



## OBSERVATIONAL STUDY OF OUTCOME OF SUBARACHNOID BLOCK IN PARTURIENTS WITH UNSTABLE ECLAMPSIA

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### ABSTRACT

**Objective:** To report the outcome of subarachnoid block (spinal anaesthesia) in Cesarean delivery for women with unstable eclampsia. **Methods:** A prospective study of spinal anaesthesia in women with unstable eclampsia requiring Cesarean section from January 2013 to December 2016 was carried out. Maternal age, parity, gestational age at delivery, booking status, Apgar scores, intraoperative maternal hypotension, episodes of convulsion, failed spinal anaesthesia, neonatal scores and postoperative complications were documented. **Results:** Induction of subarachnoid block was successful in all the 36 patients. Twelve parturients had difficult airway. Also twelve patients had pulmonary oedema. Ten parturients were unconscious as at time when subarachnoid block was performed. Thrombocytopenia was found in five parturients. Raised intracranial pressure was found in three patients. Only two patients had uncontrollable convulsion and another one with uncontrollable restlessness. One patient had difficult spinal anaesthesia. No patient had hypotension. No patient had episode of a convulsion on the table. Median Apgar Score at 1 and 5 minutes were 7 and 9 respectively. Average hospital stay was 16 days. **Conclusion:** The study highlights that subarachnoid block is possible in some selected cases of unstable eclampsia.

**KEYWORDS:** Spinal anaesthesia, General anaesthesia, eclampsia, Caesarean section.

### INTRODUCTION

The first known established goal in the management of eclampsia is prevention of further convulsions and stabilization of parturients blood pressure status.<sup>[1,2]</sup> This could be achieved through the use of magnesium sulphate. Established magnesium sulphate protocol has been demonstrated to be efficient, safe, rapid and reliable pharmacological measure for attaining this required goal.<sup>[3,4]</sup> While saving the life of the mother, the goal should also incorporate measure to save the life of the baby. In a bid to allow the fetus to have maximum chance of extra uterine survival, the entire management of the patient should not only focus on the time and mode of delivery but also on the safest anaesthesia so that both the mother and fetus will be able to cope favourably with caesarean section.<sup>[1,2,3]</sup> In preventing mortality and morbidity experienced by most of the eclamptic patients following caesarean section, effort in the time past had been placed on obstetric management protocol with<sup>[5,6,7]</sup> less emphasis on the influence of anaesthesia in the over all outcome of parturients who undergo caesarean section.<sup>[8,9]</sup>

Recently, attention is being shifted away from general anaesthesia to regional anaesthesia in the management of patients with stable eclampsia.<sup>[10,11,12,13]</sup> This paradigm

shift is as a result of complications, such as difficult intubation, post operative respiratory failure and delayed recovery from anaesthesia, associated with general anaesthesia.<sup>[10,11,14,15,16,17]</sup> There have been publications popularising the use of regional anaesthesia in eclamptic patients.<sup>[7,8,9,11,12,13,14,15,18,19]</sup> Many of these publications dwelled on the use of subarachnoid block in stable eclamptic patients<sup>[9,11,12,13,18,19]</sup> while a scant ones, mostly case reports, demonstrated its use in unstable eclamptic parturients.<sup>[7,8,14,15]</sup>

Patient is said to have unstable eclampsia if she presents with any of the following alongside eclampsia 1) unconsciousness, 2) restlessness despite sedation, 3) features of raised intracranial pressure 4) uncontrolled convulsions despite magnesium Sulphate regimen, 5) swelling of tongue, 6) uncontrollable hypertension despite patient receiving antihypertensive drugs, 7) patient with systemic complications such as, pulmonary edema, liver or acute renal insufficiency (urine output less than 0.5mL/kg/hr), 8) platelet count less than  $70 \times 10^9$  cells/L, with or without acute fetal distress.<sup>[7,8,14,15]</sup> Spinal anaesthesia in some of these complicated cases of eclampsia have been reported, especially as case reports<sup>[7,8,14,15]</sup> but none has reported the prospective

observational study of outcome of subarachnoid block in patients with unstable eclampsia.

