

Pattern and outcome of Anaesthesia techniques in patients presenting with pre-eclampsia/eclampsia for caesarean section in a Teaching Hospital

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Abstract

Objectives: To review the pattern of anaesthesia techniques among pregnant women with pre-eclampsia or eclampsia who had caesarean section in our health facility and their management outcome.

Methods: A retrospective analysis was undertaken for all the obstetric patients with pre-eclampsia or eclampsia who had caesarean sections under different types of anaesthesia in a tertiary hospital between January 1st 2014 and December 31st 2018.

Results: A total of one hundred and eighty-two patients who presented with pre-eclampsia and eclampsia had emergency caesarean sections. Of these, 134 (74%) were diagnosed pre-eclampsia and 48 (26%) had eclampsia. The mean age was 29.71±6.40years. Subarachnoid block was performed in 165 (90.66%), 15 (8.24%) had general anaesthesia relaxant technique, and the remaining two (1.10%) had local anaesthetic infiltration ± total intravenous anaesthesia. Peri-operative anaesthetic complications encountered included post-anaesthetic shivering 19 (10.44%), hypotension 16 (8.79%) and nausea 1 (0.55%). Incidence of death on table was six percent (11 patients). Among those that died, the anaesthesia technique was general anaesthesia in eight cases (73%) while three patients (27%) had subarachnoid blocks.

Conclusion: Spinal anaesthesia was the most commonly used anaesthesia technique in this centre for patients with pre-eclampsia and conscious eclamptic patients, and it proved to be a relatively safe technique with few mortality.

Keywords: Anaesthesia techniques, Pre-eclampsia, eclampsia, Management Outcome.

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Modèle et résultat des techniques d'anesthésie chez les patients présentant une pré-éclampsie/éclampsie pour une césarienne à l'hôpital universitaire

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Résumé

Objectifs de l'étude : Examiner le schéma des techniques d'anesthésie chez les femmes enceintes atteintes de pré-éclampsie ou d'éclampsie qui ont subi une césarienne dans notre établissement de santé et les résultats de leur prise en charge.

Méthode de l'étude : Une analyse rétrospective a été entreprise pour toutes les patientes obstétricales atteintes de pré-éclampsie ou d'éclampsie qui ont subi une césarienne sous différents types d'anesthésie dans un hôpital tertiaire entre le 1er janvier 2014 et le 31 décembre 2018.

Résultat de l'étude : Au total, cent quatre-vingt-deux patientes qui se sont présentées avec un pré-éclampsie et une éclampsie ont eu une césarienne en urgence. Parmi celles-ci, 134 (74 %) avaient reçu un diagnostic de pré-éclampsie et 48 (26 %) avaient une éclampsie. L'âge moyen était de $29,71 \pm 6,40$ ans. Un bloc sous-arachnoïdien a été réalisé chez 165 (90,66 %), 15 (8,24 %) avaient une technique d'anesthésie générale relaxante, et les deux autres (1,10 %) avaient une infiltration d'anesthésique local ± une anesthésie intraveineuse totale. Les complications anesthésiques péri-opératoires rencontrées comprenaient les frissons post-anesthésiques 19 (10,44 %), l'hypotension 16 (8,79 %) et les nausées 1 (0,55 %). L'incidence du décès sur la table était de six pour cent (11 patients). Parmi ceux qui sont décédés, la technique d'anesthésie était l'anesthésie générale dans huit cas (73%) tandis que trois patients (27%) avaient des blocs sous-arachnoïdiens.

Conclusion : La rachianesthésie était la technique d'anesthésie la plus couramment utilisée dans ce centre pour les patientes atteintes de pré-éclampsie et les patientes éclamptiques conscientes, et elle s'est avérée être une technique relativement sûre avec peu de mortalité.

