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Original Research Article

Incidence of decision to delivery interval delay in emergency LSCS and its impact on fetal and maternal outcome: a prospective observational study

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ABSTRACT

Background: Caesarean delivery is a complex multidisciplinary procedure. Decision to delivery interval is supposed to play a significant role in maternal and neonatal outcomes. The present study was undertaken to determine the incidence of DDI delay among pregnant women undergoing Emergency LSCS in tertiary care centres.
Methods: This study was conducted on 400 subjects who underwent emergency LSCS in category I and category II during a period from November 2020 to August 2021.
Results: The maximum patients were from the age group of 25-29 years (43%), primigravida (59.1%), gestational age between 37-40 weeks (78%). 29% have undergone category-1 LCSC and 71.2% have undergone category-2 LSCS. Out of 116 patients underwent category-1 LSCS, 11 (9.5%) patient delay was present whereas in category-2 LSCS out of 284,12 (4.2%) patient delay was present. Among Category-I LSCS the most common indication was Fetal distress and among Category-II LSCS the major indication was non reassuring CTG. Maximum babies have APGAR scores between 7-10 at 1 (N=369) and 5 min (N=398). The mean cord PH was 7.31, ranged from 6.9-7.47. 98 babies required NICU admission and most of them admitted for respiratory distress. 11 patients required blood transfusion. There was no significant association found between various parameters and DDI delay, ($p>0.05$).
Conclusions: In the present study, the interval between the decision to delivery interval has no significant impact on feto-maternal outcome in Category-I LSCS. Among Category-II LSCS there was a delay in 12 cases, among them 7 babies required NICU admission, the complications among neonates were significantly more when DDI was >75 minutes.

Keywords: Emergency LSCS, RCOG guidelines, Category I and II, Decision to delivery interval delay, Feto-maternal outcome

INTRODUCTION

Emergency caesarean section delivery is the most commonly performed surgical procedure in pregnant women associated with significant mortality and morbidity both in the mother and foetus. Decision-delivery interval (DDI) defines as the timeline between a decision being made to terminate the pregnancy by caesarean section and delivery of baby.[1] The American college of obstetricians and gynaecology (ACOG) committee in 1989 had declared that a hospital that can provide obstetric services should have the capacity to deliver the baby within 30 minutes after the decision is made.[2] In 2010, the Royal college of obstetricians and gynaecologists (RCOG) standardized the classification of the urgency of Caesarean sections (CSs) into four defined categories which was modified from Lucas et al.[3] Lucas et al proposed a new classification of emergency LSCS based on clinical definitions.[4] In 2012

ACOG and the American academy of paediatrics (AAP) agreed that hospitals should have the capability of accomplishing delivery within 30 minutes, but that this timing should take into consideration maternal and fetal risks and benefits, and hence the DDI should be acceptable based on local circumstances and logistics.[5] National institute for health and care excellence guidelines have recommended that category I (immediate threat to the life of the woman or fetus) and Category II (maternal or fetal compromise that is not immediately life-threatening) caesarean sections should be carried out within 30 minutes and 75 minutes after the decision, respectively. They also recommend the use of 30-minute and both 30- and 75-minute intervals to measure the overall performance of an obstetric unit in category 1 and category 2 caesarean sections, respectively.[6]

In 2011, National institute of clinical excellence (NICE) UK guidelines suggested a decision to a delivery interval of 30 minutes for Category I emergency LSCS and both 30 minutes and 75 minutes for Category II Emergency LSCS.[7] In our centre, we try to optimize all the conditions so that the DDI is within the prescribed guidelines. However, in many instances, even with all our efforts, we are unable to do CS in the prescribed time interval. This has been worsened with added protocols related to COVID. In this study, we wanted to know how many deliveries are happening within the prescribed time limit and whether this had an impact (of concern) on fetal and maternal outcomes. The study aims to determine whether the decision to deliver interval delay in Category I and II Emergency LSCS has an impact on maternal and fetal outcome and to ensure that decision to delivery interval is within the standard criterion as per standard protocol.