## METHODS

This was a prospective observational study. The study received Institutional Ethical Committee Research Review approval from Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria. Eighteen unstable eclamptic parturients scheduled for emergency cesarean section were enrolled in the study. Informed consent was received directly or indirectly from all patients who participated in the study. They were reliably informed that their procedure could be converted to general anesthesia if there was any failed or difficult spinal anesthesia.

Patient was said to have unstable "eclampsia" if she had any of the following alongside eclampsia 1) unconsciousness, 2) restlessness despite sedation, 3) features of raised intracranial pressure 4) uncontrolled convulsions despite magnesium Sulphate regimen, 5) swelling of tongue, 6) uncontrollable hypertension despite patient receiving antihypertensive drugs, 7) patient with systemic complications such as, pulmonary edema, liver or acute renal insufficiency, urine output less than 0.5mL/kg/hr, 8) platelet count less than  $70 \times 10^9$  cells/L and 9) patients with pre-morbid intercurrent medical ailments.

Parturients to be excluded from the study included those with laceration of the tongue as a result of tongue biting, women with coagulation disorders, neurological disease, disease or deformity of the vertebral column, sepsis at the site of injection.

Parturients were treated with loading and maintenance doses of magnesium sulphate prior to induction of anaesthesia. In controlling seizures and hypertension, each of the pregnant women with eclampsia was given a loading dose of 4 grams of 20% magnesium sulphate intravenously and 10 grams of 50% magnesium sulphate intramuscularly (5 grams in each buttock). Maintenance dose of 5 grams was given in alternate buttock 4 hourly for 24 hours after the last convulsion or after delivery, depending on which one comes first. In order to achieve a threshold blood pressure of systolic < 160 mmHg and Diastolic < 100 mmHg, hypertension in these parturients was controlled with initial dose of labetalol hydrochloride 20 mg by slow (over 2 minutes) intravenous injection. If blood pressure threshold was still exceeded, after 10 minutes of initial dose, a second dose of intravenous labetalol 40 mg was administered slowly. Blood pressure was checked after 10 minutes. However, if blood pressure threshold was still exceeded then intravenous labetalol 80 mg was administered slowly. Blood pressure would be repeated after 10 minutes. If blood pressure threshold was still exceeded despite 80 mg dose, then intravenous hydralazine 10 mg was given very slowly. Blood pressure would be repeated in 20 minutes following hydralazine

administration. Upon achievement of target blood pressure, then subsequent blood pressure was monitored every 10 minutes for the first hour, every 15 minutes for the second hour and every 30 minutes for the third hour.

After moving the patients to operative theatre, they were placed on tiltable operating table on arrival in the operating suite. Monitors for electrocardiography (ECG), pulse oximetry, and non-invasive blood pressure were attached in order to measure and record both baseline and intraoperative vital parameters such as heart rate, respiratory rate, oxygen saturation, systolic and diastolic blood pressure. All patients were premedicated with intravenous ranitidine 50 mg (antacid prophylaxis), metoclopramide 10 mg (gastric prokinetic agent) after establishing an intravenous access with 16-gauge cannula in the preoperative room. Facilities for rescue general anaesthesia were put in place in case of difficult spinal anaesthesia with or without convulsion.

In order to perform subarachnoid block, each of the unstable eclamptic patient whether conscious or not was supported or held in either lateral or sitting position with the aid of two assistants. Patients were preloaded with 700mL body weight of crystalloid solution (lactated Ringer's solution). A minimum of Senior Registrar Anaesthetist was saddled with the responsibility of performing the block in this unstable eclamptic population.

