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COMPARISON OF INTRAVENOUS LABETALOL AND ORAL NIFEDIPINE IN ACUTE CONTROL OF SEVERE HYPERTENSION PREGNANCY

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ABSTRACT

Background Globally, hypertensive diseases account for 14% of maternal fatalities. The risk of maternal death increases when blood pressure is more than 160/110 mmHg. **Method** This prospective, randomized clinical trial was carried out with participation from the JJM Medical College, Bapuji Hospital, Chigateri General Hospital, and Women and Child Health Hospital, all of which are connected with Davanagere. **Result** This study contained 100 cases in total; the subjects were split into two groups according to the medications they received. Patients in groups A (labetalol) and B (nifedipine) had average ages of 24.47 and 23.07 years, respectively. 46% of the women in the labetalol group were primigravida, and 54% were multigravida; 38% of the women in the nifedipine group were primigravida, and 62% were multigravida. The average number of doses required to reach the desired blood pressure was 2.86 with labetalol and 1.66 with nifedipine. **Conclusion** According to our findings, oral nifedipine is a better option—especially in low-resource settings—than intravenous labetalol for treating acute severe hypertension in pregnancy. It is also more cost-effective.

KEYWORDS :

INTRODUCTION

Pregnancy-related hypertension is the most prevalent medical condition and is said to complicate up to 1 in 10 pregnancies.[1] One of the most prevalent medical conditions during pregnancy is hypertension. Acute blood pressure (BP) management during hypertensive crisis in pregnancy has been achieved using a variety of medications. Long-term preferred medication was hydralazine, however a meta-analysis of clinical studies revealed concerning maternal and fetal adverse effects with its usage.[2] The primary challenge with high blood pressure (BP) is that it might have detrimental consequences on both the mother and the fetus. The belief in hydralazine has decreased despite the Cochrane review listed it as a first-line alternative with two other medications for immediate reduction of BP during hypertensive crises in pregnancy. Additionally, hydralazine is unavailable in many regions of the world due to a lack of production.[3]

Despite the fact that one of the severe characteristics of preeclampsia is systolic blood pressure (BP) of 160 mm Hg or diastolic BP 110 mm Hg, according to the American Congress of Obstetricians and Gynecologists (ACOG). Preferably, blood pressure measurements should be obtained twice, with at least a 4-hour gap between each. However, a diagnosis can be established in a shorter amount of time (even minutes), allowing for prompt antihypertensive medication. Considering the fact that preeclamptic women have a higher risk of morbidity and death when their blood pressure is elevated. Use of antihypertensive medicine is advised by the ACOG Task Force to reduce severe hypertension in preeclamptic women during pregnancy.[4]

Antihypertensive medication use during pregnancy can lower the risk of developing severe hypertension, but further study is required to determine the best beneficial medication.[5] It is necessary to compare the effectiveness, safety, and speed of action of intravenous Labetalol with oral Nifedipine in the treatment of severe hypertension in pregnancy. In this high-risk situation, knowing the best treatment option is essential for the welfare of the mother and the fetus.

METHODOLOGY

The JJM Medical College, Davanagere-affiliated facilities Bapuji Hospital, Chigateri General Hospital, and Women and Child Health Hospital all participated in the conduct of this prospective, randomized clinical study. These medical centers offered a varied and representative sample of expectant patients, which improved the generalizability of our study.

Sample size

A total sample size of 100 patients was our goal, with a minimum of 50 patients in each therapy group. Based on statistical considerations, the sample size was chosen to be sufficiently powered to detect significant differences between intravenous Labetalol and oral Nifedipine in the treatment of severe hypertension during pregnancy.

Study Plan

We used a prospective, randomized clinical trial design. Due to the fact that it reduces bias and offers solid evidence for clinical decision-making, this design is regarded as the gold standard for assessing the effectiveness of medical therapies. In order to ensure that each patient had an equal chance of being assigned to either the Labetalol or Nifedipine therapy groups, randomization was used to divide patients into those groups. The study's internal validity was further increased by the use of computer-generated random numbers in the randomization process.

