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Original Research Article

Interventions required and outcome in pregnancy induced hypertension patients in Intensive Care Unit: An observational study

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ABSTRACT

Background: Hypertensive disorders of pregnancy, particularly preeclampsia, eclampsia remain one of the leading causes of maternal morbidity and mortality worldwide. We studied the association between the risk factors, interventions required, diagnosis and outcome in these patients admitted to the Intensive Care Unit (ICU).

Materials and Methods: We conducted a prospective, observational study after the Institutional Scientific and Ethics committee approval. The Institutional record was taken to identify 70 women with Pregnancy Induced Hypertension (PIH) admitted to ICU after meeting the inclusion and exclusion criteria. Socio-demographic details, indication and timing of ICU admission were noted. On ICU admission; baseline vitals, detailed history, duration of complications, therapeutic interventions, laboratory parameters and imaging were compiled. Maternal outcome was assessed in terms of interventions needed, complications encountered and mortality or discharge and follow up was done up to 6 weeks postpartum. Fetal outcome was assessed in terms of live births or Intrauterine fetal death (IUFD), Apgar score, term/preterm and followed up to 7 postnatal days.

Result: It was observed that out of 70 women enrolled in our study, 48 women were diagnosed with preeclampsia, 54 belonged to the age group of 21-30 years, 61 were unregistered for antenatal checkup, 46 had term gestation, 52 were nulliparous and 64 underwent Lower segment caesarean section (LSCS). 60 of them had postpartum ICU admission, all of them had significant rise in blood pressure. Most common interventions were transfusion of blood products (n=30) and mechanical ventilation (n=6). HELLP syndrome was the most common complication (n=7). Maternal mortality was seen in 6 women. 35 neonates had low birth weight, 6 had intra uterine growth retardation (IUGR), 19 were preterm and Apgar score was significant at 5 minutes.

Conclusion: From our observations, it can be concluded that majority of the women were diagnosed with preeclampsia, were relatively of younger age group, nulliparous with no antenatal checkup, underwent LSCS and were admitted postpartum to ICU. Transfusion of blood products was the most common intervention & HELLP syndrome was most common complication. Maternal mortality was higher in women with preeclampsia although overall mortality was low. The incidence of low birth weight, IUGR and preterm neonates was more in eclamptic women. Neonatal mortality was more in preeclamptic women.

1. Introduction

Hypertension is the most common medical disorder of pregnancy, affecting 6% to 10% pregnancies. It is

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a leading cause of maternal mortality, together with hemorrhage it accounts for about one half of all maternal deaths worldwide and significant neonatal complications. Hypertensive disorders of pregnancy encompass a range of conditions- chronic hypertension, gestational hypertension, preeclampsia, preeclampsia superimposed on chronic hypertension and eclampsia. It is difficult to differentiate because clinical presentation is often similar despite complex differences in their underlying pathophysiology and prognoses.

Preeclampsia usually manifests after 20 weeks of gestation with hypertension and proteinuria, where hypertension is defined as systolic blood pressure of 140 mmHg and/or diastolic blood pressure of 90 mmHg on at least two occasions and at least 4-6 hours apart in a woman known to be normotensive beforehand. The diagnosis of preeclampsia should also be considered in the absence of proteinuria when any of the following signs or symptoms of end organ involvement are present: persistent epigastric or right upper quadrant pain, persistent cerebral symptoms, fetal growth restriction, thrombocytopenia or elevated liver enzymes. HELLP syndrome refers to development of hemolysis, elevated liver enzymes and low platelet count in a woman with preeclampsia. The term eclampsia is used when central nervous system involvement results in the new onset of seizures in a woman with preeclampsia. Eclampsia can occur suddenly at any point in the puerperium; however, most seizures occur intrapartum or within first 48 hours after delivery.

Risk factors for pregnancy induced hypertension include extremes of maternal age, nulliparity, multiple gestation, molar pregnancy, previous history of preeclampsia or eclampsia, preexisting hypertension, obesity, diabetes mellitus, chronic renal disease, urban or rural domicile, availability and utilization of health facilities. Major maternal complications include pulmonary aspiration, pulmonary edema, cerebrovascular accident, venous thromboembolism, acute renal failure, liver failure, disseminated intravascular coagulation (DIC), sepsis, cardiopulmonary arrest and death. Perinatal complications include fetal growth restriction, perinatal asphyxia, iatrogenic prematurity, stillbirths, preterm delivery and neonatal mortality.

