestational age. Fetal outcomes assessed included fetal distress, meconium-stained liquor, preterm delivery, intrauterine growth restriction, low birth weight, Apgar score at 1 and 5 minutes, requirement for neonatal resuscitation, NICU admission, and perinatal mortality. Neonates were evaluated immediately after birth by the attending pediatrician.

Statistical Analysis: Data obtained during the study were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 20.0. Quantitative variables were expressed as mean ± standard deviation, whereas categorical variables were presented as frequencies and percentages.

Comparison between the two study groups for continuous variables was performed using Student's independent t-test. Categorical variables were compared using Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 133 pregnant women with severe hypertension were included in the study, of whom 66 received intravenous labetalol and 67 received oral nifedipine. The mean maternal age was comparable between the intravenous labetalol and oral nifedipine groups (25.8 ± 4.1 vs 26.3 ± 4.5 years; p=0.448). Majority of women in both groups were aged ≥25 years (56.1% vs 59.7%; p=0.657) and were primigravida (57.6% vs 61.2%; p=0.698). Mean gestational age at presentation was 35.1 ± 2.8 weeks in the labetalol group and 34.8 ± 3.0 weeks in the nifedipine group, without significant

difference (p=0.574). Most patients presented at gestational age ≥34 weeks in both groups (72.7% vs 68.7%; p=0.691). Registered antenatal cases constituted 59.1% in the labetalol group and 55.2% in the nifedipine group (p=0.684), while the majority of patients belonged to rural areas in both groups (66.7% vs 68.7%; p=0.778). Mean systolic and diastolic blood pressure at admission were similar between the two groups (172.6 ± 10.4/114.8 ± 6.9 mmHg vs 174.1 ± 11.1/115.6 ± 7.3 mmHg; p=0.492 and p=0.501 respectively). Severe preeclampsia was the predominant diagnosis in both groups (74.2% vs 74.6%), followed by gestational hypertension with severe features and chronic hypertension with superimposed preeclampsia, with no statistically significant intergroup differences (Table 1).

Table 1: Baseline demographic, obstetric, and clinical characteristics of study participants receiving intravenous labetalol and oral nifedipine for severe hypertension in pregnancy

Variable	Intravenous Labetalol (n=66)	Oral Nifedipine (n=67)	p-value
	Frequency (%)/Mean±SD		
Age (years)	25.8 ± 4.1	26.3 ± 4.5	0.448
Age group			
≥25 years	37 (56.1%)	40 (59.7%)	0.657
<25 years	29 (43.9%)	27 (40.3%)	
Gravida			
Primigravida	38 (57.6%)	41 (61.2%)	0.698
Multigravida	28 (42.4%)	26 (38.8%)	
Gestational age (weeks)	35.1 ± 2.8	34.8 ± 3.0	0.574
Gestational age			
≥34 weeks	48 (72.7%)	46 (68.7%)	0.691
<34 weeks	18 (27.3%)	21 (31.3%)	
Registered			
No	27 (40.9%)	30 (44.8%)	0.684
Yes	39 (59.1%)	37 (55.2%)	
Residence			
Urban	22 (33.3%)	21 (31.3%)	0.778
Rural	44 (66.7%)	46 (68.7%)	
Systolic BP at admission (mmHg)	172.6 ± 10.4	174.1 ± 11.1	0.492
Diastolic BP at admission (mmHg)	114.8 ± 6.9	115.6 ± 7.3	0.501
Severe preeclampsia	49 (74.2%)	50 (74.6%)	0.996
Gestational hypertension with severe features	11 (16.7%)	10 (14.9%)	0.748
Chronic hypertension with superimposed preeclampsia	6 (9.1%)	7 (10.4%)	0.739

BP: blood pressure.

