



## CRASH CESAREAN SECTIONS-DECISION TO DELIVERY INTERVAL, MATERNAL AND FETAL OUTCOMES

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**ABSTRACT** Objective

- To determine decision to delivery interval in crash caesarean sections .
- To review the risks and benefits associated with crash caesarean section, and ways to achieve swift and safe delivery.
- To know the maternal and fetal outcome of crash caesarean section.

**Methods:** This is a 30 month retrospective cross-sectional study at Yenepoya medical college studying Category 1(Crash Caesarean sections) of RCOG caesarean section between July 2017 to December 2019 .A total 509 Crash caesarean sections were analyzed out of 6169 deliveries for decision to delivery interval (DDI) and maternal and fetal outcomes

**Results:** During the study period there were total of 6169 deliveries of which caesarean section comprised of 1852(30.03%) and 509(8.25%) crash caesarean sections. 82 (16.1%) of crash caesarean sections had DDI of less than 30 min. Neonatal out comes compared as NICU admission in groups with DDI less than 30 min and greater than 30 min had significant p value of 0.0002.Fresh still births(n=2) were present with DDI greater than 30 min. Maternal complications such as bladder injury, traumatic PPH, postoperative wound infections, ICU admissions, negative birth experience were noted.

**Conclusion:** Monitoring decision to delivery intervals remains essential in assessing quality of obstetric Caesarean section units. For swift and safe C sections, periodic simulation drills are valuable to improve team work, readiness and enhance communication skills.

**KEYWORDS :** Crash Caesarean sections, Decision to delivery interval of interest**INTRODUCTION**

'Crash' Caesarean section (extremely urgent Caesarean delivery) is defined by Mac Kenzie and Cooke<sup>1</sup> as emergency caesarean performed when life-threatening fetal distress occurs when imminent delivery is not expected, with an aim to protect maternal and neonatal well-being. Lucas *et al.*<sup>2</sup> in 2000 proposed a new classification based on clinical definitions for caesarean sections. Royal College of Obstetrician and gynaecologist (RCOG) in 2010 classified urgency of caesarean section, a modified version of Lucas *et al* classification, relating to the degree of urgency to the presence or absence of maternal or fetal compromise is illustrated in Figure 1<sup>3</sup>. Crash caesarean sections are considered as category 1 caesarean section.

Royal College of Obstetricians and Gynaecologist (RCOG), American college of Obstetricians and Gynaecologist (ACOG), Canadian college of Obstetricians and Gynaecologist and National Institute of Clinical Excellence [NICE,UK] guidelines 2011<sup>4</sup> suggested that, decision-to-delivery interval (DDI) should be less than 30 min for Category 1 caesarean section (immediate threat to life of women or foetus) and between 30 and 75 min for Category 2 caesarean section (maternal and fetal compromise that is not necessarily life threatening). In emergency situations a hospital should be capable of initiating caesarean section with DDI less than 30 min.Global incidence of category I caesarean section is 6 to 7%.<sup>5</sup>

Figure 1. A classification relating the degree of urgency to the presence or absence of maternal or fetal compromise

Urgency	Definition	Category
Maternal or fetal compromise	Immediate threat to life of woman or fetus	1
Maternal or fetal compromise	No immediate threat to life of woman or fetus	2
	Requires early delivery	3
No maternal or fetal compromise	At a time to suit the woman and maternity services	4

Studies have shown that a very short period of fetal anoxia could lead to irreversible cerebral lesions.<sup>6,7</sup> Hence fetal monitoring during labour is required to prevent hypoxic ischemia . Delivery within the recommended 30 minute interval during fetal distress resulted in improved APGAR scores and umbilical artery pH<sup>7</sup>. Hypoxic ischemic encephalopathy (HIE), stillbirth or neonatal death may result from delay in delivery, and this has serious implications. Maternal complications such as, bladder injury, postpartum haemorrhage (traumatic, atonic and mixed), post operative wound infections, retained placental bits and negative birth experience were noted.

Long DDI have adverse maternal and fetal out comes. In order to

improve maternal and neonatal morbidity and mortality, an audit tool that allows study of study of DDI, causes for the delay with maternal and neonatal outcomes is required to analyze the efficacy of whole delivery team, reasons for delay and measures to overcome long DDI to reduce maternal and neonatal morbidity and mortality .This study was under taken to review the risks and benefits associated with crash caesarean section, and ways to achieve swift and safe delivery, and to know the maternal and fetal outcome of crash caesarean section.

**Methods And Methodology**

This was a 30 month retrospective cross-sectional study at Yenepoya medical college studying Category 1(Crash CESAREAN SECTION) of RCOG CESAREAN SECTION between July 2017 to December 2019 .A total 509 Crash CESAREAN SECTION were analyzed out of 6169 deliveries for decision to delivery interval (DDI) and maternal and fetal outcomes. The following data was collected

- Indication for crash Caesarean section
- DDI
- Neonatal outcomes
- Maternal outcomes
- Causes for the delay

**Exclusion criteria:**

- Category 2, 3,4 CESAREAN SECTION
- Fetus with congenital anomalies
- Preterm crash caesarean sections

Study work commenced after obtaining ethical clearance from the institution. Outcome variables DDI, APGAR, Maternal outcomes and neonatal outcomes were tabulated. Reasons for delay in DDI were noted

**RESULTS**

During the study period there were total of 6169 deliveries of which caesarean sections comprised of 1852(30.03%) and 509(8.25%) crash caesarean sections. (FIG: 2)

FIGURE 2: Figure showing total number of deliveries, total caesarean sections and crash caesarean sections.

