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A study of maternal morbidity and mortality in elective and emergency lower segment caesarean section

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Abstract
Background: Caesarean delivery being one of the most commonly performed surgical procedures in the world has enormous potential for preservation of life and health. It also poses a greater risk of maternal morbidity and mortality compared to vaginal delivery. Indications for performing caesarean delivery have shown a marked change in recent years and there is a growing concern regarding the rising rate of caesarean deliveries. Although the morbidity has come down over the years, it is important to assess and study the maternal as well as neonatal morbidity and mortality associated with it.
Aims and Objectives: The present study was aimed to study and compare maternal morbidity like intra-operative and post-operative complications in emergency and elective caesarean delivery groups, and to study maternal mortality if any, between the two groups and also study neonatal outcome in both the study groups.
Material and Methods: The present study was conducted in the Department of Obstetrics and Gynaecology, TRR Institute of Medical Sciences, Inole (v), Patancheru (M), Sangareddy (Dist.), Telangana, India. The study subjects selected were pregnant women participants attending the antenatal outpatient department attached to our Medical College consisting of n = 250 subjects who underwent elective and emergency Lower Segment Caesarean Section.
The patients were divided into two study groups: those undergoing emergency caesarean section and those undergoing elective caesarean section. For every fourth case of emergency lower segment caesarean section (LSCS), one elective case was studied, since the ratio of emergency to elective lower segment caesarean section was 4:1 in our institution.
Results: Maternal morbidity and mortality studied in n = 250 subjects who underwent caesarean delivery, morbidity was found to be more in emergency caesarean delivery group than in elective section. Majority caesarean sections were at term, whereas most of the preterm sections were of emergency group. Haemorrhage was most frequent intra-operative complication in both study groups. Additional procedures like B-lynch, uterine artery ligation, internal iliac artery ligation were seen in both groups. Morbidity associated with second stage sections like uterine incision extension, haemorrhage and difficult extraction was documented. Post-operative complications like anaemia, wound infection, sepsis, prolonged hospital stay, pulmonary oedema, DIC, SICU admission were significantly associated with emergency caesarean sections.
Conclusion: Caesarean delivery should be done only when indicated and justified. Only then can we bring down caesarean section rates and the maternal and perinatal complications related to it.

Keywords: caesarean delivery, complications, intra-operative, morbidity, mortality, post-operative

Introduction
The Caesarean Section (CS) or Caesarean Delivery (CD) is one of the most commonly performed major surgical procedures across the world. Caesarean delivery has an enormous potential for the preservation of life and health, probably greater than that for any other surgical procedures. The evolution of caesarean delivery as a safe procedure with extraordinary low maternal and fetal mortality rates is one of the most important developments in modern obstetrics and perinatal medicine.
By the early decades of the 20th Century, several important innovations in surgical care occurred, which included aseptic techniques, reliable and safe anesthesia and the control of hemorrhage by proper suturing of tissue planes and ligation of severed blood vessels. The introduction of the lower segmental incision allowing exclusion of the uterine wound from the peritoneal cavity dramatically decreased the risk of postoperative peritonitis as a complication of puerperal endometritis. The availability of blood transfusion and antibiotic therapy further reduced the mortality and morbidity of caesarean section.

This decrease in maternal mortality of caesarean section made the operation a reasonable alternative for delivery of the fetus at increased risk for asphyxia or trauma from labor and vaginal delivery.

Worldwide the rise in caesarean section rate during the last three decades has been alarmingly high and needs an in depth study. The guidelines on Caesarean Section rates published by WHO in 1985, were revised in 1994. The guidelines published by UNICEF, WHO and UNFPA in 1997 [1] states that proportion of Caesarean births should range between 5 - 15%. The rate of Caesarean Sections below 5% seems to be associated with gaps in obstetric care leading to poor health outcomes for mothers and children, whereas, rates over 15% do not seem to improve either maternal or infant health.

Several studies conducted across India have shown an alarming increase in the rate of caesarean section deliveries. The caesarean delivery rate reached an all-time high of 31.8% in 2007. Although the caesarean rate rose 50% since 1995, there has been no concomitant reduction in neonatal mortality [2]. Studies carried out in various medical colleges and teaching hospitals in India the overall rate of caesarean deliveries is reported to be 24.4% [3].

The obstetric care consensus developed jointly by the American College of Obstetrics and Gynaecology (ACOG) and Society for Maternal Foetal Medicine reported in 2011 that one in three women who gave birth in the United States did so by caesarean delivery [4]. In America by 2004, the overall caesarean rate had risen to 29.1% and the primary caesarean rate to 20.6%, both representing the highest national rates ever reported [5].

The latest data of National Family Health Survey, 2015-16 (NFHS-4) showed the caesarean rate at population level in India was 17.2%. The reported results showed discrepancies in the caesarean section rates that the private sector delivers more babies by caesarean section than the public sector in the urban areas and absolutely no indication of morbidity rates either maternal or neonatal in either sector. In a study over a period of two years in urban India, the reported CS rates were 20% and 38% in the public sector and private sector respectively. Sreevidhya and Sathiyasekeran; and Farine *et al.* [6, 7] study reports showed an alarming rate of 47% in the private sector.

