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Maternal and Perinatal Morbidity in Second Stage Versus First Stage Cesarean Sections in Sultan Qaboos University Hospital

By Mallak Alkalbani & Mariam Mathew
Sultan Qaboos University

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Materials and Methods: This is a retrospective cross-sectional study. The study included all emergency cesarean sections on both stages of labor done in SQUH during a three years from January 2015 to December 2017. Maternal and neonatal characteristics and outcomes were obtained from delivery ward registers and Hospital Information System, which were analyzed later. Bar charts were used to display the prevalence. The continuous variables were tested by t- test and Mann-Whitney U test.

Keywords: *cesarean sections, second stage, maternal, neonatal, morbidities.*

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Mallak Alkalbani [α] & Mariam Mathew [σ]

Abstract- Introduction: Over the last few decades, cesarean sections have been increased dramatically due to several medical and non-medical reasons. We can classify cesarean sections in emergency into either of the two stages of labor; at the first stage in which the cervix is dilated but not fully or at the second stage where the cervix is fully dilated. Studies revealed that the second stage cesarean sections are associated with a higher risk of maternal morbidities such as, intraoperative trauma and hemorrhage, which increase the need for blood transfusion. Also, some fetal morbidities can manifest, such as low APGAR score and umbilical artery pH at birth. This study aimed to assess the maternal and perinatal morbidity in the second stage cesarean sections compared to the first stage cesarean sections in Sultan Qaboos University Hospital.

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Results: Out of 172 cesareans sections, 93 (54.3%) were done during the first stage of labor, and 79 (45.9%) were during the second stage of labor. Second stage cesarean sections are associated with higher rate of maternal and neonatal morbidities compared to first stage cesareans. The rate of intraoperative hemorrhage (9.0% vs. 1.1%), the extension of the uterine incision (10.1% vs. 1.1%) and the need for blood transfusion (73.4% vs. 37.6%) are significantly higher in second stage cesareans. The mean length of hospital stay is significantly higher in the second stage cesareans. The babies born by second stage cesareans have a lower mean umbilical artery pH (7.22).

Conclusion: Intraoperative hemorrhage, the extension of uterine incision, increased need for blood transfusion and low neonatal arterial cord pH were the most morbidities associated with second-stage cesarean sections in SQUH. Further prospective multicentric studies with more sample size should be done.

Keywords: cesarean sections, second stage, maternal, neonatal, morbidities.

Author α: Medical student, College of Medicine, Sultan Qaboos University, Oman. e-mail: aalhabsi526@gmail.com
Author σ: Department of Obstetrics & Gynecology, Sultan Qaboos University Hospital, Oman.

I. Introduction

a) Cesarean sections

Over the last few decades, cesarean sections have been increased dramatically due to several medical and non-medical reasons (1). The average rate of the cesarean sections in Oman has raised progressively from 9.7% in 2000 to 15.7% in 2009 (2). In Sultan Qaboos university hospital, the cesarean sections rate is similar to those at developed countries (2). Therefore, considerable attention has been devoted to cesarean sections as it has more adverse outcomes on the mother and baby than vaginal delivery (3), (4), (5). The worldwide increase in the cesarean section rate has been attributed to some risk factors such as; high maternal Body mass index (BMI), advanced maternal age, high birth weight, previous cesarean sections, pre-pregnancy diabetes, mal presentations and abnormal positions of the fetus. Despite these factors may be predictable, they cannot be changed in labor (3), (6), (7).

b) Types of cesarean sections

Cesarean delivery comprises two types that are elective operations and emergency operations. Elective cesarean sections are planned cesareans, whereas emergency cesarean sections are performed due to obstetric emergencies. The types of cesarean sections are linked with different degrees of morbidities. In contrast to elective cesarean section, the emergency cesarean section is riskier on mother (8). Emergency cesarean sections which are done in labor could be at either of the two stages of labour; in the first stage in which the cervix is dilated but not fully or in the second stage where the cervix is completely dilated. Fetal distress, failure to progress, and dystocia are main causes for emergency cesarean sections at both stages of labor (9), (10).

c) Emergency cesarean sections comorbidities

Many existing studies revealed that the second stage cesarean sections are associated with a higher risk of maternal and perinatal morbidities than the first stage cesareans (3), (10), (11) and (12). Vousden et al. (2014) reported that second stage cesarean sections have a higher probability of intraoperative trauma such as a laceration to bladder or bowel or extension of the

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uterine incision. Furthermore, women who underwent second stage cesarean sections have a higher risk of hemorrhage, which increases the need of blood transfusion (8), (10), (11).

