Study the effect of spinal anesthesia during cesarean Sections on mother and newborns

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ABSTRACT

The objective of the present study was to assess the effect of spinal anesthesia in pregnant women undergoing elective cesarean delivery (C-section) and on neonatal apgar score. This is a hospital-based retroprospective study. The pregnant women (n=100) enrolled during October to February and operated with C-section using spinal anesthesia were considered in the study. Apgar is the combination of initial letters of "Appearance, Pulse, Grimace, Activity, and Respiration", respectively. Apgar is a quick test performed on a baby at 1 and 5 minutes after birth. Mother health and neonatal outcome were recorded. The average ages and BMI of enrolled women were 29.50±0.82 years and 24.50±0.59, respectively. The gestational age, parity and gravidity were 38.07±0.25 weeks, 2.00±0.33, and 2.50±0.40, respectively. The postoperative hemoglobin (10.38±0.22 g/dl) and hematocrit content (34.53±0.62%) were non-significantly decreased as compared to the preoperative parameters (12.18±0.21 g/dl hemoglobin and 35.95±0.83% hematocrit). Platelet count was non-significantly increased in the postoperative stage. The blood RBCs count was significantly decreased in the post-operative stage (3.43±0.05 $x10^{12}$/L) as compared to pre-operative stage (4.92±0.25 $x10^{12}$/L). A similar trend was observed in the total white blood count. The neonatal body weight was found to be around 3256 ± 24.36 gm. The apgar scores at 1^{st} and 5^{th} min were 7.54 ± 0.31 and 8.93 ± 0.22, respectively. The spinal anesthesia was found to be better for the mother's and her recovery. Also, child showed higher apgar score, which is a major evaluation of neonatal outcome.

Keywords: Apgar score, Blood pressure, Cesarean delivery, Hemoglobin, Spinal anesthesia

الخلاصه

الهدف من الدراسه الحاليه هو تقيم تاثيرات التخدير الشوكي على النساء الحوامل اللائي يخضعن للعمليات القيصريه الاختياريه وكذلك التاثير على مؤشر ابجار للطفل الوليد .
هذه الدراسه المعتمده على بيانات المستشفى بأثر رجعي شملت مئة سيده خضعن للعمليه القيصريه بأستخدام التخدير الشوكي .
ابجار هي مختصر للحروف الأولى من الكلمات الانكليزيه التاليه
1- المظهر الخارجي Appearance
2-معدل النبض Pulse
3- التكشيره Grimace
4- الفعاليه Activity
5- معدل التنفس Respiration
حسب الترتيب .
مؤشر ابجار هو فحص سريع يتم تطبيقه على حديثي الولاده بين الدقيقه الأولى الى الدقيقه الخامسه بعد الولاده .
صحة الام ومخرجات حديثي الولاده يتم تثبيتها وتوثيقها .
معدل العمر ومقياس كتلة الجسم للنساء المشمولات بالدراسه تتراوح بين (29.5 +\- 0.8 سنه و 24.5 +\- 0.59 سنه) على الترتيب ، العمر الحملي ، عدد الولادات ، عدد حالات الحمل (38.07 +\- 0.25 الى 10.38 +\- 0.22) (2.00 +\- 0.33) و 2.5(+\- 0.04) على الترتيب.
نسبة الهيموكلوبين في الدم بعد الجراحه (10.38 +\- 0.22) ومحتوى حجم كريات الدم الحمراء الى حجم الدم الكلي (34.53 +\- 0.62 %)
لم تنخفض بشكل معتبر مقارنتا مع مؤشرات ماقبل العمليه للهيموكلوبين (12.18 +\- 0.21 غم\دسل) وحجم كريات الدم \حجم الدم الكلي (35.95 + 0.83)
عدد الصفائح الدمويه ارتفعت بشكل غير مهم بعد العمليه ، اما عدد كريالات الدم الحمراء فقد انخفض بشكل مهم بعد العمليه (3.43+ 0.05 * 10 اس 12 \التر) مقارنتا بمرحلة ماقبل العمليه (4.92 +\- 0.25 في 10 اس 12 \التر) نفس التوجه شمل كريات الدم البيضاء .
معدل وزن حديثي الولاده كان بحدود 3256 +\- 24.36غم مؤشر ابجار في الدقائق الأولى الى الخامسه كان (7.54 +\- 0.31 الى 8.93 +\- 0.22)على الترتيب .
توصلنا من خلال البحث ان التخدير الشوكي هو افضل للام والطفل حيث لمسنا ارتفاع في مؤشر ابجار بأعتباره وسيله هامه لتقيم مخرجات الولاده.