All patients had their dural puncture performed at L<sub>2,3</sub> or L<sub>3,4</sub> intervertebral spaces with the patients in the sitting or lateral decubitus position. Two percent lidocaine was used to infiltrate the skin. Spinal needle, 26 or 27-gauge, was introduced into sub arachnoid space. Withdrawal of the stylet confirmed correct placement of the spinal needle. Subarachnoid space was identified by free flow of cerebrospinal fluid. Between 2.0mL and 2.5mL of 0.5% hyperbaric bupivacaine with 25 µg of fentanyl was deposited into the intrathecal space over 20 seconds. The needle was then withdrawn and the patient was immediately placed in the wedged supine position in order to achieve a left lateral position. Sensory block height was assessed using loss of sensation to gentle pin prick test. A sensory block height of T6 was the minimum desired level of block for the commencement of the caesarean section.

Maternal age, parity, episodes of convulsion, ECG, heart rate, respiratory rate, oxygen saturation, systolic and diastolic blood pressure were recorded intraoperatively for all the patients.

period between last convulsion and induction of anaesthesia, postoperative transfer, need for post-operative mechanical ventilation, neonatal and maternal outcomes were also recorded. Also documented were the need to convert to general anaesthesia, the number of attempts at dural puncture, post operative convulsions and duration of hospital stay. Hypotension was treated

with intravenous infusion of fluids, or intravenous ephedrine in aliquots of 3mg or 6mg.

Maternal hypotension was defined as a decrease in systolic blood pressure to less than 90 mmHg. After surgery, patients were monitored in the recovery room for a minimum of 45 minutes. The usual regimen of antihypertensives and magnesium Sulphates were continued. Thereafter, every patient was transferred to either postnatal ward or Intensive Care Unit (ICU) of the hospitals for further management. Post operative pain was managed with intravenous pentazocine 30 mg 6 hourly and intramuscular Diclofenac 75 mg 12 hourly for the first 48 hours. But in the cases of unconscious parturients, intravenous tramadol 100mg 8 hourly was given instead of intravenous pentazocine 30mg. Oxygen supplementation was given for the next 72 hours postoperatively. Anaesthetist, who was unaware of intraoperative anaesthetic management, was involved in postoperative collection of data in post natal ward or ICU. Data was analyzed using statistical package for social sciences (SPSS) version 18.

## RESULTS

Thirty seven parturients had unstable eclampsia during this study period. One of them was disqualified from spinal anaesthesia because of severe bleeding from tongue laceration. The patient eventually scheduled for general anaesthesia but had cardiac arrest following difficult intubation and subsequently confirmed dead. Thirty six "unstable" eclamptic women with mean age

of 23(3.4yrs) were recruited to this prospective observational study. Majority of the parturients were nulliparous (14/38.9%) and unbooked (32/88.9%). The Mean Baseline Systolic Blood Pressure, Diastolic Blood Pressure and Fetal Heart Rate were 163.70(37.19), 98.21(15.65) and 129 (11.38) respectively. Although, induction of subarachnoid block was difficult in one patient, it was successful in all the patients. Median and range of sensory block level before the start of the surgery was T6 (T6-T4). Median Apgar score at 1 and 5 minutes were 7 and 9 respectively as shown in Table 1.

Table 2 showed complications of eclampsia during presentation in the hospital and prior to the induction of subarachnoid block. Twelve parturients had difficult airway. Also twelve patients had pulmonary oedema. Ten parturients were unconscious as at the time subarachnoid block was performed. Thrombocytopenia was found in five parturients. Raised intracranial pressure was found in three patients. Only two patients had uncontrollable convulsion and another one with uncontrollable restlessness. None of the patients had episode of hypotension. There was no need to convert to general anaesthesia. Following the induction of spinal anaesthesia, none of the parturients further convulsed on the operating table or postoperatively. Six of the unconscious patients became conscious within the next 72 hours after cesarean section while the rest became conscious before discharge. Average hospital stay was 16 days.

