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EFFECT OF SPINAL ANAESTHESIA IN THE PREGNANT WOMEN WITH PREECLAMPSIA UNDERGOING CAESAREAN SECTION

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Abstract:

Background: Preeclampsia is a condition in pregnancy characterized by high blood pressure, sometimes with fluid retention and proteinuria.
Aim: The aim of present study to evaluate the effect of spinal anesthesia in the pregnant women with preeclampsia undergoing caesarean section (c-section).
Materal and methods: The present study was a hospital-based retroprospective study conducted in October 2021between March 2022. In the present study, the around 20 patients with mild preeclampsia were enrolled. Clinical parameters along with some laboratory parameters were considered during patient enrolment in the study. The patient age, gender, body mass index (BMI), gestational age, parity, and gravidity were also noted. Hemodynamic parameters, myocardial function mesurements, serum parameters, and fluid intake and outcome were considered in this study.
Results: Their systolic blood pressure (SBP) and diastolic blood pressure (DBP) were ranges from 150 ± 15 mmHg and 115 ± 7 mmHg, respectively. Symptoms like epigastric pain, visual disturbances and headache were absent. Urinary output, protein and dipstick were >500ml / 24 hr, <5g / 24 hr and 1+ / 2+, respectively. The systolic blood pressure and diastolic blood pressure was high before delivery (155 ± 5 and 120 ± 6 mmHg, respectively) as compared to the after delivery (150 ± 15 and 115 ± 7 mmHg, respectively). Cardiac index was found to be lower at before delivery [2.6 L/(min·m^2)] then after delivery [2.8 L/(min·m^2)]. While, TVRI was higher before delivery as compared to after delivery.
Conclusion: The study can be concluded as spinal anesthesia could be the safer option for c-section delivery in the pregnant women with preeclampsia.

Keywords: Blood pressure, Caesarean section, Preeclampsia, Pregnancy, Spinal anesthesia

INTRODUCTION

Pregnancy is a normal part of life with many anatomical changes, physiology and biological chemistry occurring from conception and passing on the birth of the newborn and slowing down after birth [1]. Loss of sensation and consciousness is referred to as anaesthesia [2]. The term "local anaesthesia" indicates a lack of sensation that is limited to a specific part of the body. The conduction process suppression in peripheral nerve tissue is the most prevalent cause of loss of feeling. Mechanical trauma, anoxia, and a number of chemical irritants such as alcohol or phenol can all affect nerve conduction in different ways [3]. There are three types of anesthesia *viz.*, general anesthesia, local anesthesia, spinal anesthesia [4]. The most common surgical procedure is a caesarean section (CS). In recent years, the prevalence of this operation has risen considerably over the world. The use of anaesthetic procedures has a significant impact on all aspects of patient care [5]. Based on the preoperative history and physical examination, individuals perioperative management need to be required [6]. Modern anaesthetics drugs (desflurane, sevoflurane or propofol, and remifentanil) allow for quick recovery and early mobilisation post-surgery. Prior to the onset of problems, adequate monitoring, such as intraarterial blood pressure monitoring and repeated blood gas analyses, enhances safety of patients [7].

In the United States, the caesarean rate has been estimated to be as high as 65%. The best anaesthetic for caesarean delivery has long been discussed. Spinal anaesthesia has traditionally been considered the best option for simple elective caesarean deliveries since it is simple to execute and eliminates the hazards of challenging aspiration and intubation [8]. Because of its demonstrated efficacy, predictability, greater patient

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satisfaction, and low complication rate, spinal anaesthesia remains a vital aspect of modern anaesthesia treatment [9]. Health-Related Quality of Life (HRQoL) in patients who had a normal delivery was shown to be clearly distinguishable from HRQoL in women who had a caesarean section (CS) [10]. It is essential to have a better understanding of the physiology of spinal anaesthesia in order to administer it safely and effectively. Despite ongoing interest and research into the effects of spinal anaesthesia on several organ systems, it is still unknown exactly how and where local anaesthetics adhere to generate spinal anaesthesia [11].