1. Introduction

Loss of sensation and consciousness is referred to as anesthesia [1]. The term "local anesthesia" indicates a lack of sensation that is limited to a specific part of the body. The suppression of the conduction process in peripheral nerve tissue is the most prevalent cause of loss of feeling. Mechanical trauma, low temperature, anoxia, and a number of chemical irritants such as alcohol or phenol can all affect nerve conduction in different ways [2,3].

Based on the preoperative history and physical examination, individualised perioperative management is required. Modern anesthetics drugs (desflurane, sevoflurane or propofol, and remifentanil, respectively) 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 the safety of patients [4].

There are three types of anesthesia *viz.*, General anesthesia, Local anesthesia, Spinal anesthesia [5].

The most common surgical procedure is a caesarean section (CS) in various developed countries [6,7]. In recent years, the prevalence of this operation has risen considerably over the world. The use of anesthetic procedures has a significant impact on all aspects of patient care [8].

In the United States, the caesarean delivery rate has been estimated to be as high as 65%. The best anesthetic for caesarean delivery has long been discussed [9]. Spinal anesthesia has traditionally been considered the best option for simple elective caesarean deliveries since it is simple to perform and eliminates the hazards of difficult intubation and aspiration [10]. Because of its demonstrated efficacy, predictability, greater patient satisfaction, and low complication rate, spinal anesthesia remains a vital aspect of modern anesthesia treatment [11]. Health-Related Quality of Life (HRQoL) in patients who had a vaginal delivery (VD) was shown to be clearly distinguishable from HRQoL in women who had a caesarean section (CS) [12]. Apgar is the combination of initial letters of "Appearance, Pulse, Grimace, Activity, and Respiration", respectively. Apgar is a quick test performed on a baby at 1 and 5 minutes after birth. After birth, the child is examined by the doctor and apgar score is recorded.

It is essential to have a better understanding of the physiology of spinal anesthesia in order to administer it safely and effectively. Despite the ongoing interest and research into the effects of spinal anesthesia on several organ systems, it is still unknown exactly how and where local anesthetics adhere to generate spinal anesthesia [13].

The practice of injecting anesthetic medications into the subarachnoid space to temporarily disable the sensory and motor capabilities of many groups of spinal nerves is known as spinal anesthesia. For caesarean section, spinal anesthesia 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 [14].

The benefits of spinal anesthesia include its simplicity; it is simple to perform, has a rapid start of the effect, takes just a tiny amount of anesthetic agent, reliability, minimum foetal exposure to medicines, patients' understanding of the risks of aspiration, and it allows for early breast-feeding [15]. Potential hypotension, intrapartum nausea and vomiting, headaches in cases of dural puncture, and a short duration of action are all drawbacks of spinal anesthetic [8].

However, spinal anesthesia for caesarean birth has been linked to a high number of problems, which have been documented in up to 83% of cases [15]. Despite having a low comparative risk of mortality of up to 16.7% when compared to general anesthesia, 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 maternal hypotension [16].

Due to circumstances linked with caesarean procedure indications and the extra stress of anesthesia, infants born through cesarean delivery are more likely to suffer from birth asphyxia. When comparing infants born by cesarean delivery under general anesthetic *vs* babies born under regional anaesthetic, birth asphyxia, as shown by a poor apgar score, is more likely [17]. With this background, the present study aims to evaluate the effect of general and spinal anesthesia on maternal health and neonatal outcome in the apgar score and baby weight.

2. Patients and Methods

Ethical permission and patient enrollment

The present study was a hospital-based retroprospective study conducted in _____ between _____. Around 100 pregnant women were admitted during the study period. Depending on the sonography, mother and child condition, patient consent, they were operated with general anesthesia or spinal anesthesia. In the present study, around 57 patients operated with spinal anesthesia were considered. The women who have completed 38-40 weeks of pregnancy period were considered in this study.

Surgery methods

The patients were positioned in the left lateral decubitus with a left uterine displacement. The patients were placed supine on the operating table which had 15° left lateral tilt. Before spinal anesthesia induction, general monitoring was carried out. The neonatal care team was also kept ready before operation.

