ORIGINAL ARTICLE

The Impact of Anesthesia Type During Cesarean Section on Maternal and Neonatal Outcomes at Fakeeh Hospital

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Abstract

The World Health Organization has highlighted the importance of improving maternal and neonatal health. Their health could be affected by the anesthesia type given during cesarean section. The study aim is to assess the effect of spinal and general anesthesia on maternal and neonatal outcomes during elective cesarean section. Quantitative observational study was conducted at Fakeeh hospital in Jeddah, Saudi Arabia. 295 participants were included to spinal anesthesia group (n = 285) and general anesthesia (n = 10). A purposeful sampling was used to invite the study participants and structured questionnaire was developed to assess the impact of anesthesia type during cesarean section. The study results provide evidence that spinal anesthesia is more practiced in healthcare settings compared to general anesthesia. The results also showed an effect of general anesthesia on maternal outcomes in which mothers had more intra-operative blood loss, tachycardia, request for analgesia in a short period and neonatal outcomes as low first minute Apgar scores, low skin to skin contact, and low breast-feeding rates. In conclusion, spinal anesthesia was the method of choice in elective cesarean section due to its benefits for both mother and newborn.

Keywords

Anesthesia; Cesarean section; Maternal outcomes; Neonatal outcomes; Saudi Arabia

Introduction

The cesarean section (CS) is defined as a surgical operation performed to deliver the fetus through the abdominal route under general or regional anesthesia. The World Health Organization (WHO) recommends that the CSs rate should be 10-15% within the country for optimal maternal and neonatal outcomes[1]. In Saudi Arabia, there was 80% increase in the CSs rate between 1997 and 2006 in all governmental hospitals[2]. Furthermore, CSs rate made up 19.1% from 2009 to 2014 in King Abdulaziz Medical City, Riyadh[3] and four years later the rate has increased to 27% of all deliveries in the same hospital[4]. However, it was found in the last year that the CSs rate has reached to 32.6% of all deliveries[5], which indicate obvious increasing in the CS rate.

The increase in CS rate has led to an increase in anesthesia use which has lighted the side effects and the complications of anesthesia for mother and newborn. The anesthesia types that can be provided for mothers undergoing elective CS are general anesthesia (GA) or regional anesthesia (RA) such as epidural, spinal anesthesia or mixing both. The guidelines for obstetric anesthesia recommend spinal anesthesia as the first choice for elective CS[6]. Spinal anesthesia involves the use of anesthetic solution to produce a local loss of sensation. Bupivacaine is usually injected around the spinal cord from the lower back area at the subarachnoid space[7]. Spinal anesthesia is the preferred technique during elective CS due to its ease of performance and decreased risk of intubation or aspiration difficulties. Additionally, mothers are fully awake, which will help them bond with their babies immediately[8]. Regardless of the benefits associated with spinal anesthesia, it still has some complications such as hypotension, post-puncture headache and toxicity due to local anesthetic medications[9].

In contrast, general anesthesia defined as the lack of ability to feel pain combined with loss of awareness and mobility caused by intravenous medications such as propofol or inhalation medications such as Sevoflurane. This procedure is performed using tracheal intubation and positive pressure ventilation[7]. It is indicated for elective CS when spinal anesthesia failed, contraindicated or upon maternal request[9]. The advantages of general anesthesia includes rapid action, less cardiovascular depression, controlled ventilation and maintained secure airway[10]. However, general anesthesia is not free from complications such as failed intubation, aspiration, intraoperative blood loss, and awareness with the procedure[6].

The significant of the study comes from the WHO recommendations to improve the maternal and neonatal health[11]. Their health could be affected by the anesthesia type given during cesarean section. Moreover, general anesthesia was previously considered the best option for CS deliveries, but recent studies have found that anesthesia-related complications are the second most common cause of increased maternal mortality rate during CS after postpartum hemorrhages[12], which was also linked with general anesthesia use[13]. Therefore, the aim of the study is to assess the impact of anesthesia type on maternal and neonatal outcomes.

