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STUDY OF THE EFFECT OF GENERAL AND REGIONAL ANESTHESIA ON FOETOMATERNAL OUTCOME IN WOMEN UNDERGOING CAESAREAN SECTION FOR SEVERE PREECLAMPSIA

Anaesthesiology

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ABSTRACT

INTRODUCTION Motherhood is the ultimate joy in a woman's life. Every woman craves for her own child. However, more than half a million women die each year from pregnancy related causes across the globe. The United Nations Millennium Development Goals[1] has placed maternal health as a basic human right, one that is integral to the core of the fight against poverty and inequality. The high incidence of preeclampsia and its complications makes its prevention and effective management important.

AIMS AND OBJECTIVES To study the effect of anaesthetic technique in the foetomaternal outcome in severe preeclamptic patients undergoing caesarean section and determining any difference in the maternal and perinatal morbidity/mortality amongst those receiving either general or regional anaesthesia.

MATERIALS AND METHODS

Study Area: Eden Hospital, Critical Care Unit (CCU), Special Neonatal Care Unit (SNCU), and Neonatal Intensive Care Unit (NICU) of Medical College & Hospital, Kolkata.

Study Population: Mothers and babies of severe preeclamptic patient with 34 or more gestational weeks admitted in Eden Hospital, Medical College & Hospital, Kolkata undergoing caesarean section formed our study cohort.

Study Period: 18 months (from February 2012 till June 2013).

RESULTS AND OBSERVATIONS The patients of severe preeclampsia were in the age group 18 to 30 years (93 %). Only 1.2 % were aged more than 40years. 5.8 % of patients were between the ages of 30 to 40 years. The age patterns were similar in both the groups receiving either spinal or general anaesthesia.

SUMMARY AND CONCLUSION Severe preeclampsia mothers receiving general anaesthesia and their babies required more critical care support. Maternal as well as neonatal mortality was significantly higher with general anaesthesia. Spinal anaesthesia is safer alternative to general anaesthesia in severe preeclampsia with less post operative morbidity and mortality.

KEYWORDS

General And Regional Anesthesia, Foetomaternal Outcome, Caesarean Section And Severe Preeclampsia

INTRODUCTION

Motherhood is the ultimate joy in a woman's life. Every woman craves for her own child. However, more than half a million women die each year from pregnancy related causes across the globe. The United Nations Millennium Development Goals [1] has placed maternal health as a basic human right, one that is integral to the core of the ght against poverty and inequality. The high incidence of preeclampsia and its complications makes its prevention and effective management important. Estimates of maternal mortality from the developing countries (in Asia, Africa, Latin America and the Caribbean) suggest that 10-15% of maternal deaths are associated with hypertension in pregnancy, while eclampsia is associated with 10% maternal mortality. Preeclampsia and eclampsia accounts for 24% of all maternal death in India.[2]

The process of pregnancy is besieged by many potential challenges, of which one of the most common is preeclampsia (PE), a multisystem disorder unique to pregnancy associated with elevated blood pressure (BP) and proteinuria typically presenting after 20 weeks of gestation. More than 4 million women across the world develop this disorder every year and an estimated 50,000 to 76,000 women and 500,000 infants die of this condition every year. In fact, PE is a principal cause of fetal morbidity and mortality and is the leading reason of maternal ICU admissions and, causes 15–20% of maternal deaths worldwide.[3] Gestational hypertension is the presence of new hypertension (usually systolic BP >140 mm Hg and/or diastolic BP >90 mm Hg) occurring in the second half of pregnancy, while PE is the combination of gestational hypertension with new onset proteinuria.[3] Proteinuria is defined as presence of total protein in 24 hours urine or more than 300 mg or ≥ 2+ on at least two urine sample.[3]

The highest reported rate of pre-eclampsia is 7.1% (deliveries) in UK, the incidence of severe pre-eclampsia is 5/1000 maternities [4], while the incidence of eclampsia is 4.9/10,000 maternities. The incidence of severe pre-eclampsia in European countries ranges from 2/1000 (deliveries) in Norway to 6.4/1000 (deliveries) in Belgium and Hungary.[5] In India the incidence of preeclampsia is 10.2% of which 2-3% is severe preeclampsia and 0.6% is eclampsia. About 25% patients of preeclampsia developed severe preecalmpsia.