Quite often, further care of these women in the ICU becomes necessary for the treatment of preeclampsia/eclampsia and its complications. Initial management includes protecting the airway, breathing adequacy and circulation. Other measures include hemodynamic monitoring, use of intravenous fluids, blood transfusion, plasma expanders, antibiotics, control of seizures and blood pressure. Oxygen supplementation to improve the oxygen saturation, assisted ventilation, respiratory support is commonly required. The outcomes vary because of the different severity of complications associated with preeclampsia/eclampsia. It may be necessary, therefore, to evaluate the management and outcome of these patients. Though pregnancy and labor are considered as physiological processes, the potential for catastrophic complications is constant and may develop within minutes requiring critical care.

In our study, we aim to determine the characteristics, diagnoses, interventions and outcome of 70 obstetric patients with pregnancy induced hypertension admitted in our Critical care unit (CCU).

2. Materials and Methods

It was a prospective, observational study conducted in 70 obstetric patients diagnosed with PIH who got admitted to the CCU in Department of Anaesthesiology and Critical Care at Pt. J.N.M. Medical College & Dr. B.R.A.M. Hospital, Raipur (C.G.) after approval from the Institutional Scientific and Ethics Committee from November 2020 to October 2021, after meeting the inclusion and exclusion criteria.

2.1. Design of study

Observational, prospective study.

2.2. Study location

Critical care unit, Department of Anaesthesiology and Critical Care, Pt. Jawaharlal Nehru Memorial Medical College and Dr. B. R. A. M. Hospital, Raipur.

2.3. Research duration

November 2020 to October 2021.

2.4. Study population

All patients with PIH getting admitted to the ICU were enrolled for the study.

2.5. Sample size

70.

2.6. Sample size calculation

According to the records of our institutional ICU admissions over the last one year, the sample size has been calculated accordingly as follows:

Sample size determined using the finite population corrective factor

$n = n_0N/n_0+(N-1)$

$p \pm z\frac{\sqrt{p(1-p)}}{n}\sqrt{\frac{N-n}{N}-1}$

$n = Z^2\pi(1-\pi)/e_2$

$n = n_0N/n_0+(N-1)$

After including the 10% dropouts and exclusion criteria, the sample size is 70.

2.7. Inclusion criteria

Females with Pregnancy induced hypertension (PIH) admitted to ICU.

2.8. Exclusion criteria

1. Non eclamptic causes of fits, including hysterical causes and epilepsy
2. Patients having chronic hypertension
3. History of pre-existing liver & kidney disease
4. Haematological abnormalities
5. Structural or functional cardiac problems
6. Sickle cell disease or trait

The record of the ICU of the institution was taken to identify all women with PIH who got admitted during antenatal period and delivery or puerperium (restricted to 6 weeks postpartum) during the study duration. The subjects were divided into four groups - Group 1: Severe preeclampsia without HELLP syndrome, Group 2: Eclampsia without HELLP syndrome, Group 3: Eclampsia with HELLP syndrome, Group 4: HELLP syndrome without eclampsia. For each eligible patients for the study, the following information was collected on a data collection sheet: Socio demographic characteristics namely, age, parity, booking status, marital status, educational status, place of delivery, gestational age at the time of diagnosis, indication for ICU admission and timing of admission to ICU (antepartum or postpartum).

On ICU admission, the parameters recorded were - indication of patient admission, gestational age, obstetric and menstrual history, duration of complications, therapeutic interventions during ICU admission, maternal outcome - mortality or transfer out of the unit and foetal outcome -IUGR/term/preterm, Apgar score and follow up till 7^{th} post-natal day. Laboratory monitoring of patients included complete blood count, liver function tests, coagulation profile, renal function tests, arterial blood gas analysis (ABG), imaging (Chest X-ray/ CT, neuro-CT/ MRI), ECG, 2D Echo, USG abdomen. Interventions required in the ICU were hemodynamic monitoring (heart rate, non-invasive blood pressure, respiratory rate, SpO_2), mechanical ventilation, renal replacement therapy, transfusion of blood and its products and use of vasoactive drugs. The frequency of maternal complications like pulmonary edema, renal impairment, HELLP syndrome, sepsis, postpartum haemorrhage, aspiration, posterior reversible encephalopathy syndrome (PRES), postpartum cardiomyopathy and neurological deficits were noted. Maternal follow-up up to 6 weeks postpartum was done.