The indications for performing caesarean section have shown a marked change in recent years and keep changing, for varied reasons. Several non-clinical factors have substantial effect on the rates of caesarean section. Women of higher socio-economic status have higher incidence of caesarean section than do women of lower socio-economic status. Trends of higher caesarean section rates are found in teaching hospitals and paying hospitals. Age and parity of the women influence the caesarean section rates being more in young and elderly primigravida and grand multipara. The other areas of dispute include the place of caesarean section in breech delivery, foetal distress and placental abruption.

Primary caesarean deliveries are an important target for reduction, because they lead to an increased risk for a repeat caesarean delivery. Of particular interest are the caesarean deliveries that are elective, although the clinical use and implications of the term elective requires clarification. Elective caesarean deliveries can include medically and obstetrically indicated procedures that generally occur before labour. Elective caesarean deliveries can also include procedures for which there is no clear medical or obstetric indication. There is a growing concern that there is a rising rate of the latter. Maternal choice elective primary caesarean deliveries generate both clinical and ethical controversy and concern [8].

Objectives

The objective of the present study was to study and compare maternal morbidity like intra-operative and post-operative complications in two selected study groups, maternal mortality if any, and also to compare the neonatal outcome in both the study groups.

Materials and Methods

The present study was carried out in the Department of Obstetrics and Gynaecology, TRR Institute of Medical Sciences, Inole (v), Patancheru (M), Sangareddy (Dist.), Telangana, India. The study subjects selected were pregnant women participants attending the antenatal outpatient department attached to our Medical College. The study group sample size consisted of n = 250 pregnant women subjects who underwent elective and emergency Lower Segment Caesarean Section. The subjects were divided into two study groups: those undergoing emergency caesarean section and those undergoing elective caesarean section. For every fourth case of emergency lower segment caesarean section (LSCS), one elective case was studied, since the ratio of emergency to elective lower segment caesarean section was 4:1 in our institution.

Detailed history and examination was done and the indications for caesarean section, the pre-operative findings and complications were noted in detail with the help of a proforma. The information regarding post-operative morbidity was also collected.

The participant subjects selected were counselled for participation and informed consent was obtained from them before participation. The outcomes studied were incidence of elective and emergency caesarean sections, indications, age distribution, gravida, antenatal complications, intra-operative and post-operative complications. The duration of hospital stay for more than 6 days was considered as an indicator for post-operative morbidity. The Ethical Committee approval was taken from the Institutional Ethical Committee Board.

Inclusion Criteria: All pregnant women who underwent lower segment caesarean section.

Exclusion Criteria: Pregnant women who underwent vaginal delivery. Pregnant women who underwent classical caesarean section and caesarean deliveries with other incisions like low vertical, inverted T, J shaped and U incisions.

Statistical analysis

The data collected, was coded and fed into the computer using MS Excel and analyzed using SPSS V 19 with the assistance of a statistician. Descriptive statistics such as mean, standard deviation and percentage was used and compared between the two study groups with the help of chi square test.

Sample size estimation

Sample size formula

$$n = \frac{\{z1\sqrt{[2P(1-P)]} + z2\sqrt{[P1(1-P1) + P2(1-P2)]}\}^2}{(P1-P2)^2}$$

P1	Probability of maternal complications found in group 1	0.472
P2	Probability of maternal complications found in group 2	0.171
P	Arithmetic average of P1 & P2	0.3215
AH	Alternate hypothesis	2
1-α	Level of confidence	0.99
1-β	Power of the study	0.8
Z1	Z value associated with set level of alpha (two sided)	2.575829
Z2	Z value associated with set level of beta	0.841621
n	Minimum sample size	55

Thus, the minimum sample size required to conduct the study was 55 in each arm

Results

The data of distribution of the study group subjects based on the type of LSCS underwent is presented in the Table 1. The present study subjects (n = 250) who underwent LSCS were categorized into two study groups. Out of the total n = 250 selected subjects, n = 194 subjects had emergency LSCS and n = 56 underwent elective LSCS.

Table 1: Distribution of the study subjects based on type of LSCS

Type of LSCS	Number of subjects (%)
Emergency	194 (77.60)
Elective	56 (22.40)

The data of age wise distribution of the subjects of this study is shown in Table 2. Among n = 250 study participants who underwent CS, 95.2% belonged to age group between 21-40 years. Extremes of the age i.e., < 20 years and > 40 years were 3.2% and 1.6% respectively.

Table 2: Age wise distribution of the subjects

Age (years)	Type of LSCS				Total	
	Emergency		Elective			
	Number of subjects	(%)	Number of subjects	(%)	Number of subjects	(%)
< 20	7	3.6	1	1.8	8	3.2
21-40	184	94.8	54	96.4	238	95.2
>40	3	1.5	1	1.8	4	1.6
Total	194	100.0	56	100.0	259	100.0
Yate's Chi square test - 0.288						
p value - 0.86						

The data of booked / unbooked subjects is represented in Table 3. Among n = 250 subjects, 73.6% were booked cases and 26.4% of patients were unbooked antenatally.