Mots-clés : Techniques d'anesthésie, pré-éclampsie, éclampsie, résultat de l'administration

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INTRODUCTION

Pre-eclampsia and eclampsia are recognized hypertensive disorders of the second half of pregnancy. Pre-eclampsia is a hypertensive disorder of pregnancy in which there is hypertension (systolic blood pressure 140mmHg and a diastolic blood pressure 90mmHg and proteinuria of 300gram or more occurring after 20weeks of gestation, measured on two different occasion at least 4 to 6 hours apart in a woman previously known to be normotensive (1, 2). Severe pre-eclampsia supervenes when the systolic blood pressure becomes 160mmHg and or diastolic blood pressure 110mmHg in the presence of proteinuria with some other clinical features such as headache, epigastric pain /right hypochondrial tenderness, photophobia e.t.c.. The clinical presentation may be influenced by the severity of the illness and modified by pre-existing co-morbidity and treatment. They are challenging complications of pregnancy. They are also associated with increased maternal and fetal morbidity and mortality, as well as high demands on health resources. Eclampsia is a severe complication of pre-eclampsia that manifest with one or more generalized seizure and or coma in the absence of other neurologic conditions before, during or after labor (3).

Risk factors for eclampsia include pre-existing hypertension or renal disease, previous severe preeclampsia or eclampsia, nulliparity, multiple gestation, molar pregnancy, or eclampsia, non -immune hydrops fetalis, and systemic lupus erythematosus (4). The differential diagnosis includes hypoglycemia, hyponatremia, hypocalcemia, epilepsy, cerebral malaria, cerebral infarction, cerebral hemorrhage, subarachnoid hemorrhage, cerebral edema, cerebral abscess, malignant hypertension, benign and malignant cerebral tumors, and viral, bacterial, parasitic infestations (5,6).

Due to the high risk of morbidity and mortality that hypertensive disorders of pregnancy pose to both the foetus and the mother, delivery as soon as feasible is the standard treatment. Thus, many of them will require caesarean section under anaesthesia. In the past, spinal anaesthesia was considered unsafe for pre-eclamptic and eclamptic parturients undergoing caesarean sections due to the risk of hypotension and the uteroplacental hypoperfusion (5, 6). More recent studies have demonstrated that spinal anaesthesia is a safe technique as post-spinal hypotension is less common, less severe

and easier to treat compared with otherwise healthy women (7,8). However, the fear of possible conning from raised intracranial pressure (ICP) in this group of patients, limit the use of spinal anaesthesia techniques (6).

When there is an immediate threat to the mother or fetus e.g placental abruption with severe pre-eclampsia [Category 1], anaesthesia technique with rapid onset of action, control over the airway and potential for less hypotension should be considered. General anaesthesia provides this benefit making it better than regional anaesthesia (RA) (9,10). However, a high degree of anticipation of difficult endotracheal intubation must be considered due to increased airway oedema, short neck and large breasts that can obscure the laryngoscopic view during intubation. It is therefore, essential to keep the difficult airway cart available while planning general anaesthesia. Similarly, with the pre-existing elevated blood pressure, techniques to attenuate the hemodynamic response to intubation with minimal effects on the fetus should be considered (e.g intravenous 0.5mg/kg esmolol, 1-2mg/kg plain lidocaine e.t.c administered 1-2 minutes prior to intubation). When there is a maternal or fetal compromise, but not immediately life threatening [Category 2], the management depends on the availability of time to perform or activate RA (9, 10). Subarachnoid block with intrathecal opioid or combined spinal epidural (CSE) anesthetic technique may be considered over general anaesthesia when there is no maternal or fetal compromise but there is need for early delivery of the baby [Categories 3] (9, 10).

The administration of central neuraxial anesthesia minimizes the risk of neonatal exposure to potentially depressant anesthetic drugs, fewer life-threatening perioperative airway and respiratory complications, better pain control than intravenous narcotics, earlier recovery of bowel function, promotes early ambulation, reduces the incidence of maternal thromboembolism and promote a faster time to discharge home (9).