The statistical analysis was carried out using IBM SPSS (Statistical Package for Social Sciences) statistical version 21. The analysis includes frequency table, bar, pie chart, association of variables based on Chi-square, odd ratio, incidence with 95% confidence interval. All quantitative variables were estimated using measures of central location (mean and median) and measures of dispersion (standard deviation). For normally distributed data, Mean was compared using independent t-test (for two groups) ANOVA (for two or more groups). For not normally distributed data, Median was compared using Mann Whitney U test (for two groups). For relationship, Pearson Correlation method was used. Non parametric Chi square test was used to find association between variables.

3. Result

It was observed that 68.57% (n=48) of our study population were diagnosed with severe preeclampsia alone (Group 1), while 22.86% (n=16) of them were diagnosed with eclampsia (Group 2) (Table 1). 77.14% (n=54) of the patients belonged to the age group of 21-30 years, while 17.14% (n=12) were less than 20 years of age and 5.71% (n=5) were more than 30 years of age. 74.29% (n=52) of the women were nulliparous and the remaining were multiparous. 87.14% (n=61) of the women had unregistered status and 12.86% (n=9) were booked from the initial time of pregnancy.

30% (n=21) of the patients in our study had not completed 37 weeks of gestation, while 65.71% (n=46) were appropriate for the weeks of gestation. 7.14% (n=5) had full term normal vaginal delivery (FTNVD), 8.57% (n=6) patients had preterm normal vaginal delivery (PTNVD) while 91.43% (n=64) had lower segment caesarean section (LSCS). It was seen that 85.71% (n=60) women were admitted postpartum to the ICU and 14.29% (n=10) women were admitted ante partum to the ICU.

It was seen that blood pressure was raised among all the study groups and this increase is statistically significant with a P value of 0.04 and 0.01 for systolic blood pressure and diastolic blood pressure respectively (Table 2). It was also noticed that total bilirubin ($p<0.0036$), SGOT ($p<0.008$), SGPT ($p<0.001$) were statistically significant in Group 1 and Group 3 which may be attributed to development of HELLP syndrome.

42.86% (n=30) patients required transfusion of blood products, 8.57% (n=6) required mechanical ventilation, 4.29% (n=3) required vasoactive drugs and 1.43% (n=1) needed renal replacement therapy (Table 3). Most common maternal complications observed were pulmonary edema (n=2) and HELLP syndrome (n=7, p value <0.001) in Group 1 and Group 3. Overall, mortality was 8.57% (n=6) and the remaining 91.42% (n=64) were discharged (Table 4). Duration of ICU stay was less than 5 days in 56 patients and more than 5 days in the remaining patients.

Low birth weight babies (n=18), preterm babies (n=12) and intrauterine growth retardation (n=3) was more among

patients with severe preeclampsia and very low birth weight babies were more among eclamptic patients (n=4). Apgar score at 7 min was significantly associated with maternal diagnosis (p=0.027).

Table 1: Distribution of the patients according to diagnosis

Study groups	N	%
Group 1 (Pre-eclampsia without HELLP syndrome)	48	68.57
Group 2 (Eclampsia without HELLP syndrome)	16	22.86
Group 3 (Eclampsia with HELLP syndrome)	5	7.14
Group 4 (HELLP syndrome without eclampsia)	1	1.43
Total	70	100

Table 2: Comparison of BP among various groups

	BP (mmHg)	
	SBP	DBP
Group 1 (N=48)	157.08±9.88	102.08±7.13
Group 2 (N=16)	147.5±24.35	108.75±18.07
Group 3 (N=5)	164±16.73	104±15.16
Group 4 (N=1)	100	70
P value	0.04 S	0.01 S

Table 3: Distribution of patients according to therapeutic interventions

Therapeutic interventions	N	%
Mechanical ventilation	6	8.57
Renal replacement therapy	1	1.43
Transfusion of blood products	30	42.86
Vasoactive drugs	3	4.29

Table 4: Distribution of patients according to maternal outcome

	Maternal outcome		
	Discharge	Mortality	Total
Group 1 (N=48)	44(68.75%)	4(66.67%)	48(68.57%)
Group 2 (N=16)	15(23.44%)	1(16.67%)	16(22.86%)
Group 3 (N=5)	4(6.25%)	1(16.67%)	5(7.14%)
Group 4 (N=1)	1(1.56%)	0(0%)	1(1.43%)
Total	64(100%)	6(100%)	70 (100%)