All patients, regardless of their group assignment, will receive preventive magnesium sulphate medication in light of the severity of preeclampsia, further guaranteeing their safety during the research.

Patients who were randomly assigned to the intravenous Labetalol group would have a starting dosage of 20 mg, then five doses of 40 mg, 80 mg, 80 mg, and 80 mg every 15 minutes, up to a maximum dose of 300 mg. Patients will switch to oral Labetalol medication when the goal blood pressure has been reached and start it after a 2-hour break.

Patients who were randomly assigned to the immediate release oral Nifedipine group, on the other hand, would take five doses, reaching a maximum of 90 mg, starting with a 10 mg dosage and increasing by 20 mg each time after 15 minutes. These patients will switch to oral Nifedipine sustained-release tablets (10 mg) as soon as their blood pressure reaches the target level.

Patients using nifedipine will continue a constant intravenous fluid (IVF) regimen, acting as prophylaxis against unexpected hypotensive episodes, to protect their stability and wellbeing. This stringent procedure and meticulous drug administration are meant to provide a thorough assessment of the various treatment methods and guarantee the security and comfort of the research participants.

Duration of Study

The study's 15-month length allowed for an appropriate follow-up period to evaluate the results and any potential side effects linked to the two treatment regimens. This time frame was carefully chosen to provide a thorough assessment of the study's goals.

Inclusion criteria

To ensure homogeneity among the research population, patients enrolled in the study had to meet certain requirements. A systolic blood pressure of 160 mmHg or higher and/or a diastolic blood pressure of 110 mmHg or more on two separate occasions, each one 30 minutes apart, with measurements taken in the lateral recumbent position were considered to be severe hypertension and met the inclusion criteria. Additionally, to be eligible for the trial, patients had to have maternal heart rates (HR) that fell between 60 and 120 beats per minute. This inclusion criterion made sure that the patients' blood pressure increase was limited to pregnancy-related hypertension and that they were hemodynamically stable. Their fetal heart rate, which shows the health of the fetus, also needed to be comforting.

Exclusion criteria

Exclusion criteria were created in order to preserve the validity of the study. Patients were not allowed to participate since it was optional if they did not give their informed permission. Additionally omitted were those who had recently taken antihypertensive drugs since doing so could have tainted the findings. People whose heart rates fell outside of the range of 50 to 120 beats per minute were not included because they potentially have serious underlying cardiac problems or unstable cardiovascular conditions. To isolate the effect of hypertension and avoid confounding factors, patients with pre-existing heart illnesses, asthma, hematological disorders, liver disorders, or any drug-related allergies were eliminated. To make sure the study concentrated on acute hypertensive episodes during pregnancy, chronic hypertension was an exclusion criterion.

Statistical analysis

SPSS 20 was used to analysis the data that was gathered. For both quantitative and qualitative variables, descriptive statistics (mean, standard deviation, frequency, and proportions) were calculated. Chi-square examined relationships between qualitative variables, while Repeated Measures ANOVA examined how two groups' blood pressure changed over time. The mean difference in time for blood pressure to drop between the groups was calculated using an unpaired t-test. All statistical tests were run with a significance level of 5%, confirming the accuracy of the results.