Foetal complications include abruptio placenta, intrauterine growth restriction, premature delivery, and intrauterine foetal death. The incidence of stillbirths and neonatal deaths in mothers who suffered severe preeclampsia was 22.2/1000 and 34.1/1000, respectively, in the UK with a higher incidence in developing countries.[5] Overall perinatal mortality is increased fivefold in patients of severe preeclampsia with iatrogenic prematurity being the main culprit. Delivery of the infant and placenta is the only effective treatment; thus preeclampsia is a leading cause of preterm delivery in developed countries.[6] The birth of low-birth-weight and term neonates to preeclamptic mothers results in major medical, social, and economic burdens for families and societies. Preterm delivery is the most common indication for admission to the neonatal intensive care unit.[6] Preeclampsia is also the leading indication for maternal peripartum admission to an intensive care unit.

Usually the pregnant mothers attend the clinic in late stage which often turns into a nightmare to the doctor and the mother. But this catastrophe can be prevented by proper antenatal care and supervision. So numerous efforts at early diagnosis, prevention and treatment of this disorder has been tried to improve the maternal and foetal outcome. But still it is an unresolved, persisting and considerable problem in obstetrics.

AIMS AND OBJECTIVES

AIMS: To study the effect of anaesthetic technique in the foetomaternal outcome in severe preeclamptic patients undergoing caesarean section and determining any difference in the maternal and perinatal morbidity/mortality amongst those receiving either general or regional anaesthesia.

Specific objective of the study

To compare general and regional anaesthesia regarding maternal and foetal outcomes in patients who had diagnosis of severe preeclampsia and undergoing caesarean section.

MATERIALS AND METHODS

Study Area: Eden Hospital, Critical Care Unit (CCU), Special Neonatal Care Unit (SNCU), and Neonatal Intensive Care Unit (NICU) of Medical College & Hospital, Kolkata.

Study Population: Mothers and babies of severe preeclamptic patient with 34 or more gestational weeks admitted in Eden Hospital, Medical College & Hospital, Kolkata undergoing caesarean section formed our study cohort.

Study Period: 18 months (from February 2012 till June 2013).

Sample Size: All severe preeclamptic patients who were admitted in Eden Hospital, Medical College & Hospital, Kolkata with severe preeclampsia at 34 weeks or more than of gestational age between February 2012 till June 2013 were the initial sample population of this study. Of the total 231 patients admitted with severe preeclampsia, 58 patients refused to be a part of this prospective observational study. Thus the total sample size of this present study became 173 patients. 146 women of severe preeclampsia patient underwent caesarean section under spinal anaesthesia and another 27 patients underwent caesarean section under general anaesthesia.

Study Design: This institution based prospective, observational comparative cohort study have been carried out after getting approval of hospital ethics committee and informed patient consent at Eden Hospital, Medical College & Hospital, Kolkata under the West Bengal University of Health Sciences. The study cohort was all severe preeclamptic patients who were admitted for severe preeclampsia at 34 weeks or more of gestation between February 2012 and June 2013. No sort of intervention of any nature was performed throughout the natural course of the study. No blinding or randomization of the patients was done at any point of time.

Study Techniques: Our study concerned 173 parturients admitted with a diagnosis of severe preeclampsia posted for emergency caesarean section. The study only started after a severely preeclamptic parturient underwent anaesthesia by an anaesthesiologist not involved in the study, and given anaesthesia as per personal choice and expertise of the concerned anaesthesiologist and following institutional protocol. Of the 173 women with severe preeclampsia who underwent caesarean section 146 patient did so under spinal anaesthesia and another 27 patients underwent caesarean section under general anaesthesia. In the study period no severe preeclamptic patients were administered epidural or combined spinal epidural anaesthesia as per choice of anaesthesist or condition of patient.