The practise of injecting anaesthetic medications into the subarachnoid space to temporarily disable the sensory and motor capabilities of many groups of spinal nerves is known as spinal anaesthesia. For caesarean sections, spinal anaesthesia has received much interest. The change in mindset is due to a greater understanding that regional block procedures are safer for both the mother and the newborn [12]. The benefits of spinal anaesthesia include its simplicity; it is simple to perform, has a rapid start of effect, takes just a tiny amount of anaesthetic agent, reliability, minimum foetal exposure to medicines, patients' understanding of the risks of aspiration, and it allows for early breast-feeding [13]. Potential hypotension, intrapartum nausea and vomiting, headaches in cases of dural puncture, and a short duration of action are all drawbacks of spinal anaesthetic [5].

However, spinal anaesthesia for caesarean birth has been linked to a high number of problems, which have been documented in up to 83% of cases [13]. Although having low comparative risk of mortality of up to 16.7% when compared to general anaesthesia, spinal anesthesia (SA) is nevertheless associated with a number of adverse effects, the most common of which is hypotension, which occurs in 15–46.8% of cases. Low uterine perfusion is a well-known side effect of mother hypotension [14]. CS is a common surgical operations in the world, with 80–90% of them occurring under spinal anaesthetic. Mother hypotension is a serious impediment during the procedures, with a 60–70% occurring chance. Preoperative hypertension, type of anaesthetic, age, and newborn weight are all major risk factor for hypotension [15]. Due to circumstances linked with caesarean procedure indications and the extra stress of anaesthesia, infants born through cesarean delivery are more likely to suffer from birth asphyxia. When comparing infants born by cesarean delivery under general anaesthetic vs babies born under regional anaesthetic, birth asphyxia, as shown by a poor APGAR score, is more likely [16]. With this background, we aim to evaluate the effect of spinal anesthesia in the pregnant women with preeclampsia undergoing caesarean section.

METHODOLOGY

Ethical permission and individuals enrolment

The present study was a hospital-based retroprospective study conducted in October 2021 between March 2022. In the present study, the around 20 patients with mild preeclampsia were enrolled.

Surgery methods

Patients were placed on the left lateral decubitus with a left uterine removal. Patients were placed lying on a surgical table with a 15 ° left inclination. Prior to the implantation of spinal anesthesia, routine monitoring was performed. With an 18-G cannula infused into a vein, Ringer's lactated solution (1200-1500ml) was infused for 15 minutes. Spinal anesthesia, namely fentanyl and hyperbaric bupivacaine, was given by intrathecal injection. In the event of hypotension, ephedrine was administered. Pethidine (30mg) and atropine (0.1 mg/kg) were given when tremors and bradycardia were reported. After anesthesia, a general incision is made in the lower abdomen. All surgical births are performed by an MD specialist (obstetrician). The newborn care team was also kept ready before surgery. The placenta is removed directly. The layers of the visceral peritoneum were joined and the uterus was cut at the closing of the two layers. Continuous suturing (1-0 polyglycolic acid) was performed.

Study parameters

Clinical parameters such as systolic and diastolic blood pressure (mmHg), epigastric pain, visual disturbances, headache along with some laboratory parameters such as urinary output, urinary protein, urinary dipstick were considered during patient enrolment in the study. The patient age, gender, gestational age, body mass index (BMI), parity, and gravidity were also noted. Hemodynamic parameters, myocardial function mesurements, and serum parameters such as kidney function test were considered in this study. Fluid intake and outcome were also measured.

Statistical analysis

The statistical analyses were accomplished via GraphPad Prism 5 software. All values were represented as mean ± standard error. The data were analyzed using one-way analysis of variance (ANOVA) followed by a Dunnett multiple comparison test. The p value less than $P<0.05$ was considered statistically significant.

