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Original Article

The use of anesthetics for cesarean section delivery in women in Duhok, Kurdistan region, Iraq

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Abstract

Background: Limited information is available on anesthetics that are preferred or used by anesthesiologists for cesarean section (CS) delivery in Kurdistan region, Iraq. This study aims to document general or regional anesthesia use in elective CS deliveries in four major hospitals in Duhok province, Northern Iraq.

Methods: A retrospective cross-sectional study was conducted from February 2019 to February 2020. The general and regional anesthetics types were recorded for each CS delivery case within the selected hospitals. Any adjuvants and medications used with the anesthetics were also recorded. Univariate and bivariate analyses were undertaken. The statistically significant was considered at less than 0.05.

Results: A total of 3420 elective CS deliveries were reported. The mean age ± SD of the pregnant women was 29.6 ± 5.8 years. The anesthetics used in the four hospitals were propofol as a general anesthetic (53.0%) and bupivacaine as a spinal anesthetic (47.0%). The combination of propofol and bupivacaine was used only in 0.3%. The three most frequently and concurrently used adjuvants and medications with propofol or bupivacaine were metoclopramide (90.0%), dexamethasone (80.0%), and ephedrine (73.0%).

Conclusion: Propofol and bupivacaine were the general and spinal anesthesia of choice, respectively, for elective CS delivery in Duhok province, northern Iraq. Some adjuvants and medications were supplemented to improve the quality of anesthesia and the outcome of CS delivery.

Keywords: Bupivacaine, Propofol, Pregnancy, General Anesthesia, Spinal Anesthesia, Iraq

Background

There is a global trend of increasing preference for women to give birth by cesarean section (CS) delivery compared to natural vaginal birth [1-6]. The rate of CS delivery was reported to vary between 1-30% globally [1,4,5]. However, most CS deliveries are elective based on maternal request [4-6]. Examples of general anesthetics (GA) used for CS deliveries are isoflurane, sevoflurane, or desflurane with or without nitrous oxide, propofol, thiopental, or ketamine as inducing agents [2,3,7,8]. Local anesthetics (LA) such as bupivacaine, lidocaine, ropivacaine, 2-chloroprocaine, and tetracaine are used for spinal or epidural anesthesia [2,7,8]. A combination of spinal-epidural anesthetics can be used as well [2,7]. The choice of either GA or LA in CS delivery depends on several factors including, but not limited to, the evaluation of the case by the anesthesiologist and the surgeon, the plan of the anesthetic technique, maternal choice, the level of urgency, presence of contraindications for a particular agent or anesthetic technique and the skill of the anesthesiologist [2,6]. An overview of the use of anesthetics for CS delivery indicated that LA, when no contraindications exist, is preferred over GA in elective cases in developing countries [8]. A study conducted in Zimbabwe showed that spinal anesthesia use for CS delivery constituted 81.0% vs. 19.0% for GA [9]. Similarly, the preferred anesthetic technique in Turkey was regional anesthesia over the GA [7,10]. However, in an opinion-based survey among anesthesiologists working in the Kurdistan region- northern Iraq, propofol was the drug of choice (79.0%) to induce GA. Moreover, their daily preference for regional anesthesia was only 34.0% compared to 48.9% for GA [11]. Furthermore, the latter study did not include the use of GA or LA in cases of CS delivery. In light of this apparent controversy regarding the nationally preferred anesthetics used in CS delivery and those of other countries, the present study was undertaken to examine

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the records of using GA or LA in elective CS delivery in four major hospitals in Duhok, northern Iraq.

Methods

Study design

A retrogressive cross-sectional descriptive study was conducted between February 2019 to February 2020 at the College of Pharmacy, University of Duhok, northern Iraq. The record of elective CS delivery was reviewed in three private hospitals (Sheelan Hospital, Vazheen Hospital, and Wan Global Hospital) and one public hospital (Gynecology and Obstetrics Governmental Hospital) located in Duhok city, north of Iraq.

Inclusion and Exclusion criteria

Only elective CS deliveries performed under GA or LA individually or in combination were included in the study. Any adjuvants and medications used with the anesthetics were also recorded. Cases of CS delivery that have been done because of emergency conditions or those of multiple pregnancies were excluded.