Inclusion criteria for this study were as follows:

a. Women of child bearing age (15 to 50 years). They are to be followed up till discharge / death during the period of hospital current admission.
b. Conforming to definition of severe preeclampsia, i.e. BP $\geq$ 160/110 mmHg, proteinuria $\geq$ 5 gm in 24 hrs urine collection or persistent 2+ or more protein on dipstick. Severe headache, epigastric or right upper quadrant (RUQ) pain, visual disturbance, serum creatinine $\geq$ 1.2 mg, oliguria, cardiac dysfunction with pulmonary oedema, signs of HELLP (hemolysis, elevated liver enzymes and low platelet count) syndrome were the other inclusion criteria for severe severe preeclampsia.[5,117]
c. Undergoing caesarean delivery with diagnosis severe preeclampsia to expedite delivery.
d. Babies of mother who have undergone caesarean section for severe preeclamsia in nursery, ward and NICU. They are to be followed up till discharge / death during the period of hospital current admission.

Exclusion criteria were as follows:

a) Patient refusal
b) Women undergoing normal delivery
c) Patients with gestational age less than 34 weeks
d) Eclampsia patients
e) Patient having previous history of medical disorders like chronic hypertension, diabetes, connective tissue disorder, thyroid dysfunction, epilepsy, renal disease, heart disease and obesity.
f) Patient having any allergic reaction, ill effects or obvious serious complication due to anaesthesia procedure itself
g) Congenital anomalies of new born baby
h) Patient having abruptio placenta, placenta praeviae
i) Patient having pre-existing coagulopathy, thrombocytopenia, sepsis, neurological problems, hypovolemia

RESULTS AND OBSERVATIONS

Our study showed it can be seen that most cases (146 patients; 84.5%) received spinal anaesthesia. Only a few patients (27 patients; 15.5%) received general anaesthesia. No patients in the study cohort received epidural or combined spinal-epidural anaesthesia in the 17 month follow up period of the current study. The various indications of caesarean section in severe preeclamptic patients are shown. Of the various indications a very high percentage of patients underwent general anesthesia due to foetal distress (37% vs. 16.4%; P<0.05). All other indications for caesarean section were similar in between the patients who underwent spinal and general anaesthesia. The patients of severe preeclampsia were in the age group 18 to 30 years (93 %). Only 1.2 % were aged more than 40years. 5.8 % of patients were between the ages of 30 to 40 years. The age patterns were similar in both the groups receiving either spinal or general anaesthesia.

We found in this table shows that the patients receiving either spinal or general anaesthesia were similar with respect to age, weight and height. However, patients given general anaesthesia had more incidence of foetal distress and had earlier caesarean sections with lesser gestational age compared to patients given spinal anaesthesia ($p < 0.05$) as depicted in the figure below. In our study 54.9% patients had came from urban areas, while 45.1% from rural areas. 96.5% were literate and only 3.5% mother were illiterate ($p > 0.05$). Both the groups were similar with regard to place of residence and educational level and the overall data corresponds to demographic characteristics of the general population. Patients having severe preeclampsia generally came from a low socio-economic back- ground. Patients were similar in terms of booking status, gravida and parity. Most of the patients were booked (94.2%). Around 69 % were primigravida and 71% were nulliparous.

We showed that a significant number of patients in the GA group (33.3%) had a family history of preeclampsia / eclampsia compared to only 0.7 % in the spinal group, which was statistically significant ($p<0.05$). In spinal anaesthesia group a larger number of patients had a previous history of preeclampsia / eclampsia in earlier pregnancies. However, most of the patients in these two groups did not have a past or family history of preeclampsia or eclampsia. 98.8 % of severe preeclamptic patients had severe proteinuria (grade 3+ or more). Of them 69.4 % had a grade 3+ proteinuria, and 29.4 % had a grade 4+ proteinuria. All the patients had grade 2+ proteinuria or more conforming to the diagnosis of severe preeclampsia. In patients of severe preeclampsia undergoing caesarean section either by spinal or general anesthesia the average preoperative platelet count was below 1,00,000 /mm3. The platelet count was lower in the GA group, though it failed to reach statistically significant values ($p > 0.05$).