METHODS

Written informed consent from all the mothers was taken. This observational study was conducted in the Department of Obstetrics and Gynaecology, at tertiary care center during a period from November 2020 to August 2021. The department has 47 beds with an average of 200 outpatients, 20 admissions per day, and around 200 deliveries per month. All women in labour undergoing Category I and II indications of Emergency LSCS were included in the study. Patients undergoing elective LSCS, pregnancies involving fetus with major congenital anomaly, category 3, and category 4 LSCS were excluded from the study. From the mother's chart, DDI was calculated. Information about neonatal outcome including Apgar scores at 1 minute and 5 minutes; umbilical cord blood gases; admission to the Neonatal intensive care unit (NICU), Cardiopulmonary resuscitation (CPR), and maternal complications such as Surgical injuries, Intraoperative blood loss, Blood transfusion, uterine rupture, and Puerperal fever were obtained from the chart. Emergency Caesarean Section1: Definition: Caesarean section is called Emergency when the operation is performed due to unforeseen complications, arising either during pregnancy or during labour without wasting time following the decision.

The DDI for emergency CS was defined as the interval in minutes from the time of the decision by the obstetrician to the time of delivery of the baby. The total DDI was calculated as a continuum of the following four intervals: Interval I (A-B); Decision by an obstetrician (A) and transfer of the patient to operation theatre (B), Interval II (B-C); Arrival of the patient in operation theatre (B) to induction of anaesthesia (C), Interval III (C-D); From anaesthesia induction (C) to surgical incision (D), Interval IV (D-E); From surgical incision (D) to delivery of baby (E).

Table 1: LUCAS classification.[4]

Categories	Description
Category 1	The immediate threat to the life of a woman or foetus with maternal or foetal compromise
Category 2	No immediate threat to the life of woman or foetus with maternal or foetal compromise
Category 3	Requires early delivery, No maternal or fetal compromise
Category 4	At a time to suit the woman and maternity services

Statistical analysis

Data were entered into Microsoft Excel (Windows 7; Version 2007) and analyses were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 22.0; SPSS Inc, Chicago). Descriptive statistics such as mean and standard deviation (SD) for continuous variables, frequencies, and percentages were calculated for categorical variables. Association between Study Group and other categorical variables were analysed using the chi-square test of independence. Comparison of mean of various quantitative variables was analysed using unpaired t-test. Bar charts and Pie charts were used for a visual representation of the analysed data. The level of significance was set at 0.05.

RESULTS

A total of 400 patients were enrolled in the study. The maximum patients were from the age group of 25-29 years (43%), primigravida (59.1%), and gestational age between 37-40 weeks (78%), (Table 2). The mean age of patients was 27.91±3.85 years, ranged from18 to 42 years and mean gestational age was 38.05±2.19 weeks, ranged from 28-41 weeks.

Out of 400, 263 (65.8%) labour was induced and 137 (34.3%) came with spontaneous onset of labour. 29% have undergone category 1 LCSC and 71.2% have undergone category 2 LSCS as depicted in (Figure 1). 268 (67%) patients received spinal anaesthesia followed by 116 (29%) patients who received epidural anaesthesia and 16 (4%) patients received general anaesthesia. The maximum (60.8%) patients had blood loss in the range 500-1000 ml,

32.8% with blood loss less than 500 ml, 3.8% with blood loss in the range of 1000-1500 ml and 2.8% with blood loss of more than 1500ml. The mean blood loss was 657.63±286.47 ml.

Table 2: Distribution of study subjects according to the age, GA, and gravida (n=400).

Parameters		N	%
Age (years)	18-24	84	21.0
	25-29	174	43.5
	30-34	128	32.0
	≥35	14	3.5
GA (weeks)	28-32	10	2.5
	32/1-34/0	18	4.5
	34/1-36/6	59	14.8
	37/0 and above	313	78.3
Gravida	Primi	236	59.1
	Multi	164	40.9

Out of 116 patients underwent category 1 LSCS, 11 patient delay was present which contributes to 9.5% delay whereas in a category 2 LSCS out of 284,12 patient delay was present which contributes to 4.2% delay as shown in (Figure 2).