Oral nifedipine achieved target blood pressure significantly faster compared to intravenous labetalol (31.8 ± 14.7 minutes vs 42.6 ± 16.4 minutes; p<0.001). The mean number of doses required for blood pressure control was also significantly lower in the nifedipine group than the labetalol group (1.9 ± 0.9 vs 2.4 ± 1.1; p=0.006). Successful blood pressure control within 60 minutes was observed in 94.0% of women receiving nifedipine and 89.4% receiving labetalol, although the difference was not statistically significant (p=0.354). Treatment failure occurred in 6.0% of women in the nifedipine group compared to 10.6% in the labetalol group (p=0.344). The mean fall in systolic blood pressure was higher with nifedipine than labetalol (31.9 ± 12.3 mmHg vs 28.7 ± 11.5 mmHg), whereas reduction in diastolic blood pressure was 20.4 ± 8.1 mmHg and 18.2 ± 7.6 mmHg respectively; however, these differences were not statistically significant. Requirement for crossover antihypertensive therapy was lower in the nifedipine group (4.5%) compared to the labetalol group (9.1%), though without significant difference (p=0.289) (Table 2).

Table 2: Comparison of efficacy and blood pressure control between intravenous labetalol and oral nifedipine in severe hypertension during pregnancy

Variable	Intravenous Labetalol (n=66)	Oral Nifedipine (n=67)	p-value
	Frequency (%)/Mean±SD		
Time to achieve target BP (minutes)	42.6 ± 16.4	31.8 ± 14.7	<0.001
Number of doses required	2.4 ± 1.1	1.9 ± 0.9	0.006
Successful BP control within 60 min	59 (89.4%)	63 (94.0%)	0.354
Treatment failure	7 (10.6%)	4 (6.0%)	0.344
Fall in systolic BP (mmHg)	28.7 ± 11.5	31.9 ± 12.3	0.142
Fall in diastolic BP (mmHg)	18.2 ± 7.6	20.4 ± 8.1	0.451
Need for crossover antihypertensive therapy	6 (9.1%)	3 (4.5%)	0.289

BP: blood pressure.

Maternal outcomes were comparable between the two treatment groups. Vaginal delivery occurred in 54.5% of women receiving intravenous labetalol and 50.7% receiving oral nifedipine, whereas caesarean section rates were 45.5% and 49.3% respectively (p=0.626). Progression to eclampsia was noted in 3.0% of women in the labetalol group and 4.5% in the nifedipine group (p=0.645). Placental abruption was observed in 3.0% and 6.0% respectively (p=0.423), while HELLP syndrome developed in 4.5% and 7.5% of patients (p=0.417). Pulmonary edema occurred infrequently in both groups, affecting 1.5% of women receiving labetalol and 3.0% receiving nifedipine (p=0.587). Postpartum hemorrhage occurred in 6.1% and 7.5% of patients respectively (p=0.734). ICU admission was required in 4.5% of women in the labetalol group and 6.0% in the nifedipine group (p=0.547). Mean duration of hospital stay was similar in both groups (5.8 ± 2.1 days vs 5.5 ± 1.9 days; p=0.389). No maternal mortality was recorded in either treatment group (Table 3).

Table 3: Comparison of maternal outcomes among pregnant women treated with intravenous labetalol and oral nifedipine

Maternal Outcome	Intravenous Labetalol (n=66)	Oral Nifedipine (n=67)	p-value
	Frequency (%)/Mean±SD		
Vaginal delivery	36 (54.5%)	34 (50.7%)	0.626
Caesarean section	30 (45.5%)	33 (49.3%)	
Progression to eclampsia	2 (3.0%)	3 (4.5%)	0.645
Placental abruption	2 (3.0%)	4 (6.0%)	0.423
HELLP syndrome	3 (4.5%)	5 (7.5%)	0.417
Pulmonary edema	1 (1.5%)	2 (3.0%)	0.587
Postpartum hemorrhage	4 (6.1%)	5 (7.5%)	0.734
ICU admission	3 (4.5%)	4 (6.0%)	0.547
Duration of hospital stay (days)	5.8 ± 2.1	5.5 ± 1.9	0.389
Maternal mortality	0 (0.0%)	0 (0.0%)	—

ICU: intensive care unit; HELLP: hemolysis, elevated liver enzymes, and low platelet count.

Adverse effect profiles differed significantly between the two antihypertensive regimens. Maternal hypotension occurred more frequently in the nifedipine group compared to the labetalol group (10.4% vs 4.5%), although the difference did not reach statistical significance (p=0.109).