Table 3: Distribution of booked / unbooked subjects

Booked / Unbooked cases	Type of LSCS				Total	
	Emergency		Elective			
	Number of subjects	(%)	Number of subjects	(%)	Number of subjects	(%)
Booked	132	68.0	52	92.9	184	73.6
Unbooked	62	32.0	4	7.1	66	26.4
Total	194	100.0	56	100.0	250	100.0
Fisher's exact test - 12.525						
p value - 0.000						

The data of mode of conception of the study subjects is presented in Table 4. 90.8% of the women conceived spontaneously, 1.2% had IVF conception.

Table 4: Mode of conception of the study subjects

Mode of Conception	Type of LSCS				Total	
	Emergency		Elective			
	Number of subjects	(%)	Number of subjects	(%)	Number of subjects	(%)
SC	177	91.2	50	89.3	227	90.8
OI	10	5.2	1	1.8	11	4.4
IUI	6	3.1	3	5.4	9	3.6
IVF	1	0.5	2	3.6	3	1.2
Total	194	100.0	56	100.0	250	100.0
Yate's Chi square - 1.954						
p value - 0.58						

IUI- intrauterine insemination, IVF- *in vitro* fertilization

The data of comparison of primary sections of the study subjects is represented in Table 5. Among n = 250 subjects, n = 138 subjects, who underwent LSCS were primigravidas. Among them n = 123 (63.4%) had emergency LSCS and n = 15 (26.8%) underwent elective LSCS. The remaining 44.8% (n = 112) who underwent LSCS were multigravidas. P ≤ 0.05 is considered significant.

Table 5: Comparison of primary sections of the study subjects

primary section	Type of LSCS				Total	
	Emergency		Elective			
	Number of subjects	(%)	Number of subjects	(%)	Number of subjects	(%)
Yes	123	63.4	15	26.8	138	55.2
No	71	36.6	41	73.2	112	44.8
Total	194	100.0	56	100.0	250	100.0
Chi square - 23.56						
p value - 0.001						

The data of type of gestation of study subjects is presented in Table 6. Among n = 250 study subjects, 94.8% were singleton pregnancies and remaining 5.2% were twin pregnancies.

Table 6: Type of gestation of study subjects

Type of gestation	Type of LSCS				Total	
	Emergency		Elective			
	Number of subjects	(%)	Number of subjects	(%)	Number of subjects	(%)
Singleton	183	94.3	54	96.4	237	94.8
DCDA (twins)	7	3.6	2	3.6	9	3.6
MCDA (twins)	4	2.1	0	0.0	4	1.6
Total	194	100.0	56	100.0	250	100.0
Yate's Chi square - 0.379						
p value – 0.082						

DCDA- Dichorionic Diamniotic, MCDA- Mono Chorionic Diamniotic

The data of distribution of study subjects based on period of pregnancy is shown in Table 7. Among the total n = 250 caesarean section subjects, 77.2% were term sections, and 22.4% were preterm sections.

Table 7: Period of pregnancy of study subjects

Period of pregnancy	Type of LSCS				Total	
	Emergency		Elective			
	Number of subjects	(%)	Number of subjects	(%)	Number of subjects	(%)
Preterm	49	25.30	7	12.50	56	22.40
Term	144	74.20	49	87.50	193	77.20
Post term	1	0.50	0	0.00	1	0.40
Total	194	100.0	56	100.0	250	100.0
Chi square - 3.879						
p value - 0.143						

The data of contraception of the subjects is presented in Table 8. Among n = 250 patients 20.4% underwent sterilization and in 4% of the patients intra-uterine contraceptive device (IUCD) was inserted after consent.

Table 8: Contraception in study subjects

Contraception	Type of LSCS				Total	
	Emergency		Elective			
	Number of subjects	(%)	Number of subjects	(%)	Number of subjects	(%)
Nil	160	82.5	29	51.8	189	75.6
IUCD	8	4.1	2	3.6	10	4.0
Tubectomy	26	13.4	25	44.6	51	20.4
Total	194	100.0	56	100.0	250	100.0

IUCD- intra-uterine contraceptive device

The data of distribution of the study subjects based on the type of anesthesia given is shown in Table 9. The most common mode of anesthesia was regional anesthesia (spinal anesthesia) in both emergency and elective caesarean deliveries.

Table 9: Type of anesthesia

Type of anesthesia	Type of LSCS				Total	
	Emergency		Elective			
	Number of subjects	(%)	Number of subjects	(%)	Number of subjects	(%)
General	9	4.6	3	5.4	12	4.8
Spinal	185	95.4	53	94.6	238	95.2
Total	194	100.0	56	100.0	250	100.0
Fisher's exact test - 0.018						
p value - 0.89						

The data of the status of the baby in this study group is presented in Table 10. There were two still births both in emergency LSCS group. Among them one still born was a twin of Dichorionic Diamniotic (DCDA) pregnancy and other twin was live born. Second stillbirth was due abruption and patient underwent emergency LSCS for failed induction.