Total Number Of Deliveries	6169	
Total Number Of cesarean Section	1852	30.03%
Total Number Of Crash caesarean Sections	509	8.25% of total deliveries 27.5% of total caesarean sections

Indications for Crash cesarean sections are varied as illustrated in (Fig:3) commonest being fetal distress 56.58%(n=288) which comprised of Grade 3 MSL, persistent late or variable deceleration, persistent bradycardia of which 10.27% (n=30) achieved DDI with in 30 min. Failed vaginal deliveries included second stage arrest and failed instrumental deliveries comprised of 25.93%(n=132) of which 12.1% (n=16) had DDI of less than 30 min. Imminent eclampsia were total of 7.07%(n=36) of which 27.7%(n=10) had DDI of less than 30 min. Antepartum hemorrhage which included abruption, bleeding placenta previa comprised of 6.28%(n=32) with 56.25%(n=18) had DDI of less than 30 min. Other indications such as cord prolapsed, scar dehiscence and eclampsia comprised of 3% (n=21) of which majority had DDI greater than 30 min.

**FIGURE 3: Table showing indications for Crash cesarean section and number of cases with DDI**

Indications Of Crash Cesarean Section	Percentage	Number	DDI < 30min	DDI >30min
Fetal distress	56.58%	288	30 (10.27%)	258 (89.7%)
Second stage arrest and Failed instrumental delivery	25.93%	132	16 (12.1%)	116 (87.9%)
Imminent eclampsia	7.07%	36	10 (27.7%)	26(72.2%)
Antepartum haemorrhage	6.28%	32	18 (56.25%)	14 (43.75%)
Cord prolapse	1.76%	9	6 (66.6%)	3(33.3%)
Scar dehiscence	1.96%	10	2(20%)	8(80%)
Eclampsia	0.39%	2	-	2(100%)
TOTAL		509	82 (16.1%)	427 (83.9%)

**FIGURE 4: Table showing neonatal outcomes**

	Number	Percentage	DDI <30 Min	DDI >30 Min	P Value
Total number of live births	507	99.60%	82(100%)	425 (99.54%)	
Total number of Fresh still births Cause:Fetal distress	2	0.40%	0	2 (0.46%)	
Total number of NICU admission	164	31.78%	10 (6.09%)	154 (93.91%)	0.0002
Total number of neonatal deaths	6	1.58%	2(25%)	4(75%)	0.250
Birth Injuries	5	0.9%	3(60%)	2(40%)	0.00747

**FIGURE 5: Table showing causes of NICU admission and causes of neonatal deaths.**

Causes For NICU Admission	Number	Percentage	Day Of Neonatal Death	Cause For Death
Respiratory Distress	110	67.07%	Day 4	RDS, HIE 3, SEPSIS MODS
			Day 7	RDS, MODS, SEPSIS
			Day 11	RDS, SEPSIS, MODS
Transient Tachypnea Of New Born	22	13.1%		
Sepsis	14	8.5%		
Meconium Aspiration	18	10.9%	1 Hour	Cardio Pulmonary Arrest
			Day 6	Pulmonary Hypertension , Cardio Pulmonary Arrest
			Day 3	Pulmonary Hypertension Cardio Pulmonary Arrest

There were total of 507 (99.60%)live births out of 509 crash cesarean sections (Fig:4).82 crash cesarean sections were achieved with in 30 min .Still born were 2 (0.46%) in number which had DDI of more than 30 min and cause for still born being fetal distress. Of 507 live born

babies 164 babies (31.78%) required NICU admissions for various reasons (Fig: 5). Total number of neonatal death were 4(1.58%) and the causes of death being respiratory distress, multiple organ dysfunction, sepsis, and meconium aspiration which lead to cardio pulmonary arrest. There were 100% live births with DDI less 30 min where as DDI greater than 30 min had live births of 99.54% and fresh still births of 0.46%. Those with DDI of less than 30 min 9 out of 41 babies required NICU admission ie around 10.9% of total NICU admissions, and those with DDI greater than 30 min 73 babies out of 215 required NICU admissions i.e. 89.1% of total NICU admissions. This had a statically significant p value of 0.002. DDI less than 30 min had lesser neonatal deaths compared to DDI greater than 30min but was not statistically significant. Birth injuries like minor scalp lacerations, humerus fracture were noted and were statistically significant.