Bradycardia was significantly more common among women receiving intravenous labetalol than oral nifedipine (9.1% vs 1.5%; p=0.048). In contrast, tachycardia was observed significantly more often with nifedipine therapy (14.9% vs 3.0%; p=0.017). Headache, flushing, dizziness, and palpitations were also significantly higher in the nifedipine group, affecting 20.9%, 16.4%, 17.9%, and 11.9% of women respectively, compared to 7.6%, 3.0%, 6.1%, and 1.5% in the labetalol group (p<0.05 for all).

Nausea and vomiting were comparable between the groups (10.6% vs 13.4%; p=0.682). Drug discontinuation due to adverse effects was uncommon and similar in both groups (3.0% vs 4.5%; p=0.665) (Table 4).

Table 4: Comparison of adverse effects associated with intravenous labetalol and oral nifedipine therapy

Adverse Effect	Intravenous Labetalol (n=66)	Oral Nifedipine (n=67)	p-value
	Frequency (%)		
Maternal hypotension	3 (4.5%)	7 (10.4%)	0.109
Bradycardia	6 (9.1%)	1 (1.5%)	0.048
Tachycardia	2 (3.0%)	10 (14.9%)	0.017
Headache	5 (7.6%)	14 (20.9%)	0.028
Flushing	2 (3.0%)	11 (16.4%)	0.009
Nausea/vomiting	7 (10.6%)	9 (13.4%)	0.682
Dizziness	4 (6.1%)	12 (17.9%)	0.036
Palpitations	1 (1.5%)	8 (11.9%)	0.015
Drug discontinuation due to adverse effects	2 (3.0%)	3 (4.5%)	0.665

Fetal and neonatal outcomes were comparable between the two treatment groups. Mean birth weight was 2.31 ± 0.48 kg in the intravenous labetalol group and 2.24 ± 0.51 kg in the oral nifedipine group (p=0.401). Low birth weight neonates (<2.5 kg) were observed in 62.1% and 68.7% of cases respectively (p=0.742). Preterm delivery occurred in 42.4% of women receiving labetalol and 46.3% receiving nifedipine (p=0.865). Fetal distress during labor was reported in 15.2% and 19.4% of cases respectively (p=0.532), while meconium-stained liquor was observed in 12.1% and 16.4% of deliveries (p=0.428). Apgar score <7 at 1 minute was noted in 13.6% of neonates in the labetalol group and 16.4% in the nifedipine group, whereas Apgar score <7 at 5 minutes occurred in 6.1% and 9.0% respectively, with no statistically significant differences. NICU admission rates were comparable between the groups (21.2% vs 26.9%; p=0.844), as were rates of neonatal respiratory distress (12.1% vs 14.9%; p=0.684). Stillbirth or perinatal death occurred infrequently and did not differ significantly between the two groups (3.0% vs 4.5%; p=0.685) (Table 5).

Table 5: Comparison of fetal and neonatal outcomes between intravenous labetalol and oral nifedipine groups

Fetal/Neonatal Outcome	Intravenous Labetalol (n=66)	Oral Nifedipine (n=67)	p-value
	Frequency (%)/Mean±SD		
Birth weight (kg)	2.31 ± 0.48	2.24 ± 0.51	0.401
Low birth weight (<2.5 kg)	41 (62.1%)	46 (68.7%)	0.742
Preterm delivery	28 (42.4%)	31 (46.3%)	0.865
Fetal distress during labor	10 (15.2%)	13 (19.4%)	0.532
Meconium-stained liquor	8 (12.1%)	11 (16.4%)	0.428
Apgar score <7 at 1 min	9 (13.6%)	11 (16.4%)	0.645
Apgar score <7 at 5 min	4 (6.1%)	6 (9.0%)	0.513
NICU admission	14 (21.2%)	18 (26.9%)	0.844
Neonatal respiratory distress	8 (12.1%)	10 (14.9%)	0.684
Stillbirth/perinatal death	2 (3.0%)	3 (4.5%)	0.685

NICU: neonatal intensive care unit.

