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Comparison between Oral Nifedipine and Intravenous Labetalol in Managing Severe Preeclampsia

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ABSTRACT

Hypertensive disorders contribute to significant maternal morbidity and mortality in pregnancy. Immediate treatment is required to avoid serious complications. **Objectives:** To compare the mean time taken to achieve the target BP with oral nifedipine versus intravenous labetalol in patients with severe preeclampsia. **Methods:** This quasi-experimental study was conducted at Lady Willington Hospital, Lahore, over six months after taking approval from CPSP, involving 100 patients diagnosed with severe preeclampsia. Participants were divided into two equal groups: Group oral nifedipine and IV labetalol.Study outcome time taken to reach target BP <140/90 mmHg was compared among groups using an independent sample test, with a p-value≤ 0.05 as significant. **Results:** Target BP was achieved earlier at 43.96 ± 5.93 minutes with oral nifedipine compared to IV labetalol at 48.60 ± 6.80 minutes (p<0.001). **Conclusions:** It was concluded that the findings strongly support the use of nifedipine as a more effective option for rapidly lowering blood pressure compared to labetalol. Its faster onset of action makes it the preferred choice for achieving timely blood pressure control in patients with severe preeclampsia.

INTRODUCTION

Preeclampsia is a significant pregnancy-related complication, characterized by high blood pressure and proteinuria developing in previously normotensive women [1]. It complicates about 5-7% of first-time pregnancies and 1-3% of subsequent pregnancies, posing severe risks to both maternal and fetal health [2]. A review conducted between 1969 and 2019, encompassing data from 30 countries, found 291,247 cases of preeclampsia, prevalence of preeclampsia/eclampsia (PE/E) noted as 6.7%. This highlights the worldwide burden of PE/E over five decades and emphasizes the need for continued monitoring and intervention strategies targeting this high-risk population [3]. Severe hypertension is a frequent complication in pregnancy-associated hypertensive disorders, and there is no clear consensus on the preferred first-line antihypertensive drug for emergency use [4]. Blood pressure ≥160/110 mmHg, requires prompt intervention to prevent severe maternal complications of preeclampsia such as hypertensive encephalopathy, cerebrovascular accidents, and eclampsia and neonatal complications including intrauterine growth retardation, prematurity, and death [5]. Among the various

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antihypertensive agents available, oral nifedipine, labetalol, and hydralazine are commonly recommended for the management of severe hypertension in pregnancy [6]. Both nifedipine and labetalol are FDA-approved for managing hypertension in pregnancy. Despite nifedipine being cost-effective and easy to administer, healthcare providers often prefer labetalol, although this preference is not consistently supported by robust evidence [7, 8]. In terms of adverse reactions, nifedipine may cause reflex tachycardia, headache, and flushing, while labetalol is more commonly associated with bradycardia, fatigue, and potential fetal growth concerns when used long-term. Both drugs are generally well tolerated in acute settings and are considered safe in pregnancy when used appropriately. Some clinical trials, particularly in low- and middle-income countries, have shown that oral nifedipine lowers blood pressure more rapidly and effectively than labetalol [9]. Conversely, studies from high-income settings suggest there is no significant difference in efficacy or safety profiles between the two agents [10]. This variability in results across different healthcare systems, resource availability, and patient populations explains the absence of a clear global consensus on the preferred first-line agent. Therefore, more context-specific research is essential to establish definitive guidelines that are adaptable across varying clinical environments.

This study aims to address this gap by comparing the effectiveness of oral nifedipine and IV labetalol in achieving target BP in women with severe preeclampsia. This provides valuable insights into the optimal management of severe preeclampsia, potentially influencing clinical practice and guidelines. By determining the more effective and safer option between the two drugs, healthcare providers can make informed decisions that enhance maternal and fetal outcomes, especially in resource-limited settings where cost and ease of administration are critical considerations.

METHODS

This quasi-experimental study was conducted at Lady Willington Hospital, Lahore, from August 2021 to February 2022 after taking approval from CPSP (REU No: 40385). 100 participants, 50 cases in each group, were determined based on a 95% confidence level and 80% power of the test. This determination considered the mean time required to achieve the target BP (40 ± 10 minutes for oral nifedipine and 60 ± 11.25 minutes for intravenous labetalol) [11]. Non-probability consecutive sampling method was utilized for this study. Participants were chosen based on specified selection criteria.The inclusion criteria consisted of females with severe preeclampsia (BP≥160/110 mmHg with proteinuria >+1 on dipstick method), aged 20-40 years, with parity less than 5, gestational age over 24 weeks determined by LMP or dating scan. Exclusion criteria included females with chronic hypertension, eclampsia (BP ≥160/110 mmHg with convulsions), diabetes (random BSL ≥186 mg/dl), abnormal placenta conditions (as determined on ultrasound), multiple pregnancies, those who had taken antihypertensive treatment within past 24 hours, and those with unsuccessful medical management as noted in medical records. One hundred females meeting the selection criteria were recruited from the Emergency Obstetrics and Gynaecology Department of Lady Willington Hospital, Lahore. Informed consent was obtained from all participants. Demographic information was recorded. Participants were assigned to two groups using the lottery method. Nifedipine Group, in which females received 10 mg oral nifedipine up to 5 doses repeated every 30 minutes and Labetalol Group, in which females received IV labetalol injection up to 5 doses in an escalating dose regimen of 20 mg, 40 mg, 80 mg, 80 mg, and 80 mg repeated every 30 minutes. This is by ACOG guidelines; a slight modification was made in labetalol, repeated every 30 minutes instead of 20 minutes. [10] All female was monitored in Gynaecology wards until the target BP (<140/90mmHg) was achieved, and the time between administration of the first dose and to time when the target BP was achieved was noted in minutes, and also several doses required to achieve the target BP was noted. This information was collected using a pre-designed proforma. Analysis was done using SPSS version 26. Normality of the quantitative data was assessed using the Shapiro-Wilk test. Mean and standard deviation were calculated for quantitative variables, and frequency/percentage for qualitative variables. Outcome was compared among groups using an independent samples t-test, considering p-value ≤0.05 as significant.