The procedure of data collection

A universal sampling technique was recruited to collect the data from conveniently selected four hospitals. A CS delivery was considered an elective when the CS operation was previously scheduled for hospital admission and surgery on the mother's request and approval of the hospital's surgeon and anesthesiologist. The subjects' demographic data (age) were obtained from the hospital records. The names of the hospitals were coded as A, B, C, and D, not in consecutive order, to protect the hospital's anonymity as the data source. The hospital records were also examined for any complications during CS delivery or anesthesia.

Statistical analysis

All the data were collected and statistically analyzed using the statistical software program "Past 4.09" (https://www.downloadcrew.com/article/34304/past). The categorical variables were expressed as frequencies and percentages. Any age differences among the women in the hospitals were statistically analyzed by one-way analysis of variance (ANOVA) followed by the post hoc Tukey's test. Whenever applicable, the Chi-squared test was applied using Past 4.09 software on the frequencies using propofol, bupivacaine, or both. The z score calculator "https://www.socscistatistics.com/tests/ztest/default.aspx" was used to calculate the z score for two population proportions (percentages of anesthetics used). The level of statistical significance was $p < 0.05$.

Results

Sociodemographic characteristics

A total of 3420 elective CS delivery were performed in one-year (range 155 to 1437). The mean age ± SD of the pregnant women from the three hospitals was 29.6 ± 5.8 years. The ANOVA with post hoc Tukey's test revealed no statistical differences among the included hospitals. The number of elective CS deliveries recorded in each hospital individually under the use of propofol, bupivacaine, or both varied significantly (Chi-squared test, $p < 0.05$). Moreover, the anesthetics used in the four hospitals, propofol, and bupivacaine, were significantly different (Z test, $p < 0.05$). Propofol is used as a general anesthetic in about 52.8% compared to bupivacaine, used in 47.0% as a spinal anesthesia, respectively. A combination of two anesthetics was reported only in 0.3% of the CS deliveries (Table 1).

Table 1. Frequency of the using propofol or bupivacaine for elective cesarean section (CS) delivery in women within four hospitals in Duhok, KRG, northern Iraq, during February 2019-February 2020 (N=3420)

Hospital code	Mean age ± SD (years)	CS frequency*	Propofol		Bupivacaine		Propofol + Bupivacaine	
			N	%	N	%	No.	%
A	30.3 ± 5.3	969	5	0.5	964	99.5	0	0
B	29.2 ± 6.0	1437	1296	90.2	139	9.7	2	0.1
C	29.3 ± 6.1	155	109	70.3	46	29.3	0	0
D	NA	859	397	46.2	454	52.9	8	0.9
Total	29.6 ± 5.8	3420	1807	52.8**	1603	46.9**	10	0.3**

NA: Age records were not complete or consistent.

* The frequencies of CS delivery after propofol and bupivacaine anesthesia or both were significantly different among the hospitals, Chi-squared test, $p < 0.05$.

** The percentages differed significantly from each other, Z test, $p < 0.05$.

There were no significant age differences among the women in the hospitals, ANOVA followed by Tukey's test, $p > 0.05$.

Adjuvants and medications concurrently used with propofol or bupivacaine are listed in Table 2. They were used according to the individual needs of every CS delivery case. The three most frequently used adjuvants and medications were metoclopramide (90.0%), dexamethasone (80.0%), and ephedrine (73.0%) (Figure 1). The hospital records did not include any CS delivery complications or anesthesia complications.

Discussion

The findings of this study showed that the use of GA with propofol was the most common procedure applied for elective CS deliveries. For maintenance anesthesia, isoflurane and halothane were reported because of their availability in local hospitals. Abdulkader et al. [11] reported similar practices among surgeons and anesthesiologists surveyed in Duhok city, north of Iraq.

The choice of anesthetic usually depends on the preference of the patient and the decision of the surgeon/anesthesiologist. Furthermore, several other factors might determine the type of anesthetics, such as the demographic characteristics of the patients, anesthetic availability, professional skills, level of training, the clinical experience of the anesthesiologists, and whether the CS delivery is elective or not [2,7,8,12,13].