**Table 1: Parturients' Characteristics and Neonatal Outcome.**

Age		23(3.4) yrs
Parity		
0		14
1		9
2		9
3		4
Booking Status		
Unbooked		32
Booked		4
Mean Baseline		
Systolic BP		163.70 (37.19)
Diastolic BP		98.21 (15.65)
Fetal Heart Rate		129 (11.38)
Subarachnoid Block		
Successful		36
Fail		0
Sensory Level		T6 (T6-T4)
Mean Total Fluid Given		2.1 (0.9L)
Mean Total Blood Loss		0.65 (0.25L)
Apgar Score at 1 min	7	16 Neonates
	8	13 Neonates
	9	7 Neonates
Apgar Score at 5 min	8	13 Neonates
	9	15 Neonates
	10	8 Neonates

**Table 2: Complications of eclampsia before subarachnoid block in these parturients.**

Complications	Number of Parturients	Percentage
Difficult Airway	12	33.33
Pulmonary Oedema	12	33.33
Unconsciousness	10	27.78
Thrombocytopenia (<70 x 10 <sup>9</sup> cells/L)	5	13.89
Respiratory Failure (RR>35 but not <8)	3	8.33
Raised ICP	3	8.33
Uncontrollable Convulsions	2	05.56
Uncontrollable Hypertension	1	02.78
Uncontrollable Restlessness	1	02.78
Difficult Spinal	1	02.78

## DISCUSSION

Eclampsia is a major contributor to maternal and perinatal mortality and morbidity in major centres including the best climates in the world.<sup>[4,11,12]</sup> According to this observational study, there is a sharp reduction in both maternal and perinatal mortality and morbidity with the use of subarachnoid block in parturients with unstable eclampsia billed for emergency Caesarean section. No mother or neonate had morbidity or mortality among the patients studied. Most of the eclamptic patients presenting in our centre have one complication or the other as a result of delayed referral and presentation in our centre.<sup>[16]</sup> Apart from this, most of them are unbooked primigravidas with many episodes of seizure right from referral centres. This late referral and presentation had been reported to be due to illiteracy and poverty coupled with inefficient transport system.<sup>[16]</sup>

Before now, general anaesthesia had been the best choice of anaesthesia for eclamptic parturients scheduled for Caesarean delivery. This choice of anaesthesia had associated with one postoperative complication or the other. According to this present study twelve parturients with one or more other complications had difficult airway. These patients had swollen tongues and Mallanpati more than or equal to three. It has been reported, especially during laryngoscopy, that general anaesthesia may be associated with difficult intubation in the presence of swollen face, tongue and neck caused by severe tissue oedema in eclamptic.<sup>[11,12,20,21,22]</sup> Hypoxia during difficult intubation had been reported to worsen hypoxic brain injury in eclampsia and caused post operative respiratory failure or delayed recovery from anaesthesia.<sup>[11,12,22,23]</sup> Therefore, it may be reasonable to avoid general anaesthesia in eclamptic where possible.

Haemodynamic response to laryngoscopy and intubation can cause precipitation of adverse cardiovascular accident (intracranial haemorrhage) and worsen delayed recovery from anaesthesia.<sup>[11,12]</sup> The issue of drug interactions may pose a big problem in this set of pregnant women. In general anaesthesia, drug-drug interaction is a major burden. Magnesium sulphate used to manage convulsions in eclampsia can potentiate effect of muscle relaxant.<sup>[11,23,24]</sup> Reduction in renal clearance and metabolism of drugs as a result of impaired renal and liver functions can cause toxicity of magnesium sulphate

and anaesthetic drugs which may be hazardous in these patients.<sup>[11,23]</sup> According to this present study, twelve parturients had pulmonary oedema. Out of these, three parturients had respiratory failure.

A fluid restriction was observed for all patients in order to prevent pulmonary oedema or worsening pulmonary oedema. The decreased plasma oncotic pressure and increased pulmonary permeability in eclampsia may further increase the risk of pulmonary oedema.<sup>[25]</sup> Pulmonary oedema and aspiration of gastric fluid can cause respiratory failure post operatively following general anaesthesia.<sup>[12,24]</sup> Fulminant pulmonary oedema, drug-drug interaction, prolonged half-life of drugs and reduced renal clearance can result in delayed recovery and they are major causes of morbidity or mortality in eclampsia.<sup>[12,25]</sup> Theoretical difficulty in positioning eclamptic patients for spinal anaesthesia because of unconsciousness, restlessness coupled with possibility of convulsions occurring during induction of spinal anaesthesia make many anaesthetists to jettison option of spinal anaesthesia during Caesarean delivery.