Alongside maternal morbidities, emergency cesarean sections are associated with a higher risk of adverse outcomes on babies. In contrast to the first stage, there is a consensus that the babies who born by the second stage cesarean sections are more likely to be admitted to the Special Care Baby Unit (SCBU), because they probably have low APGAR score and umbilical artery pH at birth (10), (11).

Murphy et al. (2001: pp.1207) reveal that "women were less likely to proceed to the cesarean section or to have a major hemorrhage if they were managed by a senior operator." Therefore, skills and knowledge are required to reduce the number of emergency cesarean sections and adverse

There were no studies conducted in Oman to compare maternal and perinatal morbidity between second versus first stage cesarean sections. Thus, the aim of this study was to assess the maternal and perinatal morbidity in the second stage cesarean sections compared to the first stage cesarean sections in Sultan Qaboos University Hospital (SQUH), which advanced our understanding on this topic and will serve as a platform for future studies in this field.

II. Materials and Methods

a) Study design and sample

This study was a retrospective cross-sectional study which included pregnant women who had emergency cesarean sections in the first stage of labor and second stage of labor at Sultan Qaboos University Hospital (SQUH), during a period of three years from January 2015 to December 2017.

Medical Record Numbers of women who underwent emergency cesarean sections in the first and second stage of labor during the study period were obtained from the delivery ward registers, and the required data was gathered from the Obstetrics and Gynecology department and Neonatal Unit through Hospital Information System (Track Care system). The data was saved in a secured excel sheet. Ethical approval from Sultan Qaboos university Ethics and Research committee was obtained before the data collection.

Exclusion criteria: Women with multiple cesarean sections, multiple pregnancies, fetal anomalies, intrauterine growth restriction, premature labor and fetal malpresentation were excluded from this study.

The collected data included maternal and neonatal characteristics such as maternal age, body mass index, gestational age, parity and dilatation of cervix at cesarean, type of anesthesia used, neonatal birth weight, and gender. Data on maternal morbidity included intensive care unit admission, blood loss, need for blood transfusion, Intra-operative complications, wound infection, operative duration, and the length of hospital stay. Neonatal morbidity included APGAR score at 1 and 5 min, arterial cord pH, birth asphyxia, neonatal trauma, neonatal sepsis, and neonatal intensive care admission.

b) Statistical analysis

The data was analyzed using Statistical Package for the Social sciences (SPSS) version 23.0. Descriptive statistics were obtained and displayed in tables to represent the continuous variables. Bar charts were used to display the percentage of maternal and neonatal morbidities.

One sample Kolmogorov-Smirnov test was used to test the normality of the continuous variables. To test the difference in the variables between the two stages of cesarean sections, t-test was used for normally distributed continuous variables (arterial cord pH, APGAR score at 1 and 5 minutes) and Mann-Whitney U test for the continuous variables that do not follow the normal distribution. Chi-square test was used for categorized variables. Significance was considered when p-values were ≤ 0.05. The analysis was done under the supervision of statisticians.

III. Results

The sample size of this study included 172 women who underwent cesarean section during the period between January 2015 and December 2017. About 93 (54.1%) of the cesarean sections were done during the first stage of labor and 79 (45.9%) were during the second stage of labor.

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a) Maternal and neonatal characteristics

Table 1: Maternal characteristics by stage of labor

Parameters	First stage cesarean sections (total number = 93)	Second stage cesarean sections (total number = 79)
	Mean ± Standard Deviation (SD)	Mean ± Standard Deviation (SD)
Age (years)	28 ± 4	28 ± 5
BMI (Kilogram/ meter^2)	33.7 ± 6.6	31.5 ± 6.4
Gestational age (weeks)	39 ± 1	39 ± 1
Cervical dilation on decision to operate (cm)	5.6 ± 2.3	10.0 ± 0
Parity:	Number (%)	
Primigravida	74 (79.6%)	48 (60.8%)
Multigravida	19 (20.4%)	31 (39.2%)