Methodology

This is a quantitative observational study conducted at Dr. Soliman Fakeeh Hospital, known as Fakeeh Hospital, in Jeddah, SA. The study was conducted in the setting from November 2021 to March 2022. A purposeful sampling was used to invite 295 participants which were included to spinal anesthesia group (n = 285) and general anesthesia group (n = 10). Participants were collected from the operating room at Fakeeh Hospital, including all full-term (37–40 weeks of gestation) singleton mothers who were at the hospital for elective CS with their physical condition classified according to American Society of Anesthesiology as class 2. All high-risk cases, such as those with placental abnormalities (Placenta Previa, Accrete and Abruption), gestational diabetes mellitus, preeclampsia, neonatal anomalies, macrosomia, intrauterine growth retardation, polyhydramnios, and oligohydramnios along with emergency CS, were excluded. A structured questionnaire was developed based on comprehensive literature review and checked, approved for validity by two academic members' experts in the field of maternal and child health of nursing. It was consisted of socio-demographic data (age, weight, nationality, educational level, and employment), health history (smoking, past medical and surgical history), obstetric history (gravity; parity; number of abortion and living children; gestational age; indication for CS; obstetric history; number of previous CS; location of the previous CS; anesthesia type used in the previous CS and any complications that occurred with the area of admission for the newborn), anesthesia data (the anesthesia type in the current CS, the person who made the decision regarding the anesthesia type, the patient's knowledge about the anesthesia and if mother given the choice to select the anesthesia type, Intra-operative time), maternal outcomes (pre and post anesthesia HR and BP, estimated blood loss, time for first analgesia requirement, presence of side effects and any complication or ICU admission)., neonatal outcomes (birth weight, gender, presentation, assisted forceps delivery, forceps mark if present, Apgar score at first and fifth minutes, needs for resuscitation, oxygen saturation, oxygen supplementation, body temperature, Breast feeding, skin to skin contact, NICU admission and the reason for admission). A pilot study then was done on 10% of participants for tool's reliability and data were transferred directly to Microsoft Excel sheet for coding. Statistical analyses were done using IBM SPSS Statistics for Windows, version 19.

Results

A total of 295 participants included in the current study, with more than half of the study participants (96.6%) having received spinal anesthesia; only 3.4% had received general anesthesia. The Participant's socio-demographic result shows that those aged 20 to less than 30 years constituted majority of the study participants (38.3%); and more than half of the participants (56%) were between 70 and 90 kg. Most of the study participants (70.8%) were Saudi, with bachelor's degree or higher (66.1%), but housewives (61.7%). The frequency distribution of the participant's health history shows that majority of the study's participant (84.1%) were nonsmoker, had no past medical history (79.3%), without any surgical history (86.8%).

Regarding the obstetric history, the result shows that multi-gravity mothers constituted majority of the participants (36.9%), multi-parity mothers constituted (33.6%), mothers who had three children or more constituted around 32.9%, and more than half of the study participants (67.4%) had no previous abortion. The gestational age of 38 weeks constituted half of the participants (50.5%) and most of the elective CS (89.5%) were conducted due to previous CS. In addition, majority of the participants (99.3%) were without past obstetric history. The anesthesia type was decided by the physician for more than half of the participants (55.9%), majority of the study's participants (52.5%) had not been given the choice to select anesthesia type. Participants were also asked if they had good knowledge about the advantages and disadvantages of both anesthesia types; 53.2% of the participants said they did, while 46.8% said they did not. The results also shows a significant relationship with skin incision to delivery time, which was longer with spinal anesthesia (mean 9:16 minutes) than general anesthesia (mean 6:17 minutes).

Table 1. Blood pressure and heart rate in relation to anesthesia type

Variable		Type of Anesthesia				Total		X^2	P value
		Spinal N=285		General N=10					
		N	%	N	%	N	%		
BP at Holding Bay	Low	15	5.7	2	20	17	5.8	4.024	0.134
	Normal	219	76.8	6	60	225	76.3		
	High	51	17.9	2	20	53	17.9		
BP before anesthesia	Low	14	4.9	0	0	14	4.7	0.645	0.724
	Normal	203	71.2	7	70	210	71.2		
	High	68	23.9	3	30	71	24.1		
BP after the anesthesia	Low	41	14.4	0	0	41	13.9	1.970	0.373
	Normal	205	71.9	9	90	214	72.5		
	High	39	13.7	1	10	40	13.6		
BP at PACU	Low	32	11.2	0	0	32	10.9	6.222*	0.045
	Normal	241	84.6	8	80	249	84.4		
	High	12	4.2	2	20	14	4.7		
BP difference before and after anesthesia	Decreased	77	27	3	30	80	27.1	0.047	0.977
	Same	180	63.2	6	60	186	63.1		
	Increased	28	9.8	1	10	29	9.8		
HR at Holding Bay	Low	1	0.4	0	0	1	0.4	0.163	0.922
	Normal	264	92.6	9	90	273	92.5		
	High	20	7	1	10	21	7.1		
HR before anesthesia	Low	4	1.4	0	0	4	1.4	0.157	0.925
	Normal	229	80.4	8	80	237	80.3		
	High	52	18.2	2	20	54	18.3		
HR after the anesthesia	Low	9	3.2	1	10	10	3.4	8.238*	0.016
	Normal	224	78.6	4	40	228	77.3		
	High	52	18.2	5	50	57	19.3		
HR at PACU	Low	18	6.3	1	10	19	6.4	2.883	0.237
	Normal	261	91.8	8	80	269	91.2		
	High	6	2.1	1	10	7	2.4		
HR difference before and after anesthesia	Decreased	36	12.6	1	10	37	12.5	2.876a	0.237
	Same	215	75.4	6	60	221	75		
	Increased	34	12	3	30	37	12.5		