RESULT

This research compared the effectiveness of oral nifedipine and intravenous labetalol in regulating blood pressure in pregnant women with acute hypertensive crises. It was carried out at the JJM Medical College at Davangere's Chigateri General Hospital and Women and Child Health Hospital. Total 100 cases were included in this study; they were divided in to two group based on drugs they were given. The average age of the patients in groups A (labetalol) and B (nifedipine) was 24.47 years and 23.07 years, respectively. In the group using labetalol, 46% of women were primigravida and 54% were multigravida; in the group taking nifedipine, 38% of women were primi and 62% were multigravida. (table 01) The table 2 illustrates the comparison between IV Labetalol and Oral Nifedipine concerning urine albumin, total required dose to achieve target blood pressure, time taken to achieve target BP, and maternal adverse effects in 100 participants. There were no significant differences observed between the two groups in terms of urine albumin or adverse effects ($p > 0.05$). However, significant differences were noted in the total required dose and time taken to achieve target BP ($p < 0.05$), with Oral Nifedipine requiring fewer doses and shorter time intervals. The table 3 presents blood pressure (BP) measurements at different time intervals for Oral Nifedipine and IV Labetalol administrations among 50 participants. Both drugs significantly reduced systolic and diastolic blood pressure ($p < 0.001$) over 30 minutes, with IV Labetalol showing slightly higher reductions compared to Oral Nifedipine. The table 4 compares the mean administration of IV labetalol and oral nifedipine across 50 patients. IV Labetalol showed a significantly higher mean usage (35.70) than oral Nifedipine (24.90), with a mean difference of 10.800 ($p = 0.001$), suggesting a preference for IV Labetalol in the studied population.

DISCUSSION

Five to ten percent of pregnancies result in hypertension, the most frequent cardiovascular disease during pregnancy that has a negative impact on both mother and child's mortality and morbidity.[10] In this comparison research, the effectiveness of regulating blood pressure during hypertensive crisis with intravenous labetalol and oral nifedipine was evaluated. Side effects on mothers were also evaluated. .

The mean age of the patients in groups A (labetalol) and B (nifedipine) was 24.47 years and 23.07 years, respectively. The findings are close to those of Dhali et al.[6] and Shekar et al.[7], in which the mean age of distribution for labetalol and nifedipine was 24.3 years and 23.7 years, respectively; for Shekar et al.[7], it was 25.9 years and 26.2 years; and for Vermillion et al.[8], it was 27.0 years and 27.2 years.

In the labetalol group, the gravidity distribution revealed that 46% of women were primigravida and 54% were multigravida, while in the nifedipine group, 38% of women were primi and 62% were multigravida. The percentage of primigravida in the study by Shekar et al.[7] was 70% in the labetalol group and 73% in the nifedipine group, respectively.

The difference in mean gestational age between the nifedipine and labetalol groups at presentation—36.8 weeks vs 37.3 weeks—was not statistically significant. The mean age of distribution for labetalol and nifedipine in the research by Shekar et al.[7] was 36.1 weeks and 37.3 weeks, respectively.

In the research by Vermillion et al.[8], the mean gestational age

was 33.6 weeks for the labetalol group and 34.3 weeks for the nifedipine group. The gestational ages of distribution in Raheem et al.'s study were 37.9 and 37.1 weeks, respectively.

In this research, 79% of the participants had proteinuria. Proteinuria affected 72% of the women in the labetalol group and 86% of the women in the nifedipine group. Most patients in both groups of patients had urine albumin values of 3 or 4.

The average blood pressure readings for the labetalol and nifedipine groups were respectively 175.88 mm Hg and 117.28 mm Hg and 182.24 mm Hg and 119.40 mm Hg. In comparison to labetalol, nifedipine required an average of 1.66 doses to reach the desired blood pressure. Vermillion et al.[8] required a mean of 2.5 1.5 doses of labetalol and 1.5 0.5 doses of nifedipine. This is comparable to the number of doses needed. The average number of doses needed in the labetalol group and the nifedipine group in both investigations by Raheem et al.[9] and Shekar et al.[7] was 3. According to the Vermillion et al.[8] study, both medications had a 100% success rate. In treating hypertension, IV labetalol takes an average of 35.7 seconds and 15.42 seconds of standard deviation. And the duration of oral nifedipine is 24.9 seconds, with an SD of 10.326 and a significant p value of 0.001.

CONCLUSION

Our research suggests that oral Nifedipine is a more effective and affordable alternative to intravenous Labetalol for treating acute severe hypertension in pregnancy, making it the better option, especially in low-resource settings.