The demographical data of the mothers in both stages is presented in Table 1. The mean age of women delivered by first stage cesarean section is 28 years, which is similar to the mean age of second stage cesarean patients. Patients who underwent cesarean sections in the first stage of labor have average body mass index of 33.7 Kg/m^2, which is higher than the second stage cesarean patients. However, the difference is not significant with P-value less than 0.05. Gestational age of women in both stages is 39 weeks. The mean cervical dilation on the decision to operate in first stage cesarean sections is 5.6 cm. The prevalence of primigravida is 79.6% and 60.8% in the first and second stages of labor, respectively.

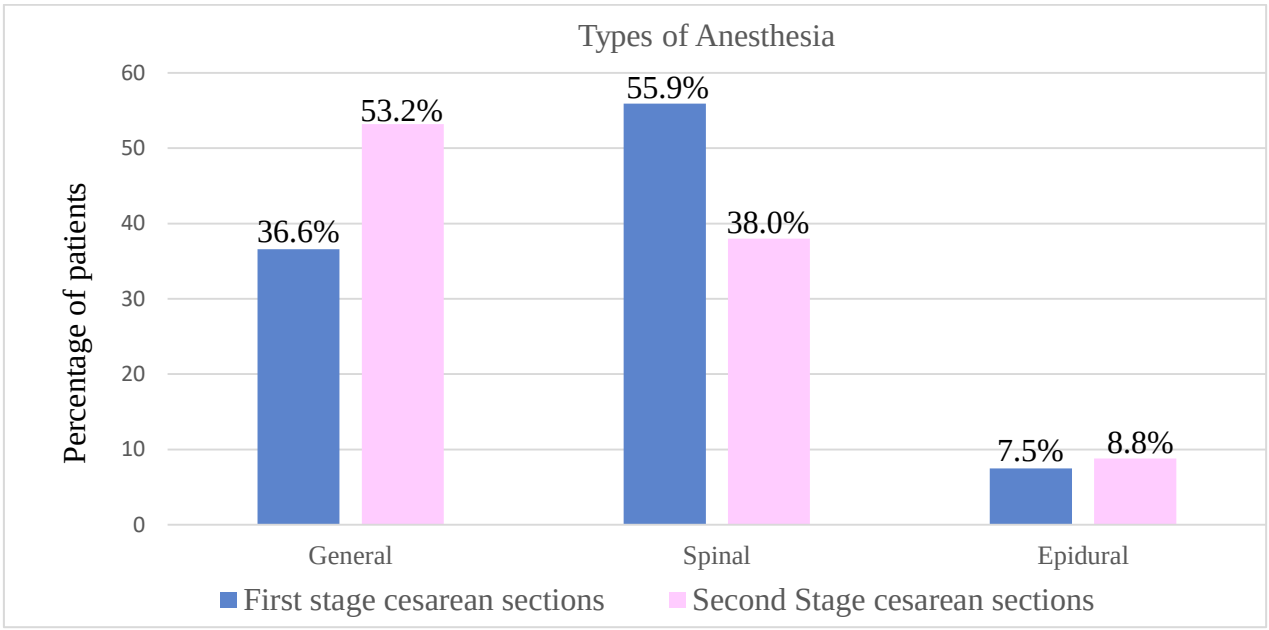


Figure 1: Type of Anesthesia used for Cesarean sections

In the first stage cesareans, the majority of mothers received spinal anesthesia 52 (55.9%). Approximately, 34 (36.6%) of them had general anesthesia. The rest of the first stage cesarean sections 7 (7.5%) were done under epidural anesthesia.

In the second stage cesarean sections, general anesthesia was received by 42 (53.2%) women. Also, 30 (38%) of second stage cesarean sections were done under spinal anesthesia, and 7 (8.8%) were done under epidural anesthesia as shown in Figure 1.