Two informed anaesthetic assistants used to place the patients in position for subarachnoid block and a minimum of senior registrar anaesthetist performed the spinal anaesthesia. As a result of this, there was no incidence of failed spinal anaesthesia in this present study. Two patients in this study had uncontrollable convulsions prior to anaesthesia and surgery. Paramore et al had suggested the use of spinal anaesthesia in controlling convulsions in unstable eclampsia.<sup>[14,15]</sup> He actually managed a parturient with repeated convulsions.<sup>[14]</sup> He was of the opinion that administration of spinal anaesthesia could abort repeated convulsions in the patient.<sup>[14]</sup> It was reported that spinal anaesthesia actually aborted the convulsions and thereafter the woman delivered normally.<sup>[14]</sup> None of our patients had any episode of convulsion intraoperatively.

According to this present study, three parturients had raised intracranial pressure. Cerebellar tonsillar herniation following raised intracranial pressure had been the most fearful reason why most anaesthetists footdrag in administering subarachnoid to eclamptics.<sup>[11,12,13]</sup> In a bid to avoid coning in patients with raised intracranial pressure, a smaller needle 27 G

was used by the supervising consultant anaesthetist. This help in facilitating fast smooth one touch, non touch spinal technique. Patients were made to lie down for some period postoperatively. All these measures culminated in reducing loss of cerebrospinal fluid and coning. The same precautions were also observed for patients with thrombocytopenia. In our study, the five patients who had low platelet counts were handled by consultant anaesthetist. Smaller spinal needles (26, 27G) were equally used for these group of eclamptics. Spinal haematoma, from thrombocytopenia, are all points of concern to the anaesthetists.<sup>[7,8,19]</sup>

Trainee anaesthetists are to stay off administration of subarachnoid block in patients with raised intra cranial pressure and thrombocytopenia. Epidural needle or bigger spinal needle are not advisable in patients with thrombocytopenia because of complication of spinal haematoma which can result in patient having paraplegia. A paraplegic patient with spinal haematoma may require laminectomy.

Subarachnoid block has been reported to be useful in stable eclamptic patients. From this study it is clear that spinal anaesthesia is useful in most of the selected cases of unstable eclampsia but with a great cautions as explained above.<sup>[26,27,28]</sup> Spinal anaesthesia in most selected cases of unstable eclampsia is practicable and can lead to reduction in incidence of aspiration pneumonia, awareness, difficult intubation, hypoxia, PONV as well as reduction in phase 1 recovery time.<sup>[11,12,23,24,29]</sup>

In this present study, only one patients had persistent restlessness out of three patients who presented with restlessness despite treatment with magnesium sulphate. That spinal anaesthesia can be used in a restless eclampsia has been reported.<sup>[24]</sup>

All neonates delivered had good Apgar Score. There was no perinatal morbidity and mortality. Basu et al reported that 11 out of 30 neonates in eclamptics with general anesthesia group had resuscitation with Ambubag-mask ventilation compared to 2 in spinal anaesthesia.<sup>[17]</sup> After comparing neonatal outcome in women with severe pre-eclampsia undergoing Caesarean section under spinal anaesthesia, Dasqu found that neonates in parturients with spinal anaesthesia had good recovery scores.<sup>[30]</sup> This was in accordance with our study where none of the neonates in this observational study had 1 min and 5 min Apgar score of less than 7.

## CONCLUSION

It is concluded that in most selected cases of unstable eclampsia, spinal anaesthesia can be attempted by any senior anaesthetist. This is especially important in developing countries with limited facilities for post operative ventilation in Intensive Care Unit or where neonatal intensive care is poorly equipped or nonexistent. Further randomized controlled study is

necessary to further establish the benefits of spinal anaesthesia in unstable eclamptic patients.

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