Our study showed both the spinal and general anaesthesia received similar amounts of pre-induction Ringer's Lactate (RL) solution preoperatively (552.4 ± 128.3 and 516.67 ± 146.1 ml respectively). Overall, 51.4% mothers were given inj. Labetalol while 48.6% were controlled with methyldopa alone. 88.9% in the GA group took inj. Labetalol compared to 48.6% in the spinal group required it (P value 0.001, statistically significant). Intraoperative systolic blood pressures (BP) in both the groups receiving spinal or general anaesthesia were similar. But intraoperative diastolic BP in GA group was higher than spinal group ($p < 0.05$). Intraoperative pulse rate decreased more in SA group than GA group ($p < 0.05$). These are depicted in Figure 13. Intraoperative more Ringer's Lactate (RL) fluid and vasopressors were given in the spinal group ($p <0.05$).

We found in Table postoperative systolic and diastolic BP were statistically similar in both GA and SA groups, but a significant number of patients (63%) of GA group required injection Labetalol in the post-operative period for controlling the blood pressure ($p<0.05$. Maternal complication in order of frequency were pulmonary oedema (24.3%), high blood pressure (18.2%), ARF (10.2%), pain at spinal injection site (9.6%), convulsion (9.5%), DIC (8.1%) headache (6.2%), PPH (5.1%), HELLP syndrome (3.7%), visual disturbance (2.1%), LRTI and CCF (0.7%). 2 patient of SA group had developed parasthesia in right leg post operatively and one patient had developed CVA. Other complications included postoperative vomiting and wound gaping. In our study 87.1% patient directly went to ward. 12.3% of patient required CCU care at some time of their hospital stay. CCU admission due to intraoperative complications were seen in 25.9% patient in the GA group ($p<0.05$). Overall 44.4% of patients in GA group required critical care at any point of time compared to 6.3 % in the spinal

anaesthesia group. Overall 9 mothers died. Of these 7 patients (25.9 %) given GA and 2 patients (1.4%) given spinal anaesthesia died (p <0.05).

DISCUSSIONS

The chief role of the obstetric anesthesiologist is to provide safe labour analgesia and anaesthesia for caesarean section. Anesthetists also play a key role in resuscitation and intensive care management, including provision of invasive monitoring and limitation of cardiorespiratory, cerebral and renal complications. These roles are dependent on an up-to-date understanding of the pathophysiology of disease as well as knowledge of recent clinical research findings**.** Despite advances in medical practices, preeclampsia/eclampsia has remained a leading cause of maternal mortality throughout the world. It is a common problem in developing countries because of illiteracy, poor antenatal care, lack of health awareness and poverty.

Some have favoured epidural anaesthesia, while others have shown that similar haemodynamic changes and neonatal outcomes with spinal anaesthesia. Advantages include (1) provision of high-quality analgesia, which attenuates the hypertensive response to pain, (2) a reduction in levels of circulating catecholamines and stress-related hormones, (3) possible improvement in intervillous blood flow and (4) provision of a means of administering local anesthetic for emergency cesarean delivery, thus obviating the need for general anesthesia with its attendant risks. **Chiu et al** [7] performed a 5-year retrospective analysis on caesarean sections for mild to moderate and severe preeclampsia and found that decreases in BP were similar after spinal and epidural anaesthesia. The use of intravenous fluids and ephedrine was also comparable in the two groups. The results support the safety of spinal anaesthesia in women with preeclampsia.

Aya et al [8] compared women with severe preeclampsia to healthy pregnant women (both preterm and at term) and found that the risk of significant spinal anesthesia–induced hypotension was significantly lower in the preeclampsia groups than in the control groups. The researchers speculated that the known greater vascular sensitivity to vasoconstrictors may explain the infrequent incidence of post–spinal anesthesia hypotension and the ease with which mean arterial blood pressure can be restored to baseline with small doses of vasopressor. **Dyer et al**[9] found that preeclampsia patients had a lower susceptibility to hypotension and probably less impairment of cardiac output than healthy parturients after spinal anaesthesia for caesarean section. Of the total of 231 women with severe preeclamptic patient who underwent caesarean section within the study period 58 patients refused to be part of the current study and thus excluded from this study. Thus the total study cohort was limited to 173 patients, and I will discuss the observation of my study on these patients.