Table 10: Status of the baby

Status of the baby	Type of LSCS				Total	
	Emergency		Elective			
	Number of subjects	(%)	Number of subjects	(%)	Number of subjects	(%)
Live birth	185	95.4	56	100.0	241	96.4
Live birth, Live birth (twins)	7	3.6	0	0.00	7	2.8
Live birth, Still birth (twins)	1	0.5	0	0.00	1	0.4
Still birth	1	0.5	0	0.00	1	0.4
Total	194	100.0	56	100.0	250	100.0
Yate's Chi square - 1.869						
p value - 0.6						

The data of mean gestational age of the study subjects shown in the Table 11 shows those who underwent emergency caesarean section was 38 weeks, while that of elective caesarean was a little earlier, at around 37-38 weeks.

Table 11: Mean gestation age of the study subjects

Type of LSCS	Number of subjects	Gestational age		Mean difference	*p* value
		Mean	Std. Dev		
Emergency	194	38.01	2.44	0.21	0.536
Elective	56	37.80	1.44		

Emergency LSCS: Most common indication was previous LSCS not willing for trial of labor after cesarean (TOLAC) (19.6%) followed by fetal distress (16%).

Elective LSCS: Most common indication was previous LSCS not willing for TOLAC (50%) followed by previous 2 LSCS (17.9%).

Table 12: Distribution of indications based on type of LSCS

Indication	Type of LSCS				Total	
	Emergency		Elective			
	Number of subjects	(%)	Number of subjects	(%)	Number of subjects	(%)
Preeclampsia	5	2.60	1	1.80	6	2.40
Imminent eclampsia	8	4.10	1	1.80	9	3.60
Eclampsia	2	1.00	0	0.00	2	0.80
HELLP	1	0.50	0	0.00	1	0.40
Abruption	3	1.50	0	0.00	3	1.20
Placenta previa	1	0.50	1	1.80	2	0.80
IUGR	1	0.50	1	1.80	2	0.80
IUGR/ Doppler changes	7	3.60	1	1.80	8	3.20
Oligohydramnios	2	1.00	0	0.00	2	0.80
Breech	14	7.20	1	1.80	15	6.00
Face	1	0.50	0	0.00	1	0.40
Cord presentation	1	0.50	0	0.00	1	0.40
DCDA Twins	3	1.50	1	1.80	4	1.60
MCDA twins	3	1.50	0	0.00	3	1.20
Macrosomia	1	0.50	0	0.00	1	0.40

HELLP- haemolysis, elevated liver enzymes and low platelet count, IUGR- Intra Uterine Growth Restriction, DCDA- Dichorionic Diamniotic, MCDA- Mono Chorionic Diamniotic

The common intra-operative complication (Table 13) was post-partum hemorrhage, n = 25 (10%), n = 7 (28%) of them belonged to the elective study group, remaining n = 18 (72%) had undergone emergency LSCS. The second most common finding was extension of uterine incision, n = 11 (4.4%), n = 2 (18.1%) of them belonged to elective group and n = 9 patients (81.8%) had undergone emergency LSCS.

The bladder injury was observed in n = 2 subjects, one in each study group, who underwent bladder rent repair. The most dreaded finding was uterine rupture in n = 3 subjects, all belonging to emergency study group, among whom one was previous one LSCS and another was previous two LSCS. Both the patients underwent rupture site repair and tubectomy. Third patient was a case of second gravida with previous vaginal delivery was in labor had acute fetal distress and on table uterine rupture was noted and ended up in obstetric hysterectomy.

The scar dehiscence was noticed in n= 5 subjects, out of which n = 3 patients belonged to previous 2 LSCS category and n = 2 belonged to previous 1 LSCS category. Among them two underwent emergency CS, in whom scar dehiscence was suspected before taking up for CS. Three underwent elective CS where scar dehiscence was noted on table.

Placenta previa was diagnosed antenatally in n = 2 subjects. Two other unbooked cases where it was not diagnosed antenatally were noticed intra-operatively. Placenta accreta syndrome was observed in n = 2 cases, both of whom belonged to previous 2

LSCS group. Bleeding was controlled by taking placental bed hemostatic stitches in n = 1 patient and by bilateral uterine artery ligation in other case.

Abruptio placenta was diagnosed in n = 3 patients antenatally and all of them ended up in emergency LSCS. Interestingly, retroplacental clot was found in n = 6 subjects, n = 3 undiagnosed antenatally, among whom n = 2 were patients with imminent eclampsia and another one participant had severe preeclampsia. The Couvelaire uterus was observed in one patient.

Among the total n = 250 Caesarean deliveries, uterine anomalies were noted intra-operatively in n = 5 subjects. The anomalies were unicornuate uterus (one case) that was diagnosed antenatally, arcuate uterus (two cases) which was not diagnosed antenatally, one case of septate uterus and didelphic uterus each of which was diagnosed antenatally. Six women underwent caesarean myomectomy, n = 3 in emergency study group and other n = 3 belonged to elective study group.