RESULTS

In the present study, women with preeclampsia (n=20) undergoing cesarean section delivery using spinal anesthesia were enrolled. The difference between mild and severe preeclampsia is depicted in the Table 1. Their systolic blood pressure (SBP) and diastolic blood pressure (DBP) were ranges from 150 ± 15 mmHg and

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115 ± 7 mmHg, respectively. Symptoms like epigastric pain, visual disturbances and headache were absent. Urinary output, protein and dipstick were >500ml / 24 hr, <5g / 24 hr and 1+ / 2+, respectively.

Table 1. Differences between mild and severe preeclampsia

Parameters	Mild	Severe
Clinical parameters		
Systolic blood pressure	140-160 mmHg	≥ 160 mmHg
Diastolic blood pressure	90-110 mmHg	≥ 110 mmHg
Epigastric pain	-	+
Visual disturbances	-	+
Headache	-	+
Laboratory parameters		
Urinary output	>500ml / 24 hr	≤500ml / 24 hr
Urinary protein	<5gm / 24 hr	≥5 gm / 24 hr
Urinary dipstick	1+ / 2+	3+ / 4+

-: Absent, +: Present

The average ages and a BMI of enrolled women were 34.6 ± 0.52 years and 30.42 ± 0.83, respectively. The gestational age, parity and gravidity were 37.03 ± 0.51 weeks, 2.00 ± 0.48, and 2.50 ± 0.32, respectively. The mother age and her BMI, gestational age, parity and gravidity are depicted in the Table 2.

Table 2. Demographic data of the patients operated by spinal anesthesia

Parameters	Mean ± SE
Age (years)	34.6 ± 0.52
BMI (kg/m^2)	30.42 ± 0.83
Gestational age (weeks)	37.03±0.51
Parity	2.00 ± 0.48
Gravidity	2.50 ± 0.32

BMI: Body mass index

The systolic blood pressure and diastolic blood pressure was high before delivery (155 ± 5 and 120 ± 6 mmHg, respectively) as compared to the after delivery (150 ± 15 and 115 ± 7 mmHg, respectively). Cardiac index was found to be lower at before delivery [2.6 L/(min·m^2)] then after delivery [2.8 L/(min·m^2)]. While, TVRI was higher before delivery [1000 (dyn/ s^{-1}·cm^{-5})/m^2] as compared to after delivery [800 (dyn/s^{-1}·cm^{-5})/m^2].

Table 3. Enrolled Individual's cardiovascular parameters before and after study

Cardiovascular parameters	Before delivery	After delivery
Blood pressure		
Systolic blood pressure	155 ± 5 mmHg	150 ± 15 mmHg
Diastolic blood pressure	120 ± 6 mmHg	115 ± 7 mmHg
Hemodynamic		
Cardiac index [L/(min·m^2)]	2.6	2.8
TVRI [dyn/s^{-1}·cm^{-5}]/m^2	1000	800
Myocardial function		
Impaired relaxation	55 %	60 %
Impaired contractility	50 %	40 %

TVRI: Total vascular resistance index.

Postpartum supervision

In this phase, monitoring was done of fluid intake and output, vital signs, and symptoms for at least 48 hr. The women were given more amounts of fluid injected into a vein during childbirth, childbirth, and the postpartum period. In addition, during childbirth, there is an accumulation of external fluid that leads to an increase in intravascular volume. As a result, women with eclampsia, especially those with kidney failure, those with abptio placentae, and those with pre-existing high

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blood pressure, are at greater risk for pneumonia and high blood pressure. Therefore, it is important to continue to monitor the postpartum period. With regard to intravenous fluids, after childbirth, a woman should be limited to fluids in anticipation of natural diuresis that occurs sometime 36-48 hr after delivery. The total amount of fluid (total volume of intravenous and oral fluids) should be limited to 80 ml / hr. Liquid inhibition will usually be carried out during the treatment of magnesium sulfate; however, an increase in drinking fluid may be allowed in the past when there is significant diuresis. For antihypertensive treatment, methyldopa can be withheld to favor calcium channel blockers, beta blockers, or alpha blockers.