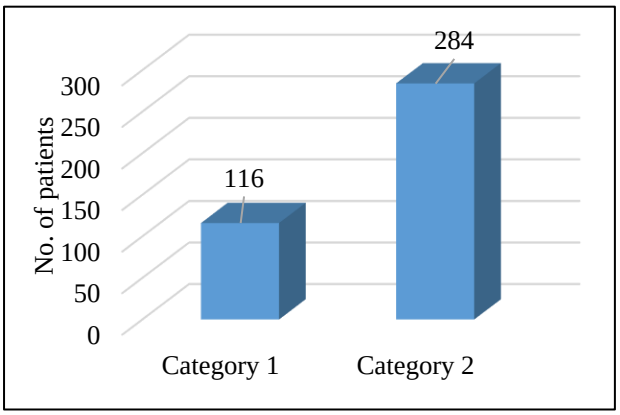

Figure 1: Distribution of study subjects according to the category (n=400).

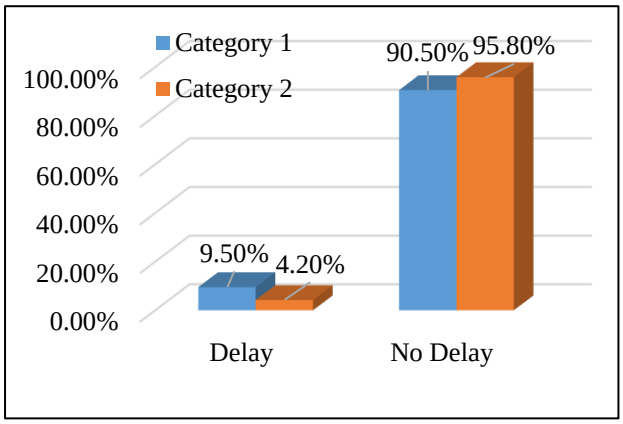

Figure 2: Distribution of study subjects according to the DDI (n=400).

The majority of patients in category I LSCS, the most indication was fetal distress (90) which contributes to 77% and 10 Abruptio (8.26%) and others as shown in table 3. However, among Category II LSCS, the majority 80 for non-reassuring CTG (28%) and 58 for Prev LSCS in labour (20%), and the rest all as shown in (Table 3).

Table 3: Indication of LSCS distribution in category 1and 2 LSCS.

Indication of LSCS		N	%
Indication of LSCS in category 1 (N=116)	Fetal distress	90	77.58
	Abruption	10	8.62
	Scar deschience	07	6.03
	Cord prolapses	04	3.44
	Failed instrumental delivery	02	1.72
	Eclampsia	02	1.72
	Uterine rupture	01	0.8
Indication of LSCS in category II (N=284)	Non-reassuring CTG	80	28.16
	Previous LSCS in labour	58	20.42
	Failed induction	50	17.60
	Arrest of dilatation	26	9.15
	Abnormal dopplers	17	5.98
	Others	53	18.66

A total 132 (33%) babies had cord PH less than 7.3 and 268 (67%) babies had cord PH more than 7.3. Mean cord PH was 7.31 with a range of 6.9-7.47. Maximum babies have APGAR scores between 7-10 at 1 min (N=369) and 5 min (N=398) (Table 4).

Table 4: Distribution of study subjects according to the APGAR Score (n=400).

APGAR Score	At 1 min, N (%)	At 5 min, N (%)
0-3	03 (0.8)	01 (0.3)
4-6	28 (7.0)	01 (0.3)
7-10	369 (92.3)	398 (99.5)

A total 98 babies required NICU admission. There were no neonatal deaths present and 8.1% of babies needed resuscitation, 4 babies (1%) were intubated, 9 babies (2.3%) required bag-mask ventilation and the rest of the babies required suction and stimulation (4.8%). There were no anaesthesia-related complications. only 3 (0.9%) patients had a surgical injury, 38 (9.5%) patients had a puerperal fever and 11 patients (2.7%) required blood transfusion (Table 5).

Majority of babies were admitted to NICU for respiratory distress ranging from mild to severe distress,12.2% of babies were depressed at birth,12.2% babies were admitted

due to TTN, 3.1% with meconium aspiration syndrome, 4.1% with low birth weight.

Table 5: Fetal and maternal outcome.