Table 13: Distribution of intra-operative findings and complications based on type of LSCS

Intraoperative findings	Type of LSCS		Total
	Emergency	Elective	
Plastered abdomen	24	14	38
Pulled up bladder	11	4	15
Edematous bladder	18	1	19
Adherent bladder	1	1	2
Bladder injury	1	1	2
Ascites	6	1	7
Distended bowel	4	0	4
Thinned out lower segment	28	10	38
Scar dehiscence	2	3	5
Uterine rupture	3	0	3
Lower segment not formed	26	5	31
Incision over upper segment	4	2	6
Bandls ring	2	0	2
Difficult extraction	12	1	13
Vacuum extraction	7	2	9
Patwardan technique	8	1	9
Extension of uterine incision	9	2	11
Cord around neck	11	1	12
Reduced liquor	21	3	24
Increased liquor	2	1	3
MSAF	48	3	51
Placenta previa	3	1	4
Adherent placenta	2	0	2
Retroplacental clot	6	0	6
Couvelaire uterus	1	0	1
PPH	18	7	25
Blood transfusion	3	0	3
Fibroids	3	3	6
Uterine anamoly	2	3	5

MSAF- meconium-stained amniotic fluid, PPH- Post-Partum Haemorrhage

The data of additional procedures in study subjects is presented in Table 14. Among the total of n = 250 subjects who underwent LSCS, 10% of them underwent some additional surgery (other than sterilisation). In emergency group 1% underwent bilateral uterine arteries ligation and another 1% underwent B-Lynch with bilateral uterine arteries ligation and another 1% had bilateral internal iliac arteries ligation with B-Lynch. One patient underwent obstetric hysterectomy for uterine rupture, who was a second gravida with previous vaginal delivery posted for emergency CS for acute foetal distress and uterine rupture was noted on table. Bladder rent repair was done in two patients.

In elective study group, bilateral uterine arteries ligation, B-Lynch with bilateral uterine arteries ligation was done in two patients each respectively. One patient had bilateral internal iliac arteries ligation and another patient had B-Lynch and bilateral internal iliac arteries ligation. Six patients underwent caesarean myomectomy, n = 3 subjects in emergency study group and another n = 3 subjects belonged to elective study group.

Table 14: Additional procedures in study subjects

Additional procedures	Type of LSCS				Total	
	Emergency		Elective			
	Number of subjects	(%)	Number of subjects	(%)	Number of subjects	(%)
Nil	177	91.23	48	85.70	225	90.00
B-Lynch	1	0.50	0	0.00	1	0.40
Left uterine artery ligation	0	0.00	1	1.79	1	0.40
B/l uterine artery ligation	2	1.00	0	0.00	2	0.80
Bilateral uterine artery ligation & B-Lynch	2	1.00	0	0.00	2	0.80
B/l internal iliac artery ligation	0	0.00	1	1.79	1	0.40
B/L internal iliac artery ligation & B-Lynch	2	1.00	1	1.79	3	1.20

B/l uterine artery ligation & internal iliac artery	1	0.50	0	0.00	1	0.40
Hysterectomy	1	0.50	0	0.00	1	0.40
Myomectomy	3	1.50	3	5.35	6	2.40
Bladder repair	2	1.00	0	0.00	2	0.80
Cervical stitch removal	2	1.00	0	0.00	2	0.80
Ovarian cystectomy	0	0,00	2	3.58	2	0.80
Parafimbrial cystectomy	1	1.50	0	0.00	1	0.40
Total	194	100.00	56	100.00	250	100.00
Yate's Chi square –21.511						
p value – 0.089						

The data of post-operative complications in study group subjects is shown in Table 15. Most frequent post-operative complication was anemia in 18.4% subjects, of which n = 37 patients (80.43%) were in emergency study group and n = 9 (19.57%) subjects were in elective study group, out of which n = 23 received blood transfusion (50%). Three cases of thrombocytopenia required platelet transfusion, of which one was case of Glanzmann's thrombasthenia, remaining two were cases of Immune Thrombocytopenic Purpura (ITP).

In the current study, out of total number of patients who underwent LSCS, n = 10 patients (4%) had wound infection, all belonging to emergency study group.

A total of n = 8 subjects needed Surgical Intensive Care Unit (SICU) post-operatively, out of which n = 7 had undergone emergency LSCS. The reasons for SICU admission were as follows:

- A case of severe preeclampsia underwent emergency LSCS and had pulmonary edema and Congestive Cardiac Failure (CCF) post operatively.
- Case of previous LSCS with Gestational Diabetes Mellitus (GDM) with polyhydramnios underwent emergency preterm LSCS and was diagnosed with amniotic fluid embolism and she died on fourth post-operative day.
- A case of Rheumatic Heart Disease (RHD) with MCDA twins underwent emergency LSCS, had post-partum haemorrhage, underwent bilateral uterine artery ligation, received blood transfusion and had peripartum cardiomyopathy. She was in Intensive Care Unit (ICU) for 20 days and was discharged.
- Another patient underwent elective LSCS with myomectomy. She developed abdominal distension and was diagnosed with peritonitis with bowel perforation. Laparotomy was done and caecal perforation was noted with faecal peritonitis, she underwent right hemicolectomy, received blood transfusion and was in SICU for 10 days and was discharged.
- A case of second gravida with term gestation and previous LSCS with Acute Fatty Liver of Pregnancy (AFLP) underwent emergency LSCS, had multiple complications such as peripartum cardiomyopathy, peritonitis with wound infection with sepsis, electrolyte imbalance with paralytic ileus. She also had thrombocytopenia with impaired coagulation profile, was diagnosed with Disseminated Intravascular Coagulation (DIC) and received platelets and fresh frozen plasma transfusion.
- Primigravida with severe preeclampsia with congestive cardiac failure underwent emergency LSCS for foetal distress and she was managed postoperatively in SICU.
- Another case was DCDA twin pregnancy with severe preeclampsia with peripartum cardiomyopathy underwent emergency LSCS and was managed in SICU.