In fact, there are many factors to consider in the anaesthetic techniques to deploy in pre-eclamptic and eclamptic women undergoing caesarean section. Several authors have reported the safety and efficacy of spinal, epidural and CSE anesthesia for caesarean section (CS) delivery in women with pre-eclampsia (7, 8, 11). In the study by Okafor UV et al on retrospective study on the management outcome of anaesthesia among pre-eclamptic/ eclamptic parturients

presenting for caesarean delivery in Enugu (Nigeria), overall deliveries were 3, 926 with 4, 036 births, only 898 women had abdominal delivery (12). Among the parturients that had abdominal deliveries, 125 (14%) presented with pre-eclampsia/ eclampsia in which 103 (82.4%) had emergency caesarean section while 22 (17.6%) elective CS. General anaesthesia was mostly used 116 (92.8%) and subarachnoid block was employed only in nine patients. The major indication for caesarean sections was severe pre-eclampsia or eclampsia in patients with unfavourable cervix (68%). A total of six maternal deaths were recorded among those who experienced general anaesthesia giving a case fatality rate of 5.2% or 4.8% of caesarean deliveries. Possible causes of death included anaesthesia in three patients, cerebrovascular accident and pulmonary oedema in two and intraoperative haemorrhage in one. There were thirteen still births and ten neonatal deaths. Conclusion from the study was that the use of spinal anaesthesia should be encouraged in view of recent favourable reviews and cheaper cost. Furthermore, conclusion drawn from a prospective study on analysis of general versus spinal anaesthesia for caesarean delivery by Ravi T et al in Asia among sixty parturient with similar socio-demographics who had been diagnosed to have severe pre-eclampsia, also support that spinal anaesthesia should be considered as first choice of anaesthesia technique for severe pre-eclamptic parturient (13).

This study aims to describe the different anaesthesia techniques and their outcomes among pregnant women with pre-eclampsia or eclampsia who had abdominal deliveries for pre-eclampsia or eclampsia in Our tertiary health facility.

MATERIALS AND METHODS

Hospital Research Ethics Committee (HREC) approval number OOUTH/HREC/455/2021AP was obtained from the hospital before the conduct of this study. A descriptive retrospective study was undertaken for all the obstetric patients who had caesarean sections for preeclampsia or eclampsia under various types of anaesthesia. The study was conducted by the Department of Anaesthesia and Intensive Care. The institution serves as a referral centre to all the suburbs adjoining villages and towns, primary and secondary health centres as well. It is a 300-400 beds hospital.

Medical records of all the pregnant women presenting with pre-eclampsia and

eclampsia (between January 1st 2014 and December 31st 2018 inclusive) and had caesarean sections in our health facility were critically reviewed and their relevant data were included in the study. The data excluded were for women with pre-eclampsia/ eclampsia who eventually delivered their baby (ies) per vaginam, those with missing case records, and those with inappropriate or incomplete information. Data were obtained from obstetric theatre records, patients' anaesthetic charts and case files. Data collected included: age, gravidity, booking status, incidence of pre-eclampsia and eclampsia, American Society of Anaesthesiologist of physical health status (ASA), nature of surgery (electives or emergency), duration of surgery, time of the day the surgery was performed (working or call hours), anaesthesia techniques, anaesthesia complications and outcome of management. Relevant clinical data obtained were entered into a proforma designed for the study. Data obtained were analyzed using Statistical Package for Social Sciences (SPSS) version 20 Chicago IL.USA. Results were presented descriptively, tables and figures.

RESULTS

The records of 182 patients were reviewed. The age ranged was from 16 to 44 years with a mean age was 29.71 ± 6.40 years. Table 1: shows the clinico-surgical parameters of the patients. One hundred and thirty-four (74%) pregnant women presented with pre-eclampsia while forty-eight (26%) of them were diagnosed to have eclampsia during the study period.

Majority (96, 53%) of the patients were primigravidae. A total of one hundred and fifty-seven patients (86.26%) were un-booked for antenatal care at the hospital, out of which 48 (26.7%) were eclamptic patients and 109 (60%) were pre-eclamptic women. Some of the patients have single risk factors (101, 55.50%) while others have multiple risk factors (81, 44.50%) that increase the development of pre-eclampsia/ eclampsia. The factors consider in this study included primigravida, age more than 40 years, multiple gestations, previous history of pre-eclampsia/ eclampsia, presence of comorbidity such chronic hypertension, migraines, diabetes mellitus, sickle cell diseases. Table 2 shows the Anaesthetic indices of the Patients.