Table 2: Neonatal characteristics and stage of cesarean section

Parameters	First stage cesarean sections (total number = 93)		Second stage cesarean sections (total number = 79)	
Baby Gender	Male	Female	Male	Female
	Number (%)			
	51 (54.8)	42 (45.2%)	48 (60.8%)	31(39.2%)
Baby Birth Weight (Kilogram)	Mean ± Standard Deviation			
	3.3 ± 0.5		3.3 ± 0.3	

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In the first stage cesarean sections, 51 (54.8%) babies were males and 42 (45.2%) were females. In the second stage cesarean sections, 48 (60.8%) babies were males and 31 (39.2%) were females. The average weight of babies in both groups was similar to 3.3 Kg, as shown in Table 2.

b) Maternal outcomes

Table 3: Maternal Outcomes in the first stage and second stage cesarean sections

	First stage cesarean sections (Total number = 93)			Second stage cesarean sections (Total number = 79)			p- value
	Mean ± SD	Minimum value	Maximum value	Mean ± SD	Minimum value	Maximum value	
Blood loss (milliliter)	582.4 ± 230.1	200.0	1800.0	656.8 ± 334.7	250.0	2000.0	0.354
Pre-surgery Hemoglobin (gram/deciliter)	11.6 ± 1.4	8.0	15.3	11.1 ± 1.4	8.0	15.0	0.022
Post-surgery Hemoglobin (gram/deciliter)	10.1 ± 1.3	6.8	13.3	9.7 ± 1.3	7.4	13.5	0.043
Operation duration (Minutes)	59.3 ± 16.9	36	103	59.5 ± 19.2	36	120	0.732
Hospital stay (days)	2.99 ± 0.68	2	7	3.32 ± 0.89	2	7	0.05