Table 2: Adjuvants and medications used with general and spinal anesthesia for elective cesarean section delivery in women within four hospitals in Duhok, KRG, northern Iraq during February 2019-February 2020

Adjuvants and other medications used with general anesthesia	Amoxicillin, Amikacin, Atracurium, Atropine, Calcium gluconate, Ceftriaxone, Cefotaxime, Chlorpheniramine maleate, Dexamethasone, Diclofenac sodium, Ephedrine, Ergotamine, Fentanyl, Fluids (Ringer lactate and/or Normal saline), Gentamicin, Halothane, Hydrocortisone, Ketamine, Magnesium, Metoclopramide, Metronidazole, Midazolam, Neostigmine, Oxytocin, Paracetamol, Pentothal, Prostaglandin, Ranitidine, Rivastigmine, Rocuronium, Tranexamic acid, Tramadol.
Adjuvants and other medications used with spinal anesthesia	Adrenaline, Amoxicillin, Ampicillin, Aminophylline, Ceftriaxone, Cefotaxime, Dexamethasone, Diclofenac sodium, Ephedrine, Ergotamine, Fentanyl, Fluids (Ringer lactate and/or Normal saline), Furosemide, Gentamicin, Hydrocortisone, Ketamine, Lidocaine, Metronidazole, Metoclopramide, Midazolam, Oxytocin, Paracetamol, Pentothal, Penicillin, Propofol, Ranitidine, Tramadol, Tranexamic acid

A unique finding that appeared from the present study, which might impact the decision for future CS delivery in local hospitals, was the fact that all the hospitals under study have broadly used propofol for the induction of GA but maintained by isoflurane or sevoflurane and the LA bupivacaine was used for spinal anesthesia; however, the combination of GA and LA was minimal (0.3%).

Other than the clinical experience in the procedures [2,6,11], the anesthesiologists and surgeons involved in CS delivery prefer propofol because of its safety records, fast recovery, and antiemetic effects with no complications reported during the CS operation [14-17]. Moreover, maintaining patent airways, ease of ventilation, and reduced cardiovascular complications are advantages reported with the use of propofol as GA for CS delivery in many other countries [2,7,15-17]. The same is equally true for the use of bupivacaine in CS delivery which showed excellent safety records [18,19]. However, in this context, it was cautioned that in the absence of a medical indication, elective CS delivery might be associated with higher risks of asthma and allergic rhinitis in children [20]. Anesthesia for CS delivery could be either GA, regional anesthesia (spinal or epidural), or a combination of spinal-epidural anesthesia [2,7,8,13]. However, international studies indicated that LA was preferred over GA in CS delivery [7-10]. Previous studies commented that GA is beneficial when LA is subjected to maternal rejection or when blood clot problems exist. Moreover, when there are contraindications for LA, such as previous spinal injuries or deformities, GA maintains patent airways with controlled ventilation [1-4,12-15].

On the other hand, LA is safe for the baby, easy to perform when proper training is available, avoids airways with lesser risks of gastric content aspiration, and patients are less likely to need a blood transfusion during CS delivery [1-4,14-16]. In the present study, there was no recorded case of using epidural anesthesia for elective CS delivery because the procedure has a prolonged onset of action, and it was considered a time-consuming technique that was not preferred by the surgeons [2]. Adjuvant drugs or therapy are used during surgical operations along with anesthesia in order to produce synergistic action and enhance the safety and quality of anesthesia. Adjuvant drugs shorten the onset of action of anesthetics, enhance the duration of analgesic effect, improve the quality of analgesia, and reduce potential adverse effects of anesthesia [4,20,21]. The most frequently used drug intraoperatively in the surveyed hospitals of Duhok was metoclopramide 1069 (90.0%), an antiemetic drug [23]. The use of other medications usually depends on the individual needs of each elective CS delivery case [2,4,20-23].

Unlike our study, Abdulkader et al. [11] surveyed the preferences of the anesthesiologist and their opinions (no patients were involved). Hence, the results of our study might further add and support the findings of Abdulkader et al. [11]. The descriptive cross-section design does not allow the cause-effect relationship; a lack of patient information in some hospital records; the study was conducted in one governorate, which affected the generalizability of its findings; however, future studies should consider this option.

Conclusion

Propofol and bupivacaine were the GA and spinal anesthesia of choice for the elective CS delivery in Duhok, KRG, northern Iraq. The propofol and bupivacaine were supplemented with some adjuvants and medications to improve the quality of anesthesia and the outcome of CS delivery.

