



## ANALYSIS OF URGENCY, GESTATIONAL AGE AND CONTRIBUTING FACTORS FOR INCREASING CAESAREAN SECTION RATES

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### ABSTRACT

**Background:** Over the past few decades, the indications for Caesarean delivery have broadened thus increasing the rate of caesarean section beyond the set level of WHO. The indications vary in different health care facilities. It is essential to determine the factors responsible for increasing caesarean section rates. **Objectives:** To find out the cesarean section rate based on urgency as per RCOG and gestational age as per the categorization of pregnancy by ACOG in a tertiary health care facility catering to large South Indian population. It also aimed to determine the associated conditions contributing for caesarean section. **Methods:** Retrospective analysis of women who underwent caesarean section from Jan-2017 to June 2017. Data was analyzed with respect to gestational age, Urgency of caesarean section, maternal fetal indications, clinical characteristics and associated conditions. Neonatal outcomes measured were gestational age, birth weight and NICU admissions. Data was expressed as proportions and percentages. **Results:** The CS rate was 24.5% among 7,346 deliveries and 81% were emergency CS. Preterm Caesarean sections were done in 18% and term 81.5%. Category II CS were the commonest (49%) followed by Category I (32%). Scarred uterus was the most common indication (85%) for elective caesarean section and fetal distress was most common indication (55.7%) for emergency caesarean sections. The associated factors were prior Caesarean section (32%), Medical disorders in 21% and 2.4% prolonged infertility and ART conceptions. Obstetric conditions including mal presentation were responsible in 19%. On the whole fetal indications accounted for 62%. **Conclusion:** Fetal indications, especially fetal distress is the most common reason for caesarean section which may have contributed for increased rate of caesarean section. Hence following strict criteria for diagnosis of fetal distress and adopting policies for intrauterine resuscitation prior to decision making for caesarean section would contribute to reduction of CS rate at tertiary health care centers.

**KEYWORDS :** Caesarean section rates, Urgency, Gestational age, Tertiary care center.

### Introduction:

Worldwide increasing rates of caesarean sections are reported in modern era and each facility is making efforts to reduce the rates. In 1985 WHO recommended a caesarean section rate of 15%. This rate was not supported by any data and it was suggested by an analysis at Harvard Medical School that the average should be at least 22% and rates as high as 36% yielded low maternal and neonatal mortality<sup>2</sup>. The CS rate of 15% is also challenged in many forums as during the modern era of quality care, safe mode of delivery needs to be practiced to reduce maternal and perinatal mortality as well as morbidity. In simple terms Caesarean section is a rescue operation for vaginal delivery and it is to be performed only to save life of pregnant woman or her fetus or both. The recent statement of WHO on Caesarean section emphasized that every effort should be made to provide caesarean sections for women in need, rather than striving to achieve a specific rate<sup>3</sup>. The traditional indications for caesarean section were cephalopelvic disproportion, Obstructed labour, fetal distress, antepartum hemorrhage and transverse lie at term. Cultural, religious factors influenced the incidence of caesarean section when it originated<sup>4</sup> but now fetal indication is the main factor for increased rate of caesarean section<sup>5</sup>. Indications for caesarean section vary in different facilities and in different parts of the World. WHO recently recommended to adopt Robson classification of caesarean section for comparison and standardization across the facilities and Nations<sup>6</sup>. This 10 group classification takes in to consideration of parity, labour onset, previous caesarean section and fetal presentation and not the exact indication, gestational age, risk factors and overall clinical scenario of pregnant or laboring women. This retrospective study is aimed to determine the proportion of caesarean section rate based on urgency as per RCOG<sup>7</sup> and gestational age as per the categorization of pregnancy by ACOG<sup>8</sup>. It also aimed to

determine the associated conditions contributing for caesarean section.

**Methods:** This is a retrospective analysis of women who underwent section between Jan 2017-June 2017 (6 months period) in a tertiary care teaching Institute South India. The inpatient records of these women were analyzed with respect to the urgency of Caesarean section as per RCOG and grouped under 4 categories. The gestational age was classified as per the ACOG committee opinion in to very preterm (28-31+6 wks), moderate pre term (32-33+6wks), late preterm (34-36+6 wks), early term (37-38+6wks), full term (39-40+6 wks), late term (41-41+6 wks) and post term ( $\geq 42$  wks). The other data collected was age, short stature, gravidity, associated factors like recurrent pregnancy loss, infertility treatment, scarred uterus, Co-morbid conditions, Obstetric conditions. The leading indication for elective and emergency caesarean section was noted. The neonatal parameters studied were birth weight and necessity of NICU admission with respect to gestational age. The results were expressed in proportions and percentages.

### RESULTS:

There were 7,346 total deliveries during this period and 1,799 were caesarean deliveries accounting to 24.48%. The trend during the 6 month period is shown in Fig 1 A and B. The CS rate remained between 20-25%. Urgency of Caesarean section under various gestational ages is shown in Table 1. Preterm Caesarean sections were undertaken in 0.2% of very preterm, 1.83% of moderate preterm, 15.8% of late preterm accounting to overall rate of 7.83%. At term 43% underwent during full term, 33% during early term and 5.3% at late term. Post term constituted 0.5% of caesarean sections. The most common urgent category was II (48.7%) followed by I (32%). Category III accounted for 6% and Category IV 12.8%. Greater risk of urgency Caesarean section was seen in post term

pregnancies though small in number. The urgency was also more at gestational ages of full term and late term as 50% of CS were among these gestational age.