Chi square value=1.04, P=0.79 NS

4. Discussion

It was seen that majority of our study population were diagnosed with severe preeclampsia (68.57%) followed by eclampsia (22.86%) and the findings were similar to the studies done by Lapinsky SE et al,[1] Singh K et al,[2] Aabidha PM et al,[3] Seyom E et al.[4] Studies conducted by Leung NYW et al,[5] Aabidha PM et al,[3] Barbosa IRC et al[6] showed that older age group was a risk factor for adverse outcomes. In our study most of them belonged to age group of 21-30 years (77.14%) with 7.41% mortality, however there was no significant association of age with maternal outcome. It was observed that most of our study population was nulliparous (74.29%) with higher incidence of ICU admission and complications. Our findings can be compared with the studies of Aali BS et al,[7] Agida ET et al,[8] Imarengiaye et al,[9] Sailaja K et al.[10]

Studies done by Imarengiaye et al,[9] Aabidha PM et al,[3] Ozumba BC et al,[11] Agida et al (2010)[8] showed that women with unregistered status had increased risk of complications and mortality. Majority of our study population were appropriate for gestational age (65.71%). 91.43% patients underwent lower segment caesarean section which was similar to that of Agida ET et al[8] and Imarengiaye et al.[9]

It was evident from our study that both systolic and diastolic blood pressure was statistically significant (P value 0.04 and 0.01 respectively) which was similar to the study conducted by Seyom E et al.[4] It was observed from our study that 42.86% of the patients required transfusion of blood products, 8.57% required mechanical ventilation, 4.29% required vasoactive drugs and 1.43% needed renal replacement therapy. Imarengiaye et al[9] observed that mechanical ventilatory support and advanced monitoring were the major interventions in their study. In the study conducted by Sailaja K et al,[10] 54.9% of patients were mechanically ventilated, blood products were transfused in the ICU in 42 patients (46%), twenty patients (22%) had unstable hemodynamics requiring vasopressor support and had significantly high risk for mortality (p=0.000). Twenty patients (22%) developed renal failure and nine of them underwent dialysis among which six (6.6%) died and three patients were discharged. Leung NYW et al[5] showed that majority of their patients required invasive mechanical ventilation.

Gupta S et al[12] noted that 91.66% patients required inotropic support and 70.83% required ventilatory support. In the study conducted by Ozcelik M et al,[13] the most common intervention required was mechanical ventilation (66.7% in antepartum patients and 43.8% in postpartum patients) followed by transfusion of blood derivatives. It was observed that frequency of requirement of mechanical ventilation was lower, but there was high mortality rate (12.5%) among patients admitted postpartum. The study conducted by Ozumba BC et al[11] showed that oxygen supplementation, blood transfusion, assisted ventilation and respiratory support were the interventions required. In the study conducted by Ramachandra Bhat PB et al,[14] 63% of the study patients needed mechanical ventilation and the most frequent indications were acute respiratory failure

(44%) and hemodynamic failure (37%).

Pulmonary edema and HELLP syndrome were the most common complications in our study population. It was supported by studies of Zuberi NF et al,[15] Aali BS et al[7] Tufnell DJ et al[16] and Imarengiaye et al.[9] Mortality was 8.57% in our study. The studies conducted by Sailaja K et al[10] showed mortality rate of 9.9%, Gupta S et al[12] showed 41.67%, Ozcelik M et al[13] showed 12.5%.

The incidence of very low birth weight, low birth weight, preterm and intrauterine growth restriction of our study was supported by inferences from Aali BS et al,[7] Bridwell M et al[17] and Lugobe HM et al.[18] As noted in our study, 85.71% women were admitted postpartum to the ICU and 14.29% women were admitted antepartum to the ICU. In the study conducted by Ozcelik M et al,[13] most antepartum patients admitted to ICU were primiparous (88.8%), while most patients admitted postpartum were multiparous (64.6%).

It can be seen from our study; that 80% of the patients had ICU stay for less than 5 days, 17.14% had ICU stay between 6-10 days and 2.86% had ICU duration of >10 days. Sailaja K et al[10] observed that the mean hospital stay was 10.1 days in their study. In the study conducted by Gupta S et al,[12] the mean duration of ICU stay was less due to higher mortality rates.

The limitation of our study was a small sample size and loss to follow up of the patients.

5. Conclusion

From our study, it was observed that preeclampsia, nulliparity, unbooked status, and lower segment cesarean section were prevalent among the subjects. Most common intervention required was transfusion of blood products. Pulmonary edema and HELLP syndrome were the most common complications. Overall mortality was low. The incidence of low birth weight, IUGR and preterm neonates was higher among those with eclampsia. Neonatal mortality was more in severe preeclampsia patients with term gestation.

6. Source of Funding and Conflict of Interest

None.

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