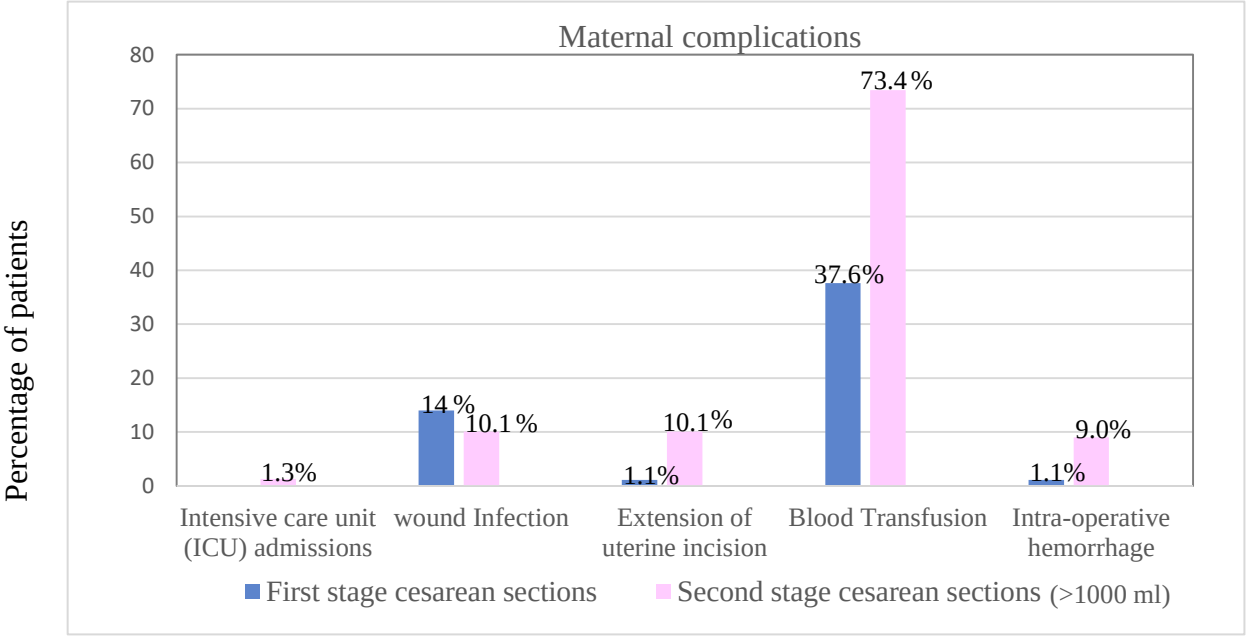


Figure 2: Maternal post-operative complications by stage of cesarean section

Table 3 represents maternal outcomes in the two types of cesarean sections, and Figure 2 represents maternal postoperative complications. The mean blood loss in women who underwent second stage cesarean sections is found to be higher (656.8 ± 334.6 ml) than the mean of the first stage (582.4 ± 230.1 ml). However, the difference is not significant as the p-value is 0.354 (more than 0.05). Pre-surgery mean hemoglobin is significantly lower in second stage cesarean sections (11.1 g/dl) and the P-value was 0.022. Post-operative mean hemoglobin is also significantly lower in the second stage cesarean sections (9.74 g/dl) with a p-value of 0.043. Women who underwent second stage cesarean sections have a significantly higher frequency of intraoperative hemorrhage (7 (9.0%)), with a p-value of 0.024. Thus, 58 (73.4%) women who underwent a second stage cesarean section needed a blood transfusion. In contrast to the second stage cesareans, there are less blood transfusion needed 35 (37.6%) for first stage cesarean sections women. The difference is significant (p-value < 0.001).

The average time needed to perform the cesarean section is almost equal in both stages, 59.3 minutes in the first stage, and 59.5 minutes in the second stage. The second stage cesareans required a significantly longer hospital stay a mean of 3.32 days, with a p-value of 0.05.

One woman (1.3%) from second stage cesareans was admitted to the Intensive care unit (ICU) and none from the first stage, which is not significant

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(p-value = 0.46). Thirteen patients (14%) of the first stage cesarean sections and eight patients (10.1%) of second stage cesarean sections had wound infection after the operation; the difference is not significant (p-value = 0.19). The number of extension of the uterine incision is significantly higher in second stage cesareans (8 (10.1%)), (p-value = 0.12). There were no cases of thromboembolism and visceral injury in both groups.

c) Neonatal outcomes

Table 4: Neonatal outcomes in the first stage and second stage cesareans

Parameters	First stage cesarean sections (total number = 93)			Second stage cesarean sections (total number = 79)			p - value
	Mean ± SD	Minimum value	Maximum value	Mean ± SD	Minimum value	Maximum value	
Umbilical artery pH	7.28 ± 0.11	6.9	7.9	7.22 ± 0.10	6.9	7.6	0.020
APGAR score at 1 minute	8.28 ± 1.35	4	9	8.03 ± 1.76	3	9	0.297
APGAR score at 5 minutes	9.58 ± 0.74	7	10	9.61 ± 0.89	4	10	0.830

Table 4 shows that babies delivered by second stage cesareans have a significantly lower mean arterial cord pH (7.22) compared to first stage cesareans (7.28), with a p-value of 0.02. There is no significant difference between stages in mean APGAR scores at both 1 and 5 minutes (p- values > 0.05).