A] Spinal anesthesia

Through an 18-G intravenous cannula, Ringer's lactated solution (1200-1500ml) was infused for 15 min. The spinal anesthesia, i.e. fentanyl and hyperbaric bupivacaine, was given by intrathecal injection. In case of hypotension, ephedrine was administered. Pethidine (30mg) and atropine (0.1 mg/kg) were given if shivering and bradycardia were notified.

B] Cesarean procedure

After applying the anesthesia, a typical lower-segment transverse uterine incision was made. All cesarean deliveries were done by the expert MD (surgical obstetrician). The placenta was removed manually. The visceral peritoneum layers were brought together with the uterine incision in a double layer closure. Continuous suturing (1-0 polyglycolic acid) was performed.

Study parameters

Blood parameters such as hemoglobin, hematocrit, platelet count, red blood count (RBCs) and total white blood count (TWBCs) were considered in this study. The newborn valuation was done by a single pediatrician. After baby birth, its weight; and 1^{st} and 5^{th} minute apgar scores were recorded (Table 1).

Table 1. Apgar score parameters

Score	**0 point**	**1 point**	**2 point**
Appearance (Skin color)	Cyanotic / pale all over	Peripheral cyanosis only	Pink
Pulse (Heart rate)	0	<100	100-140
Grimace (Reflex irritability)	No response to stimulation	Grimace or weak cry when stimulated	Cry when stimulated
Activity (Tone)	Floppy	Some flexion	Well flexed and resisting extension
Respiration	Apneic	Slow, irregular breathing	Strong cry

Statistical analysis

The statistical analyses were accomplished via GraphPad Prism 5 software. All values were represented as mean ± SE (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.

3. Results

In the present study, women undergoing cesarean section delivery using spinal anesthesia were enrolled. The average ages and the BMI of enrolled women were 29.50±0.82 years and 24.50±0.59, respectively. The gestational age, parity and gravidity were 38.07±0.25 weeks, 2.00±0.33, and 2.50±0.40, respectively. The mother's age and her BMI, gestational age, parity and gravidity are depicted in Table 2.

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

Parameters	Mean±SE	Range
Age (years)	29.50±0.82	23.00 – 36.00
BMI	24.50±0.59	21.00 – 28.00
Gestational age (weeks)	38.07±0.25	37.05-39.08
Parity	2.00±0.33	0.00-4.00
Gravidity	2.50±0.40	1.00-5.00

Preoperative and postoperative maternal hemodynamics in the enrolled women is depicted in Table 3. The postoperative hemoglobin (10.38±0.22 g/dl) and hematocrit content (34.53±0.62%) were non-significantly decreased as compared to the preoperative parameters (12.18±0.21 g/dl hemoglobin and 35.95±0.83% hematocrit). Platelet count was non-significantly increased in the postoperative stage. The blood RBCs count was significantly decreased in postoperative stage (3.43±0.05 $x10^{12}$/L) as compared to the preoperative stage (4.92±0.25 $x10^{12}$/L). A similar trend was observed in the total white blood count. However, it was found to be non-significant.

Table 3. Preoperative and postoperative maternal hemodynamics in spinal anesthesia

Variables	Preoperative		Postoperative	
	Mean ± SD	**Range**	**Mean ± SD**	**Range**
Hemoglobin (g/dl)	12.18±0.21	10.42-13.93	$10.38±0.22^{ns}$	8.23-12.52
Hematocrit (%)	35.95±0.83	30.54-41.36	$34.53±0.62^{ns}$	30.13-38.92
Platelet count ($x10^9$/L)	174.5±2.99	146-203	$175.5±1.28^{ns}$	152-199
RBCs ($x10^{12}$/L)	4.92±0.25	3.82-6.01	$3.43±0.05^{***}$	3.12-3.74
TWBCs ($x10^9$/L)	10.48±0.12	6.92-14.03	$09.94±0.39^{ns}$	5.94-13.94

RBCs: Red blood count; TWBCs: Total white blood count; NS: Nonsignificant; $^{***}p<0.001$ when compared with the preoperative parameters by Dunnett multiple comparison test.

Postoperative maternal blood pressure parameters are depicted in Figure 1. The mean systolic and diastolic blood pressures were 125.9 ± 0.94 mmHg and 81.6 ± 2.81 mmHg, respectively.