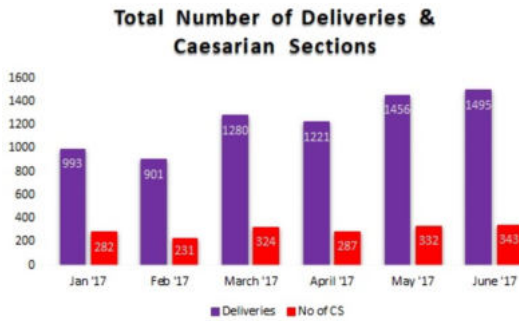


Fig 1A



Fig 1B

Table 1. Urgency and gestational age of women who underwent LSCS

S. NO	NICE Category	GESTATIONAL AGE						Total	
		Very Preterm	Moderate to late pre-term		Term (N = 1,468)				Post-term
		(28-31+6) N=5 (0.2%)	Moderate pre-term (32-33+6) N=33 (1.83%)	Late preterm (34-36+6) N=284 (15.8%)	Early term (37-38+6) N=594(33%) (33%)	Full Term (39-40+6) N=778 (43.2%)	Late Term (41-41+6) N=96 (5.3%)	≥42 wks N=9 (0.5%)	N=1799 (%)
1	Category I	-	8 (24.24%)	88 (30.9%)	172 (28.9%)	269 (34.6%)	41 (42.7%)	4 (44.4%)	582 (32.35%)
2	Category II	5	24 (72.7%)	156 (54.9%)	256(43.09%)	383 (49.2%)	48 (50%)	5 (55.5%)	<b>877 (48.75%)</b>
3	Category III	-	1	18 (6.33%)	56 (9.42%)	34 (4.37%)	-	-	109 (6%)
4	Category IV	-	-	22 (7.74%)	110 (18.5%)	92 (11.8%)	7 (7.29%)	-	

The traditional way of indications is represented in Table 2. Elective Caesarian sections were done in 19% and the most common indication was scarred uterus (85.3% of elective CS) mostly prior one CS. Prior 2 CS accounted for 22.4%.

Emergency CS accounted for 81% and the most common indication was fetal distress (55.7%) followed by doubtful scar integrity (20%).

Table 2: Traditional Indications for Caesarean Section

S. No	Indication	GESTATIONAL AGE							Total N=1,799
		Very Preterm	Moderate to late pre-term		Term			Post-term	
		(28-31+6) N=5	Moderate pre-term (32-33+6) N=33	Late preterm (34-36+6) N=284	Early term (37-38+6) N=594	Full Term (39-40+6) N=778	Late Term (41-1+6) N=96	≥42 wks N=9	
I	<b>Elective CS (N=340)</b>	-	1	40	166	126	7	-	340 (18.9%)
	CPD	-	-	-	2	10	1	-	13
	Mal-presentations			9	8	13			30
	Placenta Previa			3	3	1	-	-	7
	Scarred uterus	-	1	28	153	102	6	-	290*(85.3%)
	Prior 2 CS	-	-	15	45	16			76* (22.4)
	Prior 1 CS	-	1	13	108	85	3		210
	Scars other than CS					1	3		4
II	<b>Emergency (N=1459)</b>	5	32	244	428	652	89	9	1459 (81.1%)
	CPD	-	-	1	15	23	4	-	43
	Deep transverse arrest	-	-	-	1	2	1	-	4
	Fetal distress	4	12	105	219	392	72	9	813 \$ (55.7%)
	Failed Induction	-	-	28	19	15	2	-	64
	Mal-presentations in labour	-	12	55	40	50	2		159
	Non-progress Of labour	-	-	4	6	15	-	-	25
	Triples in labour	-	-	2	-	1	-	-	3
	Placenta Previa with haemorrhage	-	1	5	2	-	-	-	8
	Abruption	-	1	1	2	-	-	-	5
	Cord accidents	-	3	4	13	13	3	-	36
	Failed Instrumentation	-	-	1	2	5	-	-	8
	Scar Tenderness	1	3	38	109	136	5	-	292\$ (20%)

Percentage out of total elective CS ; \$ percentage out of total emergency CS

The clinical profile of women and associated conditions is shown in Table 3. The mean age is around 28 years and among the very preterm it was 32.8 years and moderate preterm it was 29 years. Short statured women constituted

6.2%. Sixty four percent were multigravidae. Scarred uterus was associated with 32% of the caesarean sections and overall 7% were for previous 2 caesarean sections and 25% had one prior scar.