Parameters			N	%
Fetal outcome	NICU admission	Yes	98	24.5
		No	302	75.5
	Neonatal death	Yes	00	0.0
		No	400	100.0
	Resuscitation (N=15)	BMV	09	2.3
		Intubated	04	1.0
		Stimulation	04	1.0
Maternal outcome	Surgical injuries	Yes	03	0.9
		No	397	99.3
	Puerperal fever	Yes	38	9.5
		No	362	90.5
	Blood transfusion	Yes	11	2.7
		No	389	97.3

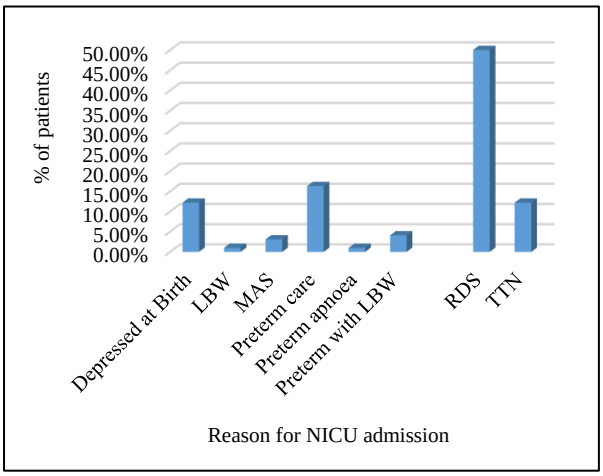

Figure 3: Distribution of study subjects according to the reason for admission (n=98).

DDI delay was not significantly associated with various parameters like APGAR score at 1 and 5 min, resuscitation, surgical injuries, blood transfusion, puerperal fever, cord PH, blood loss, NICU admission in Category I and II LSCS as shown in (Table 6).

DISCUSSION

In the present study, among 400 participants, 116 (29%) belonged to category I and 284 (71.2%) belonged to category II which is comparable with the study conducted by Anuradha et al and Radhika et al.[9,10] However, out of 116 patients who underwent category I emergency LSCS, 90.5% (105) delivered within the proposed decision delivery interval of 30 minutes thereby satisfying the RCOG criteria, and 9.5% delivered after 30 minutes of decision making.[11] Among the 284 patients who were in category II, 95.8% (272) satisfied the RCOG criteria by delivering before 75 minutes of decision making and 4.2% delivered after 75 minutes.[12] Thus, RCOG Criteria for DDI in emergency LSCS was fulfilled more in category II than category I. The most common indication among category I LSCS was Fetal distress contributes to 77.98%. Among Category II LSCS major indication was Non reassuring CTG (28%) followed by previous LSCS in labour (18%) and failed induction (17%). Similar results were found in Anuradha et al and Nair et al study.[9,11] Out of 116 patients who delivered within 30 minutes in category I, 42 babies required NICU admission, and 74 babies were found to be normal. The decision to the delivery interval was more than 30 minutes in 11 cases in category I out of which 2 babies got admitted to NICU. Out of 284 patients who delivered within 75 minutes in category II, 56 babies required NICU admission, and 228 babies were found to be normal. The decision to the delivery interval was more than 75 minutes in 12 cases in Category II out of which all the 7 babies got admitted in NICU. There was no statistically significant association between DDI and neonatal complications in category 1 LSCS but in Category II LSCS when it exceeds >75 min it was significant. These findings are comparable with the previous studies.[8,10-12]

At 1 min APGAR score less than 7 was observed among 31 babies out of 400 and APGAR score of 5 min less than 7 was observed among 2 babies, there was no statistically significant association between DDI and low APGAR score. Similar observations were found in an Anuradha et al study.[9] In the present study, 132 (33%) babies had cord pH less than 7.3 and 268 (67%) babies had cord PH more than 7.3. The mean cord pH was 7.31 with a range of 6.9-7.47. These findings are in accordance with study done by Mackenzie et al and Cynthia et al.[1,13]