Discussion

The present randomized comparative study evaluated the efficacy, maternal and fetal outcomes, and adverse effect profiles of intravenous labetalol and oral nifedipine in the management of severe hypertension during pregnancy. The study demonstrated that both drugs were effective in achieving blood pressure control; however, oral nifedipine achieved target blood pressure more rapidly and with fewer doses, while intravenous labetalol was associated with fewer vasodilatory adverse effects.

Baseline demographic and obstetric characteristics were comparable between the two groups, indicating successful randomization. The mean maternal age was 25.8 ± 4.1 years in the labetalol group and 26.3 ± 4.5 years in the nifedipine group, with most women being primigravida and presenting beyond 34 weeks of gestation. Similar demographic patterns have been reported in studies by Thalamati et al., and Chawla et al., where severe preeclampsia predominantly affected young primigravid women in the third trimester [13,14]. The predominance of rural and unregistered patients in the present study reflects the continued burden of inadequate antenatal care in developing regions [14]. A major finding of this study was the significantly shorter time required to achieve target blood pressure with oral nifedipine compared to

intravenous labetalol (31.8 ± 14.7 vs 42.6 ± 16.4 minutes; p<0.001). Additionally, fewer doses were required with nifedipine (1.9 ± 0.9 vs 2.4 ± 1.1; p=0.006). These observations are consistent with studies by Zulfeen et al., and Kaur et al., who also reported faster blood pressure control with nifedipine [15,16]. The rapid action of nifedipine may be attributed to its potent calcium channel blocking effect causing peripheral arteriolar vasodilation and rapid reduction in systemic vascular resistance [17]. Oral administration also avoids delays associated with intravenous preparation and dose escalation required for labetalol [18].

Despite the faster onset with nifedipine, both drugs showed high efficacy in achieving blood pressure control within 60 minutes, with success rates of 94.0% in the nifedipine group and 89.4% in the labetalol group. Treatment failure and crossover therapy requirements were slightly higher with labetalol but without statistical significance [19]. Similar efficacy rates have been reported in previous meta-analyses by Li et al., and Wu et al., supporting the role of both agents as effective first-line therapies for severe hypertension in pregnancy [20,21].

Maternal outcomes including mode of delivery, progression to eclampsia, placental abruption, HELLP syndrome, pulmonary edema, postpartum hemorrhage, ICU admission, and duration of hospital stay were comparable between the two groups. No maternal mortality occurred in either group. These findings correlate with studies by Shah et al., and Booker et al., where timely blood pressure control with either antihypertensive agent significantly reduced severe maternal complications [22,23]. Effective antihypertensive therapy decreases cerebral hyperperfusion and endothelial damage, thereby lowering the risk of neurological and systemic complications associated with severe preeclampsia [24]. The adverse effect profile differed significantly between the two drugs. Bradycardia was significantly more common with intravenous labetalol (9.1% vs 1.5%; p=0.048), likely due to β-adrenergic blockade reducing heart rate. In contrast, tachycardia, headache, flushing, dizziness, and palpitations were significantly more frequent with nifedipine. These findings are pharmacologically expected because peripheral vasodilation caused by nifedipine may trigger reflex sympathetic stimulation [25]. Similar adverse effect patterns have been reported in previous comparative studies by Shahnaz et al., andKumari et al, [26,27]. However, most adverse effects in both groups were mild and self-limiting, and drug discontinuation was uncommon [26,27].

Fetal and neonatal outcomes were comparable between the two treatment groups. Mean birth weight, rates of low birth weight, preterm delivery, fetal distress, low Apgar scores, NICU admission, neonatal respiratory distress, and perinatal mortality did not differ significantly. Similar neonatal outcomes have been reported in studies comparing labetalol and nifedipine, indicating that both drugs maintain adequate uteroplacental perfusion while controlling maternal blood pressure [28]. The high incidence of low birth weight and preterm delivery observed in both groups is likely related to the underlying severity of hypertensive disease rather than the antihypertensive therapy itself [29,30].