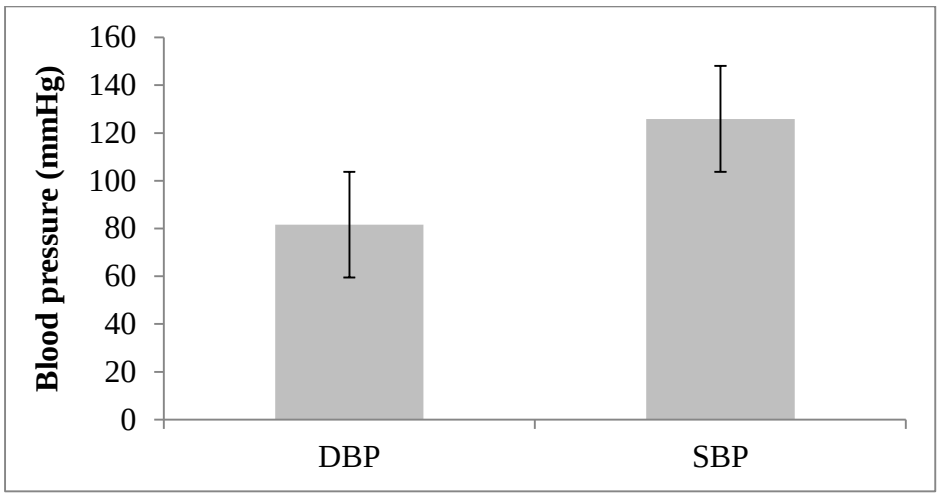

Figure 1. Postoperative maternal blood pressure parameters

The neonatal body weight was found to be around 3256 ± 24.36 gm. The apgar scores at 1st and 5th min were 7.54 ± 0.31 and 8.93 ± 0.22, respectively. The score was normal and it is in good range. The post operative conditions of enrolled individuals are given in Table 4.

Table 4. Post-operative follow-up

Variables	**Spinal anesthesia**
Hospital stay	Around 6-7 days
Post-operative pain intensity	Less
Duration of the post-operative pain	Around 3 weeks

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 [18].

When compared to ephedrine alone, providing phenylephrine alone by infusion at caesarean birth was related to a reduced risk of infant acidosis and maternal nausea and vomiting. Combining phenylephrine and ephedrine had no benefit since it caused nausea and vomiting and did not improve foetal blood gas levels any more than providing phenylephrine alone [19].

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 [20].

Teoh et al, [21] 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 [22].

The treatment of hypotension during cesarean delivery underneath spinal anaesthesia is still debatable. Although most practitioners employ non-invasive blood pressure monitoring, cardiac output (CO) inspection is a newer technique that could be useful in the near future. While fluid pre-loading and left uterine displacements are usually used to avoid this problem, a vasopressor is frequently required [23].

The incidence of low apgar score 5 was shown to be quite considerable [17]. 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 [17]. In the present study, the apgar score was found to be more than 7, which is an important and good indication of neonat health. This enhancement of agpar score may be due to the less maternal blood loss and secure the child delivery process.

Prematurity, low birth weight, and maternal preeclampsia all have an effect on the baby's low apgar score at birth, according to the research. It is essential that difficulties influencing the baby's health care be taken into account by health-care planners for both mother and kid [24].

Pulse rate (PR) and pulse transit time (PTT) study could support in the prediction of hypotension after spinal anaesthesia during caesarean 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 [25].

Significant network comparisons in baby and mother outcomes of apgar scores at 1- and 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 [10].
In elective Caesarean delivery, spinal anaesthesia is linked to better newborn outcomes than general anaesthetic [26]. According to a study, young infants born via general anaesthetic have a lower apgar score than those born with a spinal anesthetic [27]. In the present study, postoperative hemoglobin and hematocrit content were non-significantly decreased as compared to the preoperative parameters. Platelet count was non-significantly increased in the postoperative stage. The blood RBCs count was significantly decreased in postoperative stage as compared to the preoperative stage. A similar trend was observed in the total white blood count.

Conclusions

The study is concluded that the spinal anesthesia was found to be better for the mother's health recovery from delivery procedure. Also, child showed higher apgar score, which is a major evaluation of neonatal outcome. Apgar scores were found to be higher in the spinal anesthesia treated patients.

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