Another patient with severe preeclampsia had postpartum eclampsia and diagnosed with Posterior Reversible Encephalopathy Syndrome (PRES) and was admitted to ICU for further management.

Table 15: Post-operative complications in study group subjects

Post-operative complications	Type of LSCS				Total	
	Emergency		Elective			
	Number of subjects	(%)	Number of subjects	(%)	Number of subjects	(%)
Anaemia	37	80.43	9	19.57	46	100.00
Blood transfusion	17	73.91	6	26.09	23	100.00
UTI	13	81.25	3	18.75	16	100.00
Sepsis	5	71.43	2	28.57	7	100.00
Peritonitis	0	-	1	100.00	1	100.00
Paralytic ileus	4	66.67	2	33.33	6	100.00
Electrolyte imbalance	6	75.00	2	25.00	8	100.00
Wound infection	10	100.00	0	-	10	100.00
Prolong catheterization	18	100.00	0	-	18	100.00
Prolonged hospital stay	9	90.00	1	10.00	10	100.00
Hypertension	32	80.00	8	20.00	40	100.00
Thrombocytopenia	3	100.00	0	-	3	100.00
Postpartum eclampsia	1	100.00	0	-	1	100.00
Need for ICU care	7	87.50	1	12.50	8	100.00
Peripartum cardiomyopathy	3	100.00	0	-	3	100.00
Pulmonary edema	3	100.00	0	-	3	100.00
Cardiac failure	3	100.00	0	-	3	100.00
Pulmonary infection	4	66.67	2	33.33	6	100.00
Poor lactation	5	62.50	3	37.50	8	100.00
DIC	1	100.00	0	-	1	100.00
Re-laparotomy	1	100.00	0	-	1	100.00
Death	1	100.00	0	-	1	100.00

The data of perinatal morbidity and mortality shown in Table 16 shows that among 257 babies, 134 babies were given mother side and rest were admitted to Neonatal Intensive Care Unit (NICU). The most common indication for NICU admission soon after birth was for preterm and low birth weight (LBW) in 12.06%, care followed by Transient tachypnoea of new-born (TTNB) was in 9.33%. Among 24 babies with TTNB 21 (87.5%) were born via elective LSCS.

The most common indication for NICU admission after shifting the baby to mother side was neonatal hyperbilirubinemia (12.8%).

Among 56 preterm caesarean births (22.4%), 25 (44.6%) babies were given mother side and remaining 31 babies (55.3%) were shifted to NICU. Among 56 preterm births, 87.5% were born by emergency CS and the remaining 12.5% were born by elective CS.

Respiratory distress syndrome was noted in 11 babies (4.28%),5 babies (1.94%) had meconium aspiration syndrome, all born via emergency CS. Sepsis was seen in 1.9% births.

There were total of 5 neonatal deaths.

- A very low birth weight baby born to a mother at 31+5 weeks with overt DM on insulin, with IUGR and doppler changes died on day 5 of birth due to RDS, sepsis.
- A very low birth weight baby born at 33 weeks to a mother with severe preeclampsia with doppler changes with prolonged preterm premature rupture of membranes (PPROM) was succumbed to sepsis.
- A term baby born to primi mother at 40 weeks of gestation with MSAF died on day 4 of birth due to severe Meconium Aspiration Syndrome (MAS) with Persistent Pulmonary Hypertension (PPHN).
- A term baby born at 38 weeks via LSCS for foetal distress died due of birth asphyxia resulting in stage 3 Hypoxic Ischemic Encephalopathy (HIE).
- Twin 2 born to a MCDA mother at 38weeks with premature rupture of membranes (PROM) died on day 3 of life due to sepsis.

Table 16: Perinatal morbidity and mortality in study **subjects**

NICU admission	Type of LSCS		Total
	Emergency	Elective	
Mother side	96	38	134
Birth asphyxia	1	0	1
Sepsis	4	1	5
RDS	9	2	11
LBW/Preterm	29	2	31
MAS	5	0	5
Congenital anomaly	2	1	3
TTNB	3	21	24
IUGR	9	1	10
Neonatal hyperbilirubinemia	23	10	33
Death	4	1	5
Congenital heart disease	1	0	1
MAS	6	0	6

RDS: Respiratory Distress Syndrome, LBW- low birth weight, MAS- Meconium Aspiration Syndrome, TTNB- Transient Tachypnoea of the New-born, IUGR- Intra Uterine Growth Restriction

Discussion

The present study is an observational prospective study of maternal morbidity and mortality in n = 250 subjects undergoing caesarean delivery (emergency / elective) in hospital attached to our college. Caesarean sections have been long practiced as a lifesaving procedure for the mother and fetus. Though it is classified as a major procedure, the incidence of caesarean section has risen considerably over the years. In June 2010, WHO stated that there is no empirical evidence for the rate it recommends, as it has been a debatable issue. Now the WHO recommends that caesarean section should be done only when it is needed [9].