Limitations: The present study was conducted at a single tertiary care center with a relatively modest sample size, which may limit generalizability of the findings. Long-term maternal cardiovascular outcomes and neonatal follow-up after discharge were not assessed. Blinding was not feasible due to differences in route of drug administration, which could have introduced observer bias. Additionally, variations in disease severity and timing of delivery may have influenced maternal and neonatal outcomes.

Conclusion

Both intravenous labetalol and oral nifedipine were effective and safe in the management of severe hypertension during pregnancy. Oral nifedipine achieved target blood pressure significantly faster and required fewer doses compared to intravenous labetalol. Maternal and fetal outcomes were comparable between the two groups, with no significant differences in serious complications or perinatal outcomes.

However, nifedipine was associated with higher incidence of vasodilatory adverse effects such as tachycardia, headache, flushing, and palpitations, whereas labetalol showed higher frequency of bradycardia. Considering its rapid action, ease of administration, and effectiveness, oral nifedipine may be particularly beneficial in resource-limited settings.

References

1. Khedagi AM, Bello NA. Hypertensive Disorders of Pregnancy. Cardiol Clin. 2021;39(1):77-90.
2. Vera-Ponce VJ, Loayza-Castro JA, Ballena-Caicedo J, et al. Global prevalence of preeclampsia, eclampsia, and HELLP syndrome: a systematic review and meta-analysis. Front Reprod Health. 2025;7:1706009.
3. Fox R, Kitt J, Leeson P, Aye CYL, Lewandowski AJ. Preeclampsia: Risk Factors, Diagnosis, Management, and the Cardiovascular Impact on the Offspring. J Clin Med. 2019;8(10):1625.