All the caesarean sections were performed as emergencies. The mean duration of the surgery was 58.50 ± 23.79 minutes. There was no postanaesthetic complication recorded in 64 patients (80.0%) while thirty-six patients

(20.0%) developed post-anaesthetic complications as shown in table II below. One hundred and seventy-one patients (94.00%) were discharged to the post-natal ward in stable clinical state (even though two of them required admission into intensive care unit) while eleven patients (6.04%) died on the operating table as shown in table I.

There was total of 196 new born, out of which 50 babies were born from eclamptic mothers and 146 babies from pre-eclamptic mothers. Twenty sets of twins were delivered, i.e from 18 pre-eclamptic and 2 eclamptic mothers. Also there were two sets of triplets from two pre-eclamptic mothers but none from the eclamptic mothers. There were one hundred and seventy singletons, forty-six were from eclamptic mothers while 124 singletons were from pre-eclamptic mothers. Table 3 shows that higher APGAR score were obtained from babies delivered by caesarean section under subarachnoid block compared to general anaesthesia. Figure 1 shows the Frequency distribution of anaesthesia technique against severity of the diseases.

DISCUSSION

Findings from this study showed that the incidence of parturients presenting with pre-eclampsia and eclampsia for caesarean section was observed to be most common (23.6%) among young parturient especially age group between 24-27years. Also majority (53%) were primigravidae who do not had any booking experience for ante-natal care. Further observation showed that all the eclamptic women were un-booked and had emergency caesarean section. This finding agreed with the previous studies where over 90% of the eclamptic patients were un-booked (14,15). This observation showed that lack of experience in pregnancy might play a role in the burden of this condition. Therefore, all primigravidae should develop good health care-seeking behavior and regular antenatal visit to ensure proper decision making. Similar finding was observed in the study by Sotunsa et al (15) on retrospective analysis of eclampsia as a major cause of maternal and perinatal mortality in Sagamu were 78.6% and these patients were primigravidae.

Primigravida is one of vital risk factors associated with pre-eclampsia/eclampsia (14,16), although, women who had pre-eclampsia in a previous pregnancy is seven times more likely to develop pre-eclampsia in later pregnancy (17). Obesity/ overweight parturient

are more likely to have pre-eclampsia in more than one pregnancy (17). Age: women older than 40years old are at higher risk (18). Other factors includes: disease conditions such as chronic elevated blood pressure; migraines; diabetes mellitus, multiple gestation, African-American ethnicity et.c (19, 20). In this study, those who have single factors for pre-eclampsia/eclampsia were 101 patients while those with multiple factors were 81 patients.

The role of Anaesthesiologist in the management of pre-eclampsia/ eclampsia is to help the obstetrician to control the patient's blood pressure, provide labor analgesia and safe anaesthesia for cesarean section. Also to control and prevent further convulsions, establish a clear airway and prevent major complications in eclamptic women. Time of presentation (working hours/ call-hours) of patients to hospital on the choices of anaesthesia techniques coupled with patient's socio-economic factors (poverty, logistics and literacy) often posed challenges to obstetricians and anaesthetists when faced with patients who may lose significant volume of blood (e.g higher multiparity, multiple gestations and previous CS scar) perioperatively in setting where crossmatched blood and colloid availability is limited (21). Studies have shown that the day of the week or time of emergency cesarean section had no influence on the anaesthesia service as measured by the decision delivery interval (22). However, time of patient's presentation is not the key important variable; but neonatal and parental outcome in this study.

There are controversies surrounding the appropriate anaesthetic technique for pre-eclamptic and eclamptic parturients. Safety of spinal anaesthesia was studied by Razzaque et al and Afolayan et al and they concluded that spinal anaesthesia is safer than general anaesthesia for eclamptic women who are conscious (23, 24). This finding is in concordance with our findings as mortality was more in general anaesthesia (47%) as compared to in subarachnoid block (SAB) (1.8%). The increase in mortality in general anaesthesia may however be associated with severity in the pre-operative clinical state, and presence of poorly controlled pre-existing medical conditions. On the other hand, study by Adamu et al showed that general anaesthesia was the most (87.18%) common anaesthetic technique employed for eclamptics, because most of the patients that presented to their centres were either unconscious or presented late (25). The high case fatality rate for eclampsia managed in ICU as demonstrated by Adamu et al's study

could be reduced by regular public enlightenment on eclampsia in our environment and also to encourage a good team work among the members (25).