DECLARATIONS

Funding: NIL

Conflict of interest: None

Ethical approval: Yes

Table 1 Demographic and clinical status of study participants

Age group (in years)	Drug		Total	P value
	IV Labetalol	Oral Nifedipine		
20 – 24	26 (52%)	30(60%)	56(56%)	0.689
25 – 29	17 (34%)	15(30%)	32(32%)	
30 – 34	7 (14%)	5 (10%)	12 (12%)	
Total	50 (100%)	50(100%)	100(100%)	
Gravida				
Multi	27 (54%)	31 (62%)	58(58%)	0.418
Primi	23 (46%)	19 (38%)	42(42%)	
Total	50 (100%)	50(100%)	100 (100%)	
Clinical variables				
ANC Visit	2 (4%)	0 (0%)	2 (2%)	
Blurring of vision	0 (0%)	2 (4%)	2(2%)	0.81
Blood pressure readings	12(24%)	16(32%)	28 (28%)	
Fetal movements	2 (4%)	2 (4%)	4 (4%)	
Headache	3 (6%)	3 (6%)	6 (6%)	
Labour pains	14(28%)	12(24%)	26(26%)	
Per Vaginal leaking	3 (6%)	5(10%)	8(8%)	
Pain in Abdomen	11 (22%)	4 (8%)	15(15%)	
Pedal edema	3 (6%)	2(4%)	5(5%)	
Vomiting	0 (0%)	4 (8%)	4(4%)	
Total	50 (100%)	50(100%)	100(100%)	

Table 2: Comparison of IV Labetalol and Oral Nifedipine in Hypertensive Pregnant Women

Urine albumin (mg/g)	Drug		Total	P value
	IV Labetalol	Oral Nifedipine		
1+	8 (16%)	4(8%)	12(12%)	0.365
2+	19(38%)	25(50%)	44(44%)	
3+	17(34%)	18(36%)	35(35%)	
Nil	6(12%)	3(6%)	9(9%)	
Total	50(100%)	50(100%)	100(100%)	
Total required dose to achieve blood pressure				
1	9(18%)	22(44%)	31(31%)	0.002
2	21(42%)	24(48%)	45(45%)	
3	14(28%)	3(6%)	17(17%)	
4	5(10%)	1(2%)	6(6%)	
5	1(2%)	0(0%)	1(1%)	
Total	50(100%)	50(100%)	100(100%)	
Time taken to achieve Target BP (minute)				
15	9(18%)	22(44%)	31(31%)	0.002
30	21(42%)	24(48%)	45(45%)	
45	14(28%)	3(6%)	17(17%)	
60	5(10%)	1(2%)	6(6%)	
90	1(2%)	0(0%)	1(1%)	
Total	50(100%)	50(100%)	100(100%	
Maternal Adverse effects				
Nil	49(98%)	47(94%)	96(96%)	0.257
Crossover	1(2%)	0(0%)	1(1%)	
Hypotension	0(0%)	2(4%)	2(2%)	
Tachycardia	0(0%)	1(2%)	1(1%)	
Total	50(100%)	50(100%)	100(100%)	

Table 3 Association between Oral Nifedipine and IV Labetalol and Blood pressure time intervals

Oral Nifidipine						
BP	Time interval	Mean	Std. Dev	N	F value*	p value
SBP	Admission	182.24	15.304	50	155.951	0.001
	15 min	158.80	14.377	50		
	30 min	146.00	11.780	50		
DBP	Admission	119.40	7.163	50	186.258	0.001
	15 min	103.00	8.303	50		
	30 min	94.04	8.547	50		
IV Labetalol						
BP	Time interval	Mean	Std. Dev	N	F value*	p value
SBP	Admission	175.88	13.519	50	145.93	0.001
	15 min	164.48	13.184	50		
	30 min	150.20	7.690	50		
DBP	Admission	117.28	7.225	50	69.143	0.001
	15 min	108.32	12.824	50		
	30 min	99.64	8.017	50		

BP – blood pressure
SBP – systolic blood pressure
DBP – diastolic blood pressure

Table 4 Comparison of Mean time taken to reach target BP in two drug groups.

DRUGS	N	Mean	Std. Dev	Mean difference	p value*
IV labetalol	50	35.70	15.420	10.800	0.001
Oral Nifedipine	50	24.90	10.326		

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