Abbreviation

CS: Cesarean Section; GA: General Anesthesia; LA: Local Anesthesia; SD: Standard Deviation; ANOVA: Analysis of Variance; SD: Standard Deviation

Declaration

acknowledgment

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Availability of data and materials

Data will be available by emailing rozheen.karam@gmail.com

Authors' contributions

Rozheen Shukry Karam (RSK) contributed to the concept, design, literature search, data analysis, data acquisition, manuscript writing, editing, and reviewing. Fouad K. Mohammad (FKM) Conceptualized and supervised the study, shared in literature search and statistical analyses, and drafted the manuscript All authors have read and approved the final manuscript.

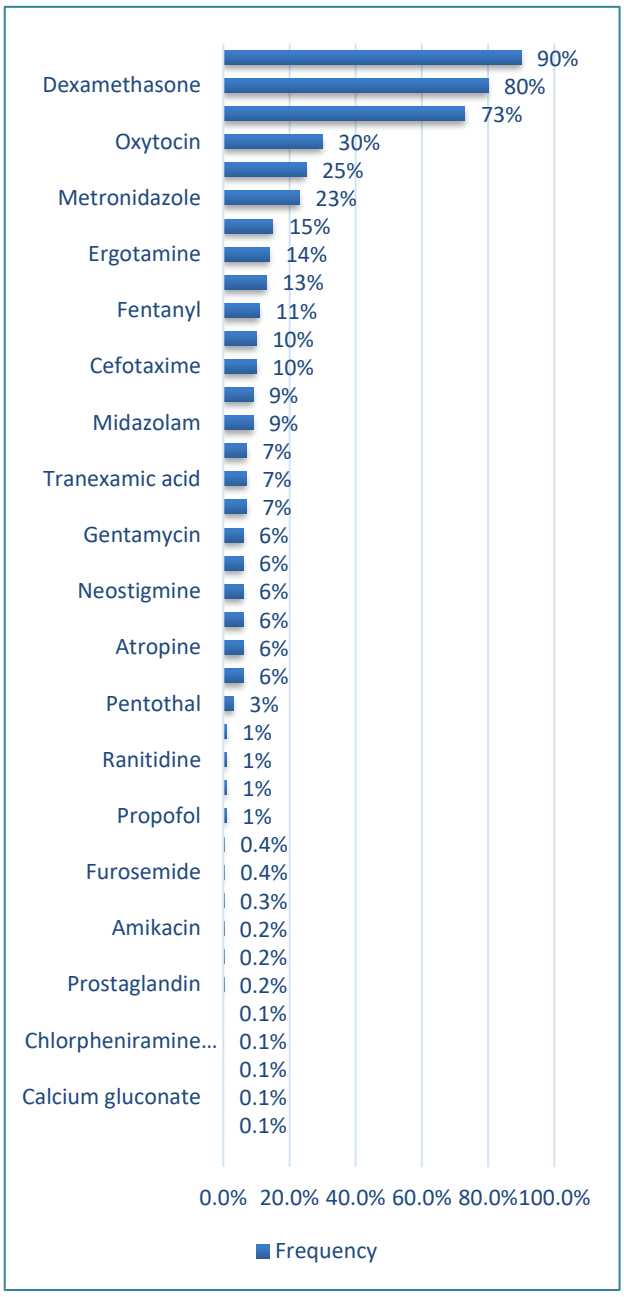

Figure 1: Frequency (expressed as %) of the use of medications (adjuvants and other therapeutic agents) during cesarean section delivery in women within four hospitals in Duhok, KRG, Iraq during February 2019-February 2020

Ethics approval and consent to participate

We conducted the research following the Declaration of Helsinki. The protocol was part of the Master (MSc) research work of the first author and approved by Committee of Post-Graduate Studies in the College of Pharmacy, University of Duhok, KRG, Iraq (No. 470, October 6, 2021) and from the Local Research Ethics Committee at the Duhok Directorate General of Health, Duhok, KRG, Iraq (No. 10112021-11-17, November 10, 2021). The hospitals' administrations have also approved conducting the study and having access to their records regarding the use of types of anesthetics and other medications for elective CS delivery.

Consent for publication

Not applicable

Competing interest

The authors declare that they have no competing interest.

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