≤0.05; **≤0.01; ≤0.001*

Table 1 presents the blood pressure and heart rate in relation to anesthesia type. The table reveals that there was an association between anesthesia and BP at PACU, mothers who received spinal anesthesia had low BP by 11.2%, while none of the general anesthesia had hypotension. The table also reveals that there was an association between anesthesia and HR after anesthesia induction, mothers who received general anesthesia had tachycardia by 50%, while most of the spinal anesthesia had normal HR by 78.6%.

Table 2 presents the blood loss, analgesia, and complication in relation to the type of anesthesia**.** The table reveals a significant relationship between anesthesia and intra-operative blood loss, none of the participants who received spinal anesthesia had intraoperative blood loss greater than 1,000 ml, while 10% of the participants who received general anesthesia did. However, none of the study's participants in either group had intraoperative complications or were admitted to the ICU. Moreover, a statistically significant relationship was found between the type of anesthesia and analgesia, in which 20% of mothers who received general anesthesia requested analgesia, while less than 1% of mothers under spinal anesthesia had received analgesia.

Table 3 presents the side effects in relation to anesthesia type (P < 0.001). majority of mothers (37.3%) who received spinal anesthesia reported to have shivering, while half of mothers who received general anesthesia (50%) had no complaints from any side effects. Furthermore, within spinal anesthesia group, mothers who experienced one side effect constituted 85.6%, whereas majority of mothers under general anesthesia (80%) had only one side effect.

Regarding neonate's socio-demographic data, almost half of the neonates (51.5%) were girls, had normal weight (93.6%), delivered by cephalic presentation, (86.1%). Forceps were used with 22% of the neonates. Table 4 shows the neonatal outcomes in relation to anesthesia type. The results revealed a statistically significant relationship between anesthesia type and Apgar score at the first minute of life, where spinal anesthesia indicated better Apgar scores (92.3%)

Table 2. Blood loss, analgesia and complication in relation to the anesthesia type

Variable		Type of Anesthesia				Total		P value	X^2
		Spinal N=285		General N=10					
		N	%	N	%	N	%		
Intra operative Blood Loss volume	less than 500 ml	47	16.5	2	20	49	16.6	29.21***	<0.001
	500 ml -700 ml	195	68.4	5	50	200	67.8		
	800 ml - 1000 ml	43	15.1	2	20	45	15.3		
	more than 1000 ml	0	0.00	1	10	1	0.3		
The first dose of Analgesia requested	None	283	99.2	8	80	291	98.7	37.08***	<0.001
	after one hours	1	0.4	2	20	3	1		
	after 2 hours	1	0.4	0	0	1	0.3		
Complication presents after CS	No	285	100	10	100	295	100	NA	NA
Admission to ICU	No	285	100	10	100	295	100	NA	NA
*≤0.05; **≤0.01;** ≤0.001									

Table 3. Side effect in relation to anesthesia type

Variable			Type of Anesthesia				P value	X^2
			Spinal		General			
			N	%	N	%		
Side effect for anesthesia	None		84	26.6	5	50	241.73***	<0.001
	Nausea		48	15.2	0	0		
	Shivering		118	37.3	3	30		
	Others	Pruritus	48	15.2	2	20		
		Vomiting	13	4.1	0	0		
		Dizziness	5	1.6	0	0		
Side effect for anesthesia	One side effect		172	85.6	4	80	252.27***	<0.001
	Two side effects		28	13.9	1	20		
	Three side effects		1	0.5	0	0		
*≤0.05; **≤0.01; ** ≤0.001								