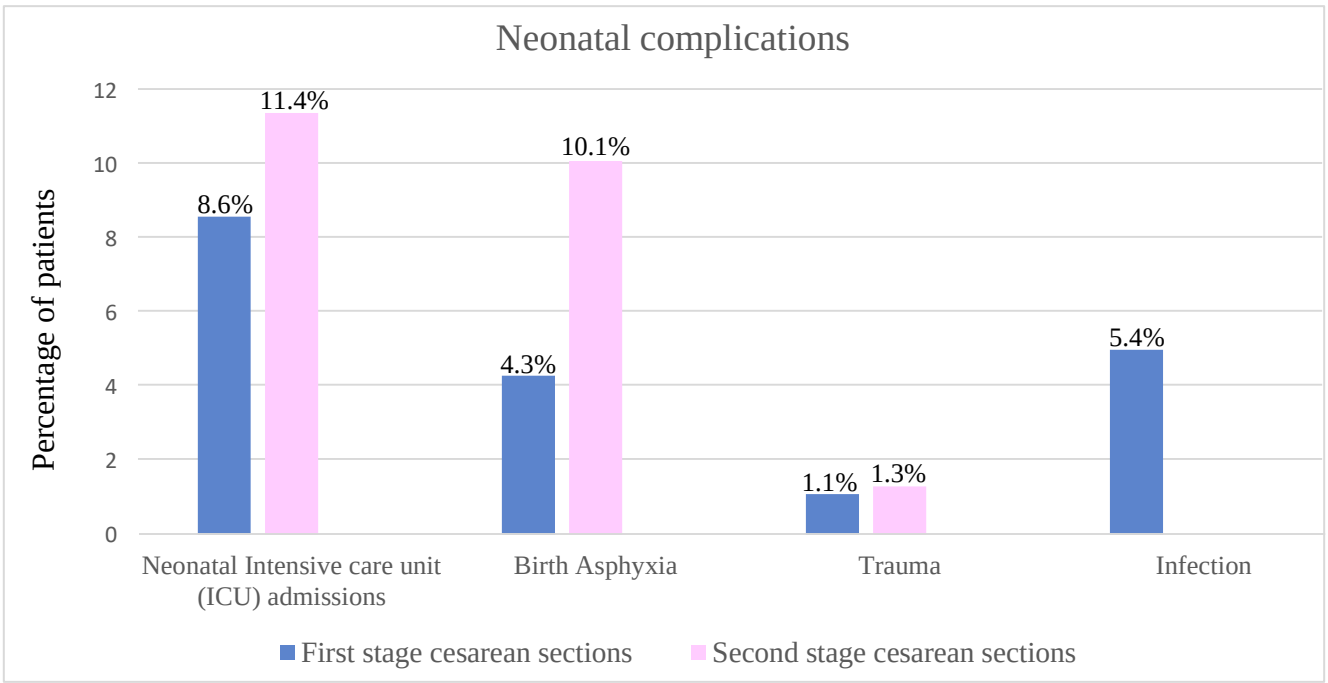


Figure 3: Percentage of Neonatal complications by stage of cesarean section

In figure 3, it is shown that neonates who were born by second-stage cesarean section have higher rates of Neonatal Intensive Care Unit (NICU) admissions 9 (11.4%) and Birth asphyxia 8 (10.1%). There is only one baby in each stage that has trauma. The difference between stages is not significant in all neonatal complications (p-value > 0.05).

IV. Discussion

Over the last few decades, cesarean sections have been increased dramatically due to various reasons. Cesarean delivery can be either elective or emergency operations. Emergency cesarean sections could be either at the first stage or the second stage of labor. Literature reveals more morbidities associated with second-stage cesarean sections compared to the first stage cesareans as shown in our study.

Unlike Asicioglu *et al*., our study revealed that the difference between first and second stage cesarean sections in mean blood loss was not significant. While, Asicioglu *et al.* revealed a significant increase in mean blood loss in second stage cesarean sections. Despite that blood loss difference is not significant in our study; it is found that intraoperative hemorrhage is significantly higher in second stage cesarean sections. Thus, the need for blood transfusion is also higher in second stage cesarean sections. These findings are supported by existing studies that revealed the same findings

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(Bashir *et al.*, 2018), (Asicioglu *et al.*, 2014), (Vousden *et al.*, 2014) .

Moreover, our results reveal that the extension of uterine incision cases were considerably higher in the second stage cesarean sections. This result supports the existing evidence of an increase in extension of uterine incision in the second stage cesarean sections (15), (11), (14), (13).

Based on this study, the prolonged hospital stay needed in second stage cesarean sections due to more complications is in line with the findings of Asicioglu *et al.* study. On the other hand, Lurie *et al.* reported no significant difference in length of hospitalization between the two stages of emergency cesarean patients. Thus, more studies are needed to test the difference in-hospital stay in the second versus the first stage cesarean sections.

Second-stage cesarean section babies had lower arterial cord pH in our study and other studies as well (10), (11). These studies also recorded lower APGAR score, more birth asphyxia and trauma thus more Neonatal Intensive Care Unit admissions among second stage cesarean section babies, unlike our results that reported no significant difference.

Asicioglu *et al.*, (2014) reported that "A cesarean delivery performed during the second stage of labour is technically difficult because the fetal head engagement in the maternal pelvis has already been completed, and the maternal uterine muscle is very thin and tense. Additionally, the identification of the bladder and the low segment of the uterus is very difficult and birthing relatively larger infants is more difficult and traumatic", which explains the findings. The non-significant findings in our study is probably due to the small sample size.

V. Conclusion

In conclusion, Intraoperative hemorrhage, the extension of uterine incision, increased need for blood transfusion, and low neonatal arterial cord pH were the most common morbidities associated with second-stage cesarean sections in SQUH. Other findings were not significant.

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