A prospective cohort comparative study by Aya et al established that pre-eclamptic parturient women experience less hypotension when compared to normal parturients (8). This finding resonates with the low incidence of hypotension of 8.97%; though we did not find out the incidence of hypotension in non- eclamptic and pre-eclamptic parturients in this study. The safety of spinal, epidural and combined spinal epidural (CSE) anesthesia for caesarean section delivery in women with pre-eclampsia has been described (11). It is noteworthy that although, the use of general anesthesia in such high risk parturient may not only further increase the blood pressure, but the exaggerated cardiovascular response to intubation may lead to increased maternal intracranial pressure, cerebral hemorrhage and cardiac failure with pulmonary oedema thereby resulting in adverse maternal and fetal outcome (26,27). Similarly, an exaggerated pressor response to intubation may also increase the maternal plasma catecholamine concentration, which in turn leads to uteroplacental vasoconstriction and adverse neonatal outcome (28,29,30). Therefore, it important to suppress these pressor responses by administration of intravenous drugs such as lidocaine, esmolol, ultra-short acting opioid e.t.c. prior intubation.

Sufficient placental blood flow is mandatory for the well- being of the fetus. Balance between uterine perfusion pressure and uterine vascular resistance should be maintained. The impact of regional anaesthesia on uterine blood flow is controversial. The commonly performed regional anaesthesia among parturients with pre-eclampsia include spinal anaesthesia, epidural analgesia/anaesthesia or combined spinal epidural (CSE) anaesthesia. Regional anaesthesia may causes a decrease in plasma catecholamines level with potential to increase uterine blood flow (31). The sympathetomy effects of neuraxial block enhances intervillous blood flow in pre-eclamptic parturients by causing vasodilation of uteroplacental beds (30, 31) Anaesthetists should maintain vigilance toward the pulmonary function, urinary output, evidence of aortocaval compression and epidural-induced systemic hypotension that may lead to decreased uteroplacental blood flow. Small incremental intravenous doses (50µg) of phenylephrine may be used to treat hypotension temporarily while

additional intravenous fluid is infused judiciously.

Regional anesthesia (RA) not only avoids the maternal complications with general anaesthesia like difficult intubation, and pressor response to intubation, but also improves uteroplacental blood flow and neonatal outcome. This was observed in our study as 10.3% of babies born to conscious eclamptic mothers that had subarachnoid block (SAB) had severe birth asphyxia while 55% of neonates born to eclamptic parturient mothers who had general anaesthesia had severe birth asphyxia. Contributory factors to low Apgar Scores in eclamptic parturient could be multifactorial and these include gestational age at which the eclampsia manifested, and presence of poorly controlled pre-existing maternal medical conditions. Regional anaesthesia have been associated with better Apgar score at 1 min and 5 min compared to general anaesthesia with use of systemic opioids as intraoperative analgesia; however, long-term effects on fetal brain development is not clear (32). It was surprising that neither epidural analgesia/ anesthesia nor combined spinal epidural anaesthesia was employed for any of our patients in this study, despite the numerous benefits it offers. These benefits include modification and extension of block through indwelling catheter, possibility of top up doses, with maintenance of hemodynamic stability as compared with spinal anesthesia. This may probably be due to the fact that most of these patients were un-booked and were seen during the call hours as emergency caesarean. Furthermore, the technique of epidural blocks could be time consuming and may be technically difficult in inexperienced hands and the patient is not properly positioned due to severe labour pains.