Maternal complications such as Postpartum hemorrhage occurred in 2.7% (N=11) CS, requiring blood transfusion. The occurrence of maternal complications was not affected by DDI (p=0.629). Similar observations were made by Gupta et al study.[8] In the current study out of 400 patients, 38 patients had a puerperal fever, there was no statistically significant association between DDI and maternal complication. Out of 400, 268 patients took spinal anaesthesia,116 patients took epidural anaesthesia and 16 patients took general anaesthesia. Maximum patients in category I LSCS (74%) took epidural anaesthesia, hence DDI of 30 minutes was able to be achieved. The use of epidural analgesia to be encouraged during labours that only a top-up is required if emergency CS was required. A similar observation was made by Yakasai et al.[14] Among category I LSCS, 11 cases delay was present, among them 2 cases delay present in obtaining consent from relatives to perform emergency LSCS, 2 cases due to non-availability of operation theatre, 5 cases due to prolong anaesthesia induction timing and 2 cases delay present from induction to baby out due to dense adhesions. However, among category II LSCS, 12 cases delay was present, among them 4 cases delay due to non-availability of operation theatre, 7 cases in obtaining consent, 1 case due to failed spinal converting to general anaesthesia. These findings are correlated with the study done by Gupta et al and Samia et al.[8,15]

Table 6: Association between various parameters and delay (n=400).

Parameters		Delay present (n=23) frequency (%)	Delay absent (n=377) frequency (%)	P value
APGAR score at 1 min	0-3	00 (0.0)	03 (0.8)	0.795
	4-6	01 (4.3)	27 (7.2)	
	7-10	22 (95.7)	347 (92.0)	
APGAR score at 5 min	0-3	00 (0.0)	1 (0.3)	0.941
	4-6	00 (0.0)	1 (0.3)	
	7-10	23 (100)	375 (99.5)	
Resuscitation	Yes	1 (4.3)	31 (8.2)	0.506
	No	22 (95.7)	346 (91.8)	
Surgical injuries	Present	00 (0.0)	3 (0.8)	0.668
	Absent	23 (100)	374 (99.2)	
Blood transfusion	Yes	01 (4.3)	10 (2.7)	0.629
	No	22 (95.7)	367 (97.3)	
Puerperal fever	Yes	01 (4.3)	37 (9.8)	0.385
	No	22 (95.7)	340 (90.2)	
Cord PH	Mean (SD)	7.325±0.081	7.317±0.080	>0.05
Blood loss	Mean (SD)	641.30±263.13	658.62±288.12	0.779
NICU admission (Cat 1)	Yes	02 (18.2)	40 (38.1)	0.191
	No	09 (81.8)	65 (61.9)	
NICU admission (Cat 1)	Yes	01 (8.3)	55 (20.2)	0.311
	No	11 (91.7)	217 (79.8)	

In the present study, we were able to achieve recommended DDI among category I and II LSCS because in our institute we follow the Lucas classification of urgency and regular auditing is done in our department. The most important thing is to recognize and choose category I LSCS. Collaboration and communication will aid in achieving the recommended DDI. The limitations in the present study were a poor perinatal outcome due to neonatal prematurity in preterm LSCS cannot be ruled out. Because our study was conducted in a tertiary care center with facilities for emergency cesarean section and round-the-clock availability of senior consultants and adequate staff, the patient outcomes and management cannot be generalized to low resource settings.

CONCLUSION

In the present study, the interval between the decision to delivery interval has no significant impact on feto-maternal outcome in Category I LSCS. Among category II LSCS there was a delay in 12 cases, among them 7 babies required NICU admission, the complications among neonates were significantly more when DDI was >75 minutes. It was able to keep the DDI in 90.5 percent of category I cases and 95.8 percent of category II cases. In our study, the use of epidural analgesia during labour has helped to reduce the DDI because only a top-up is needed if emergency CS is required. Clear channels of communications are vital in all cases requiring emergency caesarean section to prevent delay and to improve feto-maternal. Hence, obstetricians are encouraged to adopt the RCOG (2010) classification of the urgency of caesarean section which uses four categories with specific time constraints.

Recommendations

Obstetricians are encouraged to use the RCOG (2010) classification of caesarean section urgency, which uses four categories with specific time constraints so that the poor fetal outcomes can be avoided. In every scenario requiring an emergency caesarean section, open lines of communication are critical. Clinicians should define each member of the multidisciplinary team's function to improve communication and management. Crash cesarean section, simulation drills, and standardization of procedures for a crash cesarean section appear to reduce the decision to the delivery interval. The use of tools designed to shorten the decision to delivery interval (color-code communicating tool) was found to significantly reduce the decision to the delivery interval. The use of epidural analgesia during labour should be encouraged so that only a top-up is required if emergency CS is required. Patients and their relatives should be educated on the need for consent in emergency CS.

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