The situation now is that caesarean section is adopted for even trivial cases. In a study by Ghazi *et al.* [10] caesarean delivery was highest in 20 - 30 years of age, both for emergency as well as elective caesarean delivery, mean age being 28 years. The present study also showed similar findings with the mean age of 27.28 years in emergency study group and 29.86 years in elective study group. In the developing countries there is increase in maternal morbidity and neonatal prematurity due to elective caesarean delivery at 37-38wks which is associated with increased admissions in neonatal special care units.

Among the women who underwent caesarean delivery 6.8% belonged to early preterm group, 16.4% belonged to late preterm, 76.4% belonged to term group, 0.4% belonged to post term group. As regards to the type of anesthesia used in caesarean deliveries, regional anesthesia (epidural / spinal) should be chosen when possible as it has the least associated maternal and neonatal morbidity. In the current study, 95.2% of total patients received spinal anesthesia, in the emergency study group 95.4%, while in elective study group 94.6%. Total of n = 12 (4.8%) patients were given general anesthesia.

Repeat caesarean section is the commonest risk factor for subsequent caesarean section [11]. In this study the most common risk factor in patients undergoing caesarean delivery was previous LSCS followed by preeclampsia. In the emergency study group 19.6% were previous LSCS, while in elective study group 50% were previous LSCS.

In a study by Rowaily *et al*., [12] difficult labour (35.9%), foetal (21.9%) and breech presentation (11.6%) were the most frequent indications of emergency caesarean, while previous caesarean section (54.3%), breech presentation (20.4%) and maternal request (10.1%) ranked first for elective caesarean.

In a study conducted by Suwal *et al.* [13] the usual indications of emergency caesarean section were foetal distress, previous caesarean section in labour, non-progress of labour and prolonged second stage of labour. The usual indications of elective caesarean section were previous caesarean section, breech, cephalopelvic disproportion and LSCS on demand.

This study showed that in emergency LSCS, the most common indication was previous one LSCS (19.6%), foetal distress (16%) followed by second stage arrest (7.7%). In elective study group, the most common indication was previous one LSCS (50%) followed by previous two LSCS (17.9%).

Other indications for LSCS were twin pregnancy (7%), breech (6%), cephalopelvic disproportion (6.4%), IUGR with Doppler changes (3.2%), imminent eclampsia (3.6%), abruption (1.2%), placenta previa (0.8%).

The incidence of CS on maternal request and its contribution to the overall increase in the CS rate are not well known but it is estimated that 2.5% of all births united states are caesarean delivery on maternal request (CDMR) [14]. In this study, 3.6% of all births were CDMR.

In a study by Raees *et al.* [15] a comparison of maternal morbidity in emergency and elective CS was done. The reported benefits of planned / elective CS were greater safety for the baby, less pelvic trauma for the mother, avoidance of labour pain and convenience. The potential disadvantages from

observational studies include increase risk of major morbidity and mortality for the mother, adverse psychological sequelae and problems in subsequent pregnancies, including uterine scar rupture and greater risk of stillbirth and neonatal morbidity. It was noticed that there were more maternal complications in emergency CS group than in elective CS group.

In a study by Ghazi *et al.* [10] higher rate of intra-operative complications were found in emergency group (96%) compared to elective group (30%). The NICE guidelines on CS gives a rate of (1.1%) for post-partum haemorrhage following planned CS versus (6%) for planned vaginal birth (Alexander *et al.*) [16]. Magaan *et al.* [17] studies on over 4000 caesarean deliveries reported the incidence of PPH in emergency CS 6.75% and 4.74% for elective CS. Bergholdt *et al.* [18] study reported hysterectomy was uncommon at 0.2% and did not differ significantly between emergency and elective procedures.

In this study, there was one case of obstetric hysterectomy done for uterine rupture in a second gravida with previous vaginal delivery who underwent emergency LSCS for foetal distress.

In this study, haemorrhage was the most common complication in both emergency as well as elective CS groups (10%) followed by uterine extension (4.4%) and bladder injury in two patients, one each in emergency and elective group requiring bladder repair. Adherent placenta was noted in two patients of emergency CS group. Five cases of scar dehiscence were noted, out of which three patients belonged to previous 2 LSCS category and two to previous 1 LSCS category.