One of the complications of severe pre-eclampsia/ eclampsia that may either be of cardiogenic or non-cardiogenic origin is pulmonary oedema (33). Cardiogenic pulmonary oedema is due to impaired left ventricular systolic or diastolic function. The presence of low cardiac output (CO), high pulmonary capillary wedge pressure (PCWP), high central venous pressure (CVP), and high systemic vascular resistance (SVR) characterizes systolic dysfunction. On the other hands, diastolic dysfunction is associated with normal or high CO, high PCWP, and a normal SVR. Non-cardiogenic pulmonary oedema results from such factors as increased capillary permeability, iatrogenic fluid overload, an imbalance between colloid osmotic pressure (COP) and hydrostatic pressure, or a combination

of these factors.

In this study, pulmonary oedema was the most common cause of death among parturient with severe pre-eclampsia or eclampsia, followed by pulmonary embolism and disseminated coagulopathy. Women with pre-eclampsia are at increased risk of thromboembolic disease but this can be ameliorated. For the preventive measure against emboli phenomenon, we recommend that before delivery, all patients should have anti-embolic stockings or low molecular weight heparin while immobile. Following delivery, low molecular weight heparin (dose adjusted on early pregnancy weight) should be given daily until the patient is fully mobile (seven days if delivered by Caesarean section). Low molecular weight heparin should not be given until 4-6 hours after spinal anaesthesia. Also when indicated an epidural catheter should be left in place for at least 12 hours after low molecular weight heparin administration. Following removal of an epidural catheter low molecular weight heparin should not be given for 4-6 h (34). Prevention of overzealous preloading with intravenous fluids and meticulous monitoring of in-put/out-put fluids maintenance will go a long way to minimize iatrogenic fluid overload which may precipitate pulmonary oedema.

CONCLUSION

The common anaesthetic techniques used for pre-eclamptic and eclamptic parturient mothers going for caesarean section in our health facility were subarachnoid blocks, general anaesthesia relaxant technique, and general anaesthesia spontaneous with or without local anaesthetic infiltration but spinal anaesthesia was the most used. The anaesthesia outcome in the patients were relatively good because majority of the patients presented in conscious state with few of them (the eclamptic parturient) being drowsy, so spinal anaesthesia could still be employed if there is no other contra-indications. Spinal anaesthesia is a relatively safe anaesthetic technique for parturient with pre-eclampsia requiring caesarean section. It could be considered as first choice of anaesthetic technique in a pre-eclamptic patient and with careful patient selection in conscious eclamptic parturients for lower segment caesarean section. Also, epidural anaesthesia can as well be given safely if the patient is conscious, seizure free with stable vital signs with no signs of raised intracranial pressure (ICP) or any other contraindications.

Limitations

Some limitations are notable in this study. This was a retrospective study and it was not possible to have full detailed information about the patients' characteristics. Among the eleven patients who died on the operation table had no definitive cause of death probably because post mortem examination was not performed for social, financial or religious reasons. Thus, the fact that the cause of the death were mere suspicious was a limitation of this study.

Recommendations

1. There is need for increased public enlightenment especially for primigravidae so as to ensure timely antenatal care booking and regular antenatal visits.
2. Improving care for women during pregnancy and around the time of childbirth to prevent and treat pre-eclampsia and eclampsia is a necessary step towards the achievement of the health targets of the Sustainable Development Goals (SDGs).

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Table 1: Clinico-Surgical parameters of the Patients

Parameter	Frequency (n)	Percentage (%)
1. Age group (Years)		
16-19	9	5.0
20-23	25	14.0
24-27	43	23.0
28-31	27	15.0
32-35	37	20.3
36-39	30	17.0
40-44	11	6.0
Total	182	100.0
2. Hours of duty when surgery was performed		
Call hours (4pm-8am)	60	33.0
Working hours (8am-4pm)	122	67.0
Total	182	100.0
3. Outcome of Surgery		
Alive	171	94.0
Intraoperative Death	11	6.0
Total	182	100.0
4. Possible causes of intraoperative death (in 11 patients)		
Acute pulmonary oedema	4	2.20
Pulmonary Embolism	4	2.20
Disseminated Intravascular Coagulopathy	3	1.60
Total	11	6.0