Table 4. Neonatal outcomes in relation to anesthesia type

Variable		Type of Anesthesia				Total		X^2	P value
		Spinal N=285		General N=10					
		N	%	N	%	N	%		
Apgar score at 1st minute 7 and above	Yes	263	92.3	7	70	270	91.5	6.18*	0.01
	No	22	7.7	3	30	25	8.5		
Apgar score at 5th minute 7 and above	Yes	283	99.3	10	100	293	99.3	0.07	0.79
	No	2	0.7	0	0	2	0.7		
Needs for resuscitation	Yes	14	4.9	0	0	14	4.7	0.52	0.47
	No	271	95.1	10	100	281	95.3		
normal oxygen saturation at 10 min.	Yes	175	61.4	6	60	181	61.4	0.01	0.93
	No	110	38.6	4	40	114	38.6		
Needs for oxygen supplementation	Yes	110	38.6	4	40	114	38.6	0.01	0.93
	No	175	61.4	6	60	181	61.4		
Normal temperature before transferring	Yes	283	99.3	9	90	292	99	8.30***	<0.001
	No	2	0.7	1	10	3	1		
Admission to NICU	Yes	21	7.4	0	0	21	7.1	0.79	0.37
	No	264	92.6	10	100	274	92.9		
Brest feeding initiation	Within 30 min.	7	2.5	0	0	7	2.4	16.14***	<0.001
	Within one hour	170	59.6	0	0	170	57.6		
	after one hour	23	8.1	1	10	24	8.1		
	Not done	85	29.8	9	90	94	31.9		
Skin to skin contact initiation	Within 30 min.	188	66	0	0	188	63.7	41.96***	<0.001
	Within one hour	52	18.2	0	0	52	17.6		
	after one hour	14	5	0	0	14	4.7		
	Not done	31	10.8	10	100	41	14		

≤0.05; **≤0.01; ≤0.001*

than general anesthesia (70%). In addition, the results showed a statistically significant relationship between anesthesia type and the newborn's temperature, in which 99.3% of the newborns in the spinal anesthesia group showed normal body temperature before being transferred to the nursery more than the general anesthesia group (90%). Regarding breast feeding and skin to skin contact, the results showed a statistically significant relationship, in which more than half of the mothers (59.6%) who had spinal anesthesia breastfed their babies within one hour of delivery, whereas none of the mothers who had general anesthesia did so. Additionally, 66% of mothers who received spinal anesthesia started skin to skin contact with their baby in the first 30 minutes after delivery, while none of mothers who received general anesthesia did.

Discussion

Looking to the anesthesia that was provided for elective CS in the current study, spinal anesthesia was the method of choice in most of the study participants (96.6%), while only (3.4%) of participants had general anesthesia. This shows that spinal anesthesia is more practiced in healthcare setting compared to general anesthesia. In concurrent with that, a study done in SA found that most of the elective CS were under spinal anesthesia at rate of 85%, while general anesthesia was on average of 14%[14]. Moreover, the limited number of general anesthesia could be related to the national obstetric guidelines produced during COVID-19 pandemic which recommend avoiding general anesthesia unless necessary[15]. In consistent with that, the hospitals showed a reduction in the use of general anesthesia before the pandemic and during the first wave of COVID-19 pandemic between 7.7% to 3.7%[16].

Obstetric anesthesia affects the mother in variable ways such as maternal vital signs. The present study shows that mothers who received general anesthesia had tachycardia after anesthesia induction. This fact could be explained by the body's compensation mechanism for hypovolemia or blood loss associated with the general anesthesia, as shown in the results of the present study. In concurrent with that, a study conducted in Korea revealed that heart rate was higher with general anesthesia group[17]. Similarly, another study in China, measured HR before anesthesia, at the time of skin incision, and at the time of delivery, and found that heart rate was higher after anesthesia induction[18].

Despite the fact that the number of participants who had spinal anesthesia in the present study was higher, none had intraoperative bleeding; 10% of those who received general anesthesia had significant high visual estimation of blood loss. This agreed with Aksoy, who studied blood loss during elective CS in relation to anesthesia type and showed that spinal anesthesia was associated with a lower risk of intra-operative blood loss than general anesthesia[19]. Similarly, previous updated studies have made the same conclusions[17,20,21]. The reason for the bleeding could be the effects of general anesthetic medication on uterine contractions, which interfere with the uterine to cause atony. One of the anesthetic medications used in the induction of general anesthesia is sevoflurane, which has been found to affect the uterine muscle. sevoflurane suppress the oxytocin-induced contractions to cause atony, as shown in the study of Kimizula[22].