146 (84.5%) patients were administered spinal anaesthesia and 27 (15.5%) patients received general anaesthesia. This preponderance of spinal anaesthesia as the preferred anaesthetic technique for caesarean section in patients with severe preeclampsia by anaesthetists is similar to another recent retrospective analysis in similar cohorts of patient performed by **Keerath K et al (2012)**[10].

The total length of stay (LOS) in hospital did not differ between the groups. This was similar to findings by **Fassoulaki A et al (2009).**[11] **Ahsan-ul Haq et al (2004)**[12] noted a longer LOS with general anaesthesia.

18.5% of babies of mother receiving general anaesthesia required neonatal intensive unit care (NICU) admission compared to 6.2% in the spinal group ($p < 0.05$;. A significantly higher population of babies in the general anaesthesia group died (29.6% vs 11%; $p < 0.01$;. The main causes of neonatal mortality were hypoxic ischemic encephalopathy (HIE; 47.7%) and sepsis (37.5%). Ventilator associated pneumonia (VAP), aspiration pneumonia, meconium aspiration syndrome (MAS) and hyperbilirubinemia with sepsis were the other causes of neonatal death, and were comparable in both the groups ($p > 0.05$%).

SUMMARY AND CONCLUSION

Overall neonatal mortality was significantly higher in babies born to mother in general anaesthesia group compared to spinal anaesthesia (29.6% vs 11%; $p < 0.05$), but causes of neonatal mortality were found to be similar in the two groups. The main causes of neonatal mortality were hypoxic ischemic encephalopathy (HIE; 47.7%) and sepsis (37.5%). Ventilator associated pneumonia (VAP), aspiration pneumonia, meconium aspiration syndrome (MAS) and hyperbilirubinemia with sepsis were the other causes of neonatal death, and were comparable in both the groups ($p > 0.05$%).

Severe preeclampsia mothers receiving general anaesthesia and their babies required more critical care support. Maternal as well as neonatal mortality was significantly higher with general anaesthesia. Spinal anaesthesia is safer alternative to general anaesthesia in severe preeclampsia with less post operative morbidity and mortality.

Table 1 : Obstetric Parameters (booking status, gravida and parity)

	GROUP				
Booking status	**Spinal anaesthesia**	**General anaesthesia**	Total	p value	Significance
Booked	138 (94.5 %)	25 (92.6 %)	163 (94.2%)	0.693	*Not Significant*
Un-booked	8 (5.5 %)	2 (7.4 %)	10 (5.8%)		
Total	146 (100)	27 (100)	173 (100)		
Gravida	**Spinal**	**GA**	Total		
Primigravida (G 1+0)	96 (65.8%)	23 (85.2%)	119 (68.8%)	0.340	*Not significant*
G2+0 (2nd gravida)	31 (21.2%)	3 (11.1%)	34 (19.7%)		
G3+0 (3rd gravida)	12 (8.2%)	0	12 (6.9%)		
G4+0 (4th gravida)	2 (1.4%)	0	2 (1.2%)		
G5+0 (5th gravida)	3 (2.1%)	1 (3.7%)	4 (2.3%)		
G6+0 (6th gravida)	2 (1.4%)	0	2 (1.2%)		
Total	146 (100)	27 (100)	173 (100)		
Parity	**Spinal**	**GA**	Total		
P0+0 (Nulli parous)	100 (68.5%)	23 (85.2%)	123 (71.1%)	0.436	*Not significant*
P1+0	27 (18.5%)	3 (11.1%)	30 (17.3%)		
P2+0	12 (8.2%)	0	12 (6.9%)		
P3+0	2 (1.4%)	0	2 (1.2%)		
P4+0	3 (2.1%)	1 (3.7%)	4 (2.3%)		
P5+0	2 (1.4%)	0	2 (1.2%)		
Total	146 (100)	27 (100)	173 (100)	**Chi Square test**	

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