Table 2: Anaesthetic indices of the Patients

Parameters	Frequency (n)	Percentage (%)
1. ASA classifications		
• I E	0	0.0
• II E	39	21.0
• III E	133	73.0
• IV E	10	6.0
Total	182	100.0
2. Anaesthetic techniques		
• Subarachnoid block	165	91.0
• General Anaesthesia Relaxant	15	8.0
• General Anaesthesia Spontaneous	2	1.0
Total	182	100.0
3. Outcome of Anaesthesia		
• Uneventful	64	80.0
• Shivering	19	9.0
• Hypotension	16	10.0
• Nausea	2	1.0
Total	100	100.0

Table 3: Neonatal Outcome Using Apgar Score at 1 minute post-delivery

APGAR	General Anaesthesia (GA)			Subarachnoid block (SAB)		
	0-3	4-6	7-10	0-3	4-6	7-10
Pre- Eclampsia	0	4	10	0	20	112
Eclampsia	11	2	7	3	9	18

KEY:

GA General Anaesthesia

SAB Subarachnoid block

APGAR Neonatal Resuscitation Scoring System. 0-3=Severe birth asphyxia

4-6 = Mild –Moderate birth asphyxia

7-10= GOOD, HEALTHY

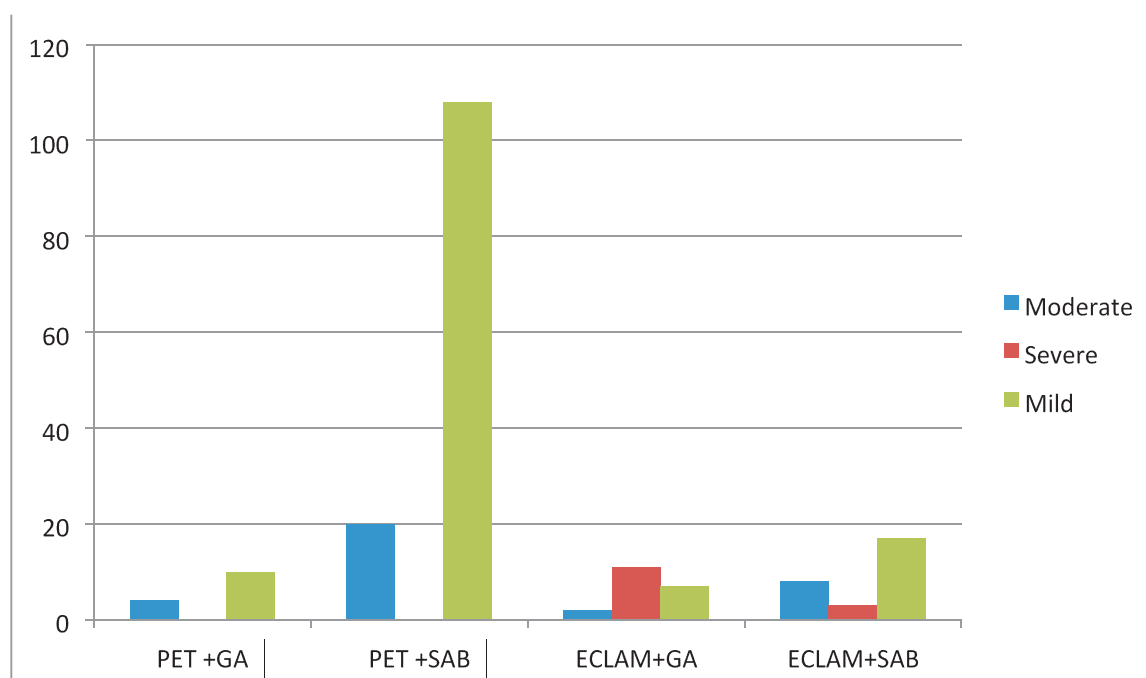


Figure 1: Frequency distribution of anaesthesia technique against severity of disease

? Total number of newborn was 197

? Total number of newborn with severe perinatal asphyxia (APGAR <= 3/10) was 14

? They were all by mothers with eclampsia

? 21% (3 neonate) were born to mother who had SAB

? 78% (11 neonate) were born to mothers who had GA