The findings of the current study revealed the superiority of spinal anesthesia in longer time to the first requirement of analgesia. A similar feature of spinal anesthesia was also found in the literature review[20-24]. These studies revealed that spinal anesthesia was associated with longer duration to first analgesic request. Regarding the side effects of anesthesia, the present study noted that mothers who received spinal anesthesia had high incidence of shivering. However, this was managed successfully with bed warmers for all participants. This finding was in line with two studies, who found that shivering was the most frequent side effect in the spinal anesthesia groups[18,21]. On the other hand, half of the mothers who received general anesthesia in this study did not report any side effects, which could be explained by the long effects of general anesthesia causing a delay in the return of neurological function.

Newborns are also affected by the type of anesthesia, in a different way than mothers. The findings of the current study showed that the Apgar scores at the first minute were normal, with an advantage for mothers under spinal anesthesia of 92.3%, while only 70% of mothers who received general anesthesia had newborns with normal Apgar scores at the first minute of life. This could be related to the effects of general anesthetic agents on utero-placental circulation and long incision to delivery time (more than three minutes). This agreed with the results of Obsa, who studied the factors associated with Apgar scores among newborns delivered by CS and found that newborns of mothers exposed to spinal anesthesia had a higher first-minute Apgar score[25]. The same result was also found in the other studies[20,21,26].

Breast feeding within the first hour of delivery provides protection against infection[27] and prevents neonatal death due to sepsis, pneumonia, and hypothermia[28]. In the current study, the results showed that skin to skin contact and breast-feeding rate were higher with spinal anesthesia. The majority of mothers who received general anesthesia did not initiate skin to skin contact nor breastfeeding in the OR, while more than half of the mothers who received spinal anesthesia-initiated skin to skin contact within 30 minutes of delivery (66%) and breastfed within one hour of delivery (59.6%). These results show that general anesthesia was not favored at a baby friendly hospital like Fakeeh Hospital.

In lines with that, Kutlucan found that lactation onset time was delayed with general anesthesia compared to spinal anesthesia[29]. This could be related to the long effect of general anesthesia, which makes the mother unable to hold the baby even in the PACU. In contrast, Karasu studied the effects of anesthesia type on breast feeding and found that the breast feeding rate at six months was higher in mothers who received spinal anesthesia. However, no significant relationship was found in the first hour breast feeding rates[30], unlike in the current study. The fact that only 19% of the participants in Karasu's study breastfed within the first hour of delivery in both groups could explain the differing results in the current study.

The current study is one of the few nursing studies recently conducted in SA to assess the impact of two different anesthesia types during elective CS in terms of maternal and neonatal outcomes. Moreover, the observational method used in the present study added more credibility to the data and results. The research results also improve the health practice knowledge in relation to maternal and neonatal wellbeing. However, the study has some limitations that should be considered. The main limitation of the current study is the inability to generalize the data due to the small number of the participants involved in the study, particularly those who received general anesthesia. In addition, the number of hospitals included and the short duration for follow-up could be counted as one of the study limitations. However, this does not affect the credibility and reliability of the study data and results.

Conclusions

The current study provides evidence that spinal anesthesia is more often practiced in healthcare settings compared to general anesthesia. This study also revealed that anesthesia type impacts maternal and neonatal outcomes, with spinal anesthesia having less complications and lower risks for mothers and newborns compared to general anesthesia. This was proven by measuring the maternal and neonatal outcomes in relation to the type of anesthesia used.

The present study showed an effect of general anesthesia on maternal outcomes in which mothers had more intraoperative blood loss, tachycardia, and request for analgesia in a short period. In addition, an association was found between spinal anesthesia and side effects like shivering and nausea. Moreover, an effect of general anesthesia on neonatal outcomes was found in which mothers who received general anesthesia had babies with low first minute Apgar scores, low skin to skin contact, and low breast-feeding rates. On the other hand, spinal anesthesia showed no association between anesthesia type and any of the neonatal parameters. In conclusion, spinal anesthesia was the method of choice in elective CS due to its benefits for both mother and newborn.

Conflict of Interest

The authors declares that they have no conflict of interest that is related to this study and this article.

Disclosure

The authors did not receive any form of commercial support, either in the form of compensation or financial assistance, for this case report. The authors have no financial interest in any of the products, devices, or drugs mentioned in this article.

Ethical Approval

The study was approved by the Ethics Committee of the Dr. Soliman Fakeeh Hospital in Jeddah, Kingdom of Saudi Arabia.

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