In a study by Nimisha and Shrikant [19] reported 80% success rate of B Lynch and concluded that B-Lynch was safe and effective and easily implemented method in controlling PPH. Swarupa Rani *et al.* [20] study observed that bilateral uterine artery ligation afforded good control of PPH performed with or without uteroovarian ligament ligation. Joshi *et al.* [21] reported that bilateral ligation of internal iliac arteries doesn't result in complete blockage of blood supply to the female pelvic organs but contributes to significant decrease in blood loss and also concluded that internal iliac artery ligation is useful in prevention and treatment of PPH from any cause. Early resort to internal iliac artery ligation effectively prevents hysterectomy in women with atonic PPH. Villar *et al.* [22] study reported hysterectomy as uncommon in the vaginal birth reference group (0.05%) but was significantly more common among women who experienced both elective and emergency caesarean birth.

In this study, in emergency group 1% underwent bilateral uterine arteries ligation and another 1% underwent B-Lynch with bilateral uterine arteries ligation and other 1% had bilateral internal iliac arteries ligation with B-Lynch. Two patients underwent bladder rent repair. In elective group, bilateral uterine arteries ligation, B-Lynch with bilateral uterine arteries ligation was done in two patients each respectively.

Ghazi *et al.* [10] study evidenced the commonest post-operative complication as anemia in both groups as 82% in emergency group and 24% in elective group. Gayathry *et al.* [23] reported that post-operative complications were found to be associated more with the emergency CS (30.6%) than elective CS (14.4%). Infections were UTI (3.3%), respiratory infection (0.8%), wound infection (2.1%). Other complications included postoperative fever (1.3%), prolonged catheterization (0.8%), prolonged hospital stay (2.5%). In this study, anaemia was the most common post-operative complication (18.4%), 80.43% in emergency CS group and 19.57% in elective CS group, with blood transfusion required in 23 (50%) patients. Thrombocytopenia was seen in 3 patients, two of them were ITP and one was a case of Glanzmann thrombasthenia. Urinary tract infection was seen in 16 patients and pulmonary infection in 6 patients.

Cochrane systematic review reported wound infection in 6% women undergoing caesarean delivery, while 18.4% patients had post caesarean wound infections according to the study conducted by Leth *et al.* [24]. In this study 10 patients had wound infections all belonging to emergency CS group out of which four required secondary suturing.

WHO study of pregnancy outcomes in Latin American countries reported an increased risk of admission to ICU in women who underwent caesarean birth compared to women who experienced vaginal birth. This effect was evident for both emergency intra-partum. In this study, eight patients required admission to ICU, seven (87.5%) belonged to emergency group and one (12.5%) belonged to elective group.

Ghazi *et al.* [10] found prolonged hospital stay in 62% of patients in emergency caesarean delivery and in 14% of patients in elective caesarean delivery. In this study, ten patients had prolonged hospital stay. Sepsis was seen in seven patients, out of which five patients (71.43%) belonged to emergency group while, two patients (28.57%) to elective group. The cause of the sepsis was peritonitis in one patient, pyelonephritis in two patients and severe pneumonia in four patients among which one had synpneumonic effusion. Other complications observed were pulmonary oedema, cardiomyopathy, cardiac failure and postpartum eclampsia.

Earlier study results reported that maternal deaths per 1000 births among vaginal deliveries being 0.47% was not significantly different from 0.31% of elective CS and both rates were significantly lower than 2.87% per 1000 births of emergency section. In this study, one maternal death was seen which was a case of previous LSCS with scar dehiscence with GDM with polyhydramnios underwent emergency LSCS with bilateral internal iliac artery ligation had amniotic fluid embolism succumbed on postoperative day four. Amniotic fluid embolism (AFE) although rare, remains one of the leading causes of direct maternal mortality.

The concern for the Caesarean section rates is due to its rapid increase over the last three decades. Maternal request is emerging as one of the important factors for the increasing Caesarean section rates.

Inspite of the low rate of maternal morbidity and mortality due to improved surgical technique and modern anaesthesia, this rate is still significant and more in subsequent pregnancies. Therefore, an attempt should be made to reduce the rate of primary Caesarean sections.

The ACOG and Society Maternal-Foetal Medicine (SMFM) have released joint guidelines for the safe prevention of primary caesarean delivery. These include the following:

- Prolonged latent (early)-phase labour should be permitted.
- The start of active-phase labour can be defined as cervical dilation of 6cm, rather than 4cm.
- In the active phase, more time should be permitted for labour to progress.
- Multiparous women should be allowed to push for 2 or more hours and primiparous women for 3 or more hours; pushing may be allowed to continue for even longer periods in some cases as when epidural anaesthesia is administered.
- Techniques to aid vaginal deliveries, such as the use of forceps should be employed.
- Patient should be encouraged to avoid excessive weight gain during pregnancy.
- Access to non-medical interventions during labour such as continuous support during labour and delivery, should be

increased.
- External cephalic version should be performed for breech presentation.

Conclusion

Child birth by its very nature carries potential risks for the mother and her baby regardless the route of the delivery. For certain clinical conditions, Caesarean delivery is firmly established as the safest route of delivery. This surgical procedure has been saving lives for a long period of time.

Hence, an attempt should always be made for natural mode of delivery as far as possible without jeopardising the mother and foetus. Surgical intervention in the form of caesarean section should be done only when indicated and justified. Only then can we bring down caesarean section rates and the maternal and perinatal complications related to it.

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