4. Di Martino DD, Avagliano L, Ferrazzi E, et al. Hypertensive Disorders of Pregnancy and Fetal Growth Restriction: Clinical Characteristics and Placental Lesions and Possible Preventive Nutritional Targets. Nutrients. 2022;14(16):3276.
5. Guida JPS, Surita FG, Parpinelli MA, Costa ML. Preterm Preeclampsia and Timing of Delivery: A Systematic Literature Review. Rev Bras Ginecol Obstet. 2017;39(11):622-631.
6. Kernaghan D, Duncan AC, McKay GA. Hypertension in pregnancy: a review of therapeutic options. Obstet Med. 2012;5(2):44-49.
7. Martinez A, Lakkimsetti M, Maharjan S, et al. Beta-Blockers and Their Current Role in Maternal and Neonatal Health: A Narrative Review of the Literature. Cureus. 2023;15(8):e44043.
8. Katsi V, Papakonstantinou IP, Papazachou O, Makris T, Tsioufis K. Beta-Blockers in Pregnancy: Clinical Update. Curr Hypertens Rep. 2023;25(2):13-24.
9. MotherToBaby | Fact Sheets. Brentwood (TN): Organization of Teratology Information Specialists (OTIS); 1994. Nifedipine (Procardia®) 2024.
10. Brown CM, Garovic VD. Drug treatment of hypertension in pregnancy. Drugs. 2014;74(3):283-296.
11. Agarwal M, Rukshana M, Basu R, Shullai WK, Singh SA. Comparison of the efficacy of intravenous labetalol versus oral nifedipine in patients with severe pregnancy-induced hypertension beyond 30 weeks of gestation. J Family Med Prim Care. 2023;12(12):3119-3122.
12. Sahai R, Nidhi A, Ranjan R, Lal S. Comparative study of oral nifedipine versus intravenous labetalol in severe hypertension in pregnancy: A randomized controlled study. Indian J Obstet Gynecol Res. 2020;7(1):75-80.
13. Thalamati S, Bandaru S, Bhumireddy D. Assessment of safety and efficacy of oral nifedipine and intravenous labetalol in management of increased blood pressure in severe preeclampsia. Int J Reprod Contracept Obstet Gynecol. 2018;7:2645-2649.
14. Chawla D, Khatri R, Minal, Nayyer PS. A comparative study of intravenous labetalol versus oral nifedipine in severe hypertension in pregnancy in a tertiary hospital. J Dent Med Sci. 2018;17(3):56-59.
15. Zulfeen M, Tatapudi R, Sowjanya R. IV labetalol and oral nifedipine in acute control of severe hypertension in pregnancy-A randomized controlled trial. Eur J Obstet Gynecol Reprod Biol. 2019;236:46-52.
16. Kaur T, Kumari K, Rai P, et al. A Comparative Study of Oral Nifedipine and Intravenous Labetalol for Acute Hypertensive Management in Pregnancy: Assessing Feto-Maternal Outcomes in a Hospital-based Randomized Control Trial. Int J MCH AIDS. 2024;13:e011.
17. Sridharan K, Sequeira RP. Drugs for treating severe hypertension in pregnancy: a network meta- analysis and trial sequential analysis of randomized clinical trials. Br J Clin Pharmacol. 2018;84(9):1906-1916.
18. Shekhar S, Gupta N, Kirubakaran R, Pareek P. Oral nifedipine versus intravenous labetalol for severe hypertension during pregnancy: a systematic review and meta-analysis. BJOG. 2016;123:40-47.
19. Easterling T, Mundle S, Bracken H, et al. Oral antihypertensive regimens (nifedipine retard, labetalol, and methyldopa) for management of severe hypertension in pregnancy: an open-label, randomised controlled trial. Lancet. 2019;394(10203):1011-1021.
20. Li L, Xie W, Xu H, Cao L. Oral nifedipine versus intravenous labetalol for hypertensive emergencies during pregnancy: a systematic review and meta-analysis. J Matern Fetal Neonatal Med. 2023;36(2):2235057.
21. Wu HZ, Cheng Y, Yu D, Li JB, Jiang YF, Zhu ZN. Different dosage regimens of nifedipine, labetalol, and hydralazine for the treatment of severe hypertension during pregnancy: a network meta-analysis of randomized controlled trials. Hypertens Pregnancy. 2022;41(2):126-138.
22. Shah MS, Verma M, Kumar S, Jivani H. Effectiveness of Oral Nifedipine Versus Intravenous Labetalol in Controlling Hypertension in Severe Preeclampsia: A Comparative Study. Cureus. 2025;17(6):e85899.
23. Booker WA, Bejerano S, Frappaolo A, Miller EC, Bello NA. Short-Acting Oral Nifedipine versus Intravenous Labetalol for the Control of Severe Hypertension in the Postpartum Period: A Retrospective Cohort Study. Am J Perinatol. 2025;42(6):806-812.
24. Wasim T, Agha S, Saeed K, Riaz A. Oral Nifidepine versus IV labetalol in severe preeclampsia: A randomized control trial. Pak J Med Sci. 2020;36(6):1147-1152.
25. Singh A, Singh MP, Thakur P, Khasbage SU, Yadav R. Efficacy of pharmacological agents for management of post-partum hypertension: A systematic review and network meta-analysis. J Hum Hypertens. 2026;40(3):147-157.
26. Kumari A, Sinha A. Comparative study of efficacy and safety of oral nifedipine and intravenous labetalol for hypertensive emergencies in pregnancy. Int J Pharm Clin Res. 2024;16:1170–1174.

27. Shahnaz I, Ali E, Das S, Ul Hoque I. A comparative study on efficacy of intravenous labetalol and oral nifedipine for control of blood pressure in severe pre-eclampsia in a tertiary care hospital. Int J Acad Med Pharm. 2024;6(4);945-951.
28. Shi DD, Yang FZ, Zhou L, Wang N. Oral nifedipine vs. intravenous labetalol for treatment of pregnancy-induced severe pre-eclampsia. J Clin Pharm Ther. 2016;41(6):657-661.
29. Deng NJ, Xian-Yu CY, Han RZ, et al. Pharmaceutical administration for severe hypertension during pregnancy: Network meta-analysis. Front Pharmacol. 2023;13:1092501.
30. Ma S, Zhu L, Zhou T, Qi T, Wang W. Oral nifedipine and phytosterol, intravenous nicardipine, and oral nifedipine only: Three-arm, retrospective, cohort study for management of severe preeclampsia. Open Life Sci. 2023;18(1):20220581.