RESULTS

The mean age of participants was comparable between the Nifedipine group (25.3 ± 4.8 years) and the Labetalol group (24.9 ± 4.3 years, p=0.661). Parity was also similar between groups (p=0.511). Regarding residence, 46% of patients in the Nifedipine group and 48% in the Labetalol group were from rural areas, whereas 54% in the Nifedipine group and 26% in the Labetalol group were from urban areas. Mean gestational age was 37.3 ± 3.4 weeks and 37.4 ± 3.1 weeks in Nifedipine and Labetalol groups, respectively (p=0.878) and mean BMI was 28.5 ± 5.4kg/m2 and 27.6 ± 5.4kg/m2, respectively (p=0.406). Baseline systolic BP was 180.40 ± 5.48 mmHg in the Nifedipine group and 182.30 ± 6.43 mmHg in the Labetalol group (p=0.115), while diastolic BP was 116.80 ± 5.92 mmHg and 115.60 ± 7.33 mmHg, respectively (p=0.370)(Table 1).

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Table 1: Demographics and Baseline Characteristics

Characteristics		Nifedipine Group (n=50)	Labetalol Group (n=50)	p-Value
Age	Years	25.3 ± 4.8	24.9 ± 4.3	0.661
Parity	–	1.7 ± 0.94	1.6 ± 0.52	0.511
Residence	Rural (%)	23 (46%)	24 (48%)	–
	Urban (%)	27 (54%)	52 (26%)	–
Gestational Age	–	37.3 ± 3.4	37.4 ± 3.1	0.878
BMI	–	28.5 ± 5.4	27.6 ± 5.4	0.406
Baseline BP (mmHg)	Systolic	180.40 ± 5.48	182.30 ± 6.43	0.115
	Diastolic	116.80 ± 5.92	115.60 ± 7.33	0.370

Patients in the oral nifedipine group have achieved the target BP in 43.96 ± 5.93 minutes, compared to 48.67 ± 6.8 minutes in IV labetalol group (p<0.001). Mean doses required to achieve target BP were also less for the nifedipine group as compared to the labetalol group, 2.20 ± 1.24 and 2.75 ± 1.43, p=0.04, and this difference was statistically significant (Table 2).

Table 2: Comparison of Study Outcome

Outcomes	Nifedipine Group (n=50)	Labetalol Group (n=50)	p-Value
Time Taken to Achieve Target BP (Minutes)	43.96 ± 5.93	48.67 ± 6.80	<0.001
Doses Required to Achieve the Target BP	2.20 ± 1.24	2.75 ± 1.43	0.04

DISCUSSION

Hypertensive emergencies in pregnancy require prompt and effective management to prevent feto-maternal complications. Antihypertensive agents are commonly used to achieve rapid blood pressure control, each with varying efficacy and time to reach target levels [12]. The choice of medication depends on factors such as onset of action, safety profile, and clinical response, making it essential to evaluate their comparative effectiveness in different settings [13]. Current study found that average time to reach target BP of <140/90 mmHg was less for nifedipine 43.96 ± 5.93 minutes for and 48.67 ± 6.80 minutes for labetalol, (p<0.001) and mean doses required to achieve target BP was also less for nifedipine group as compared to labetalol group, p=0.04. These findings align with Li *et al.*, where the time taken to achieve target BP was significantly less with nepidipine than IV labetalol [14]. Sahai *et al.*, also reported similar findings. However, the mean time taken by nifedipine in their study was shorter than the current observation (34.67 minutes), while the time taken by labetalol was longer (52.00 minutes), p<0.001 [15]. In contrast, Kaur *et al.*, found that IV labetalol is more effective in terms of achieving target BP in less time as compared to nefidipine (48.67 ± 17.80 minutes' vs 64.33 ± 9.81, p<0.001) [16]. Furthermore, Nivethana *et al.*, found both drugs safe, but IV labetalol has taken less time in lowering BP [17]. Upendra *et al.*, however, concluded that both drugs are equally effective in lowering BP [18]. A trial conducted in 2022 found that the effectiveness of nifedipine, labetalol, and hydralazine in achieving a 20% reduction in MAP varied with dosage [19]. In contrast, a locally conducted trial by Wasim *et al.*, found both drugs equally effective in terms of achieving the target BP and several doses required to achieve that [20]. One meta-analysis recommends nifedipine as the preferred strategy for BP management in pregnant women with severe hypertension. While labetalol and hydralazine remain conventional treatment options, their efficacy appears more limited and also stated that clinicians should be mindful of hydralazine's inconsistent blood pressure-lowering effects and need for higher doses of labetalol to achieve optimal benefits [21].

CONCLUSIONS

It was concluded that the findings strongly support the use of nifedipine as more effective option for rapidly lowering blood pressure compared to labetalol. Its faster onset of action makes it preferred choice for achieving timely BP control in patients with severe preeclampsia.

Authors Contribution

Conceptualization: AS[1]
Methodology: AS[1], AS[2], NS, FB, HR, HZ
Formal analysis: AS[1]
Writing review and editing: NS, FB

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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