Table 4. Postpartum management

Blood Biochemistry	Before delivery	After delivery
Kidney function test		
Serum creatinine	0.81 ±0.15	0.89 ± 0.12
Serum urea	21.56 ± 4.2	22.35 ± 5.1
Fluid intake	--	76 ml/hr
Fluid outcome	--	52 ml/hr

DISCUSSION

In healthy patients with a history undergoing caesarean section under spinal anaesthesia, prophylactic intravenous infusion of ephedrine was proven to be safe and efficient in keeping maternal blood pressure close to baseline without causing severe maternal tachycardia, hypertension, nausea, vomiting, or foetus compromise [17]. When compared to leg elevation or control, leg wrapping and thromboembolic stockings reduced the incidence of hypotension. There were several reported differences in neonatal outcomes or mother nausea and vomiting. The use of colloid and leg wrapping to increase central blood volume reduces but does not eliminate the occurrence of hypotension prior to spinal anaesthesia for elective caesarean section [18]. In severe preeclampsia, spinal anaesthesia was linked to clinically minor alterations in CO. Phenylephrine increased maternal CO, but did not restore mean arterial pressure. Oxytocin induced substantial hypotension, tachycardia, and CO increases in the short term [19].

Teoh et al [20] found that spinal anaesthetic for caesarean birth can lead to serious maternal hypotension, as well as a reduction in cardiac output (CO) and blood flow to the placenta. The most prevalent significant side effect of spinal anaesthesia for caesarean section is hypotension. The use of phenylephrine as a vasopressor infusion to promote maternal cardiovascular stabilization and infant outcome has lately gained popularity [21]. The treatment of hypotension during cesarean delivery underneath spinal anaesthesia is still debatable. Although most practitioners employ cardiac output (CO) inspection and non-invasive blood pressure monitoring which is a newer technique that could be useful in the close future. While fluid pre-loading and left uterine displacements are usually used to avoid this problem, a vasopressor is frequently required [22].

Abdissa et al, [16] reported that the incidence of low APGAR score 5 was shown to be quite considerable. A higher percentage of neonates born under general anaesthetic had a poor APGAR score 5 than those delivered under spinal anaesthesia. General anaesthesia for caesarean sections should be used rarely and only in cases when spinal anaesthesia is problematic. Low birth weight, a longer uterine incision to the baby's delivery, a pre-anesthetic lethal heart rate of less than 120, and general anaesthesia have all been linked to a low APGAR score 5 [16].

Pulse rate (PR) and pulse transit time (PTT) study could support in the expectation of hypotension after spinal anaesthesia during c-section delivery, furthering the understanding of autonomic nervous system (ANS) regulation and reaction to postural changes. These findings could point to the importance of peripheral control and blood pressure changes in avoiding the negative side effects of preventive treatment in the low-risk population [23].

Significant linkage associations in baby and mother outcomes of Apgar scores at 1 at 5 min, Apgar score 6 at 1 min, and umbilical venous pH, benefiting spinal and epidural anaesthesia over general anaesthetic, were found. Except for umbilical arterial pH, spinal and epidural anaesthesia had the highest chance of being the best for all outcomes [8]. In elective Caesarean delivery, spinal anaesthesia is linked to better newborn

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outcomes than general anaesthetic [24]. Prematurity, low birth weight, and maternal preeclampsia, all have an effect on the baby's low Apgar score at birth [25]. It is essential that difficulties influencing the baby's health care be taken into account by health-care planners for both mother and kid [25,26]. According to a study, young infants born *via* general anaesthetic have a lower Apgar score than those born with spinal anaesthetic [27].

CONCLUSIONS

The study can be concluded as spinal anesthesia could be the safer option for caesarean section delivery in the pregnant women with preeclampsia. It is not appropriate to bring up an unstable mother even if there is a fetal depression. Once the seizures are controlled, treatment for high blood pressure and hypoxia is adjusted, delivery may be delayed. Always consider prophylaxis against thromboembolism. Liquid administration and treatment of magnesium and antihypertensive with strong hemodynamic monitoring will be carried out in the postpartum period.

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