Total of 99 mothers had complications which resulted in delayed hospital stay; need for ICU admissions, need for blood and blood products and one of combined PPH proceeded to subtotal hysterectomy. Maternal complications are being illustrated in fig 6. Most common complication was negative birth experience due to prolonged hospital stay, complications, labour pains, surgical site pain, admission to NICU and neonatal deaths. Others being post partum hemorrhage and surgical site wound infection required secondary suturing. 1 had retained bits of placenta leading to secondary PPH. There was 2 bladder injury,2 peripartum hysterectomy, 1 patient had intra op tonic clonic seizures due to administration of INJ Methyl ergometrine IM. 1 patient developed b/l lower limb weakness post operatively when evaluated was diagnosed to have syrinx in spinal cord.

Causes for delayed DDI were investigated. They can be broadly divided as follows

- Delay in obtaining consent
- Preparation for operation

Preparation of patient, administration of antiemetic, H2 blockers and antibiotic test dose.

• **Technical difficulties**

**Figure 6: Table illustrating maternal complications.**

Maternal Complications	Number
PPH	9
Hysterectomy	1
Traumatic PPH	2
Combined PPH leading to Subtotal Hysterectomy	1
ICU admissions	13
Eclampsia	2
Tonic clonic seizures	1
Peripartum cardiomyopathy	1
Obstetric haemorrhage leading to DIC	
PPH	5
APH	2
Hypertensive disorder in pregnancy leading to DIC	2
Bladder injury	2
Intraoperative tonic clonic seizures	1
Retained bits of placenta	1
Lower limb weakness	1
Post operative Wound infection	13
Negative birth experience	58
TOTAL	99

During administration of anaesthesia

Difficulty in surgery due to previous scar, adhesions, bleeders and deeply impacted head.

**DISCUSSION**

Crash caesarean section rates in the present study are 8.25% slightly higher than the global standards. As the institution is a tertiary referral centre here emergency cases requiring crash caesarean sections are higher. This study had 16.1% (n=82) Crash caesarean section delivered within 30 min of DD. Khemanat Khemworapong, et al<sup>8</sup> in his study DDI in emergency caesarean section in Thailand had Crash Caesarean section rates of 3.5% delivered within 30 min. DDI is commonly longer than 30 min in developing countries<sup>9-11</sup>.

The most common indication for crash caesarean section in this study

was fetal distress (56.6%) which requires immediate action so as to reduce neonatal morbidity and mortality. There were 2 still births and 164 new born were shifted to NICU for special care which had 6 neonatal deaths. Nair VV et al.<sup>12</sup> study had persistent bradycardia / fetal distress accounting for 69%. They could achieve 50.29% of crash cesarean section within 30 min in contrast to present study. This was possible as there was regular audit of crash cesarean sections and necessary measures taken to improve the outcomes in the institution as per RCOG guidelines. The study by Nair VV et al showed that delivery within 30 min had lesser NICU admissions neonatal morbidity and mortality. Gabbay<sup>13</sup> in shorter DDI had better neonatal outcome.

In present study maternal outcomes were noted such as negative birth experience PPH, wound infections and other complications but were not specific to crash cesarean sections and did not depend on DDI. Gupta et al<sup>14</sup> in his study concluded that maternal complications were not affected by DDI.

Weiner et al<sup>15</sup> in his study showed DDI more 30 min had significant neonatal complications. They had later studied crash cesarean sections cases after department protocol implementation for crash cesarean sections for non reassuring fetal heart rates which showed significant increase in number of cesarean sections within DDI of 30 min, reduction in neonatal morbidity and mortality however composite maternal outcomes remained the same after protocol. In their study they had to manage 3 main issues to implement the protocol so as to reduce DDI. Improving communication with the nursing staff, anaesthesiologists and paediatricians. This was achieved by stating the urgency of the operation. Second, transferring the patient to the operating room as soon as possible after decision to operate, initiating abdominal disinfection parallel with bladder drainage. Third, general anaesthesia was preferred to regional anaesthesia to those without regional anaesthesia as general anaesthesia had shorter induction times than regional anaesthesia.

Causes for delay were studied and following measures can be taken to decrease the DDI. Counselling the patient party in high risk patients. High risk cases, practice early preparation ie to keep Nil per oral, reserve PRBC. Practice of epidural analgesia in labour, in case of emergency can be taken up for surgery without delay. Intra operatively refraining from diverting attention to control small bleeders or repair of visceral damage before delivery. Experienced in house operating team will reduce DDI. Regular crash C section drills. Use of handheld vacuum KIWI OMNICUP and forceps. Other methods for extraction of deeply impacted head with help of extra assistant, reverse breech method and push method.

## CONCLUSION

The concept of foresee ability of harm forms the principle for safe obstetric management. Therefore we are committed to good and evidence based obstetric practice rather than defensive mechanism.

For swift and safe C sections, periodic simulation drills are valuable to improve team work, readiness and enhance communication skills. Monitoring decision to delivery intervals remains essential in assessing quality of obstetric section units. Identifying the causes of delay and implementation of measures are required for better outcomes in crash cesarean section rates. A regular audit on crash cesarean sections in institutes and timely implementation and changes in protocol will help in improving the outcomes is required.

The American College of Obstetricians and Gynaecologists recommends that in an emergency, obstetrical units should be capable of initiating a caesarean section within 30 minutes of a decision to perform the procedure.<sup>16</sup>

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