**Table 3: Clinical Profile and associated Conditions**

S. No	Clinical Characteristics	PRE-TERM N=322 (17.9%)			TERM N=1,468 (81.6%)			Post-term N=9 ≥42 wks N=9 (0.5%)	Total N=1,799
		Very Preterm 28-31 +6 N=5	32-33+6 Moderate pre-term N=33	34-36+6 Late preterm N=284	37-38+6 Early term N=594 (33%)	39-40+6 Full term N=778 (43%)	41-41+6 Late term N=96 (5.3%)		
1	Mean Age in yrs	32.8	29.03	26.99	27.51	26.06	25.00	22.89	
2	Short-Stature (%)	-	-	6	39	56	10	-	111(6.2%)
3	<b>Gravidity</b>								
	Primigravida	1	13	124	173	276	53	7	647(35.9%)
	Multigravida	4	20	160	421	502	43	2	1,152(64%)
4	RPL	-	-	8	12	6	-	-	26(1.44%)
5	Infertility& ART	-	2	10	20	19	1	1	53 (2.9%)
6	<b>Scarred uterus</b>	1	4	66	262	238	11	-	582(32.4%)
	Previous 1 CS	1	4	41	191	204	10	-	451 (25%)
	Previous 2 CS	-	-	25	69	31	1	-	126 (7%)
	Other Scars	-	-	-	2	3	-	-	5
7	<b>Co- morbid conditions</b>	3	14	108	159	85	6	1	376(20.9%)
	Diabetes(DIP)	1	2	28	57	41	2	-	131
	Hypertension(HDP)	1	9	62	51	40	3	-	166
	Hypothyroidism	1	3	15	42	37	1	1	100
	Other medical disorders	-	-	3	9	4	-	-	14
8	<b>Obstetric Disorders</b>								349(19.3%)
	PPROM	-	4	32	-	-	-	-	36
	PROM	-	-	-	41	61	3	-	105
	Placenta previa	-	1	8	5	1	-	-	15
	Abruption	-	1	1	2	-	-	-	04
	Malpresentations	-	12	64	48	63	2	-	189(10.5%)

RPL: recurrent Pregnancy Loss; PPROM: Preterm premature rupture of membranes; PROM: Premature rupture of membranes

In 21% medical disorders were associated and the most common medical disorder was hypertension followed by Diabetes mellitus. Obstetrical disorders were associated only in 9% and the most common association was PROM. Infertility and ART (Assisted Reproductive Techniques) and Recurrent pregnancy loss were the factors responsible for 2.9% and 1.44% caesarean sections.

Neonatal outcome was shown in Table 4. Most of the babies born were average for gestational age (87%). Small for gestational age accounted for 12.6% and large for gestational age 0.4% only. Overall 14.8% of neonates were transferred to NICU and these included all very preterm, early preterm and 50% of late preterm. Of those born at term approximately 9-10% required NICU Care.

**Table 4: Neonatal Outcome**

S. No	Characteristics	GESTATIONAL AGE						Total N=1,799	
		Very Preterm 28-31 +6 N=5	Moderate to late pre-term 32-33+6 Moderate pre-term N=33	34-36+6 Late preterm N=284	37-38+6 Early term N=594	39-40+6 Term N=778	41-41+6 N=96		Post-term ≥42 wks N=9
1.	SGA	-	6	87	72	55	7	-	227(12.6%)
	AGA	5	27	197	522	723	89	9	1,572 (87.38%)
	LGA	-	-	-	-	8	-	-	8(0.44%)
2.	NICU admission	5(100%)	33 (100%)	142(50%)	58(9.7%)	72 (9.2%)	9(9.3%)	1(11%)	267 (14.8%)

SGA: small for gestational age; AGA: Average for gestational age; LGA: Large for gestational age NICU: Neonatal Intensive Care

Table 5 shows purely the fetal indications for Caesarean section. More than 60% of caesarean sections were done for fetal indications and the commonest reason was fetal distress (45.2%) followed by malpresentations (10.5%).

**Table 5: Fetal Indications for Caesarean section**

S. No	Primary Indication	Number (%) 1,799 (100%)
1.	Mal-presentations	189 (10.5%)
2.	Fetal distress/compromise	813 (45.2%)
3.	Triples In labour	3
4.	Cord accidents	36 (2%)
5.	Recurrent Pregnancy loss	26 (1.45%)
5.	ART Pregnancies	53 (2.95%)
	Total	1,120 (62.25%)

**DISCUSSION:**

There was a gradual increase in Caesarean section rates over the years in almost all parts of the World. The rates vary

widely, Latin America having highest rates and Africa the lowest and the analysis suggested that there is an inverse relationship between Caesarean section rates and maternal, neonatal mortality in countries with high maternal and perinatal mortality<sup>9</sup>. In United States it was reported that the rate has increased from 23.5% in 1990 to 31.9% in 2016<sup>10</sup>. The absolute increase in CS rate from 1990-2014 was 4.5%, 15.1% and 13.8% for Africa, Asia and Europe respectively<sup>11</sup>.

In India there is high interstate variability in CS rates. CS rates were high in Kerala (31.8%) , Andhra Pradesh (29.3%) and Tamil Nadu (23.2%) and low in Rajasthan and Jharkhand (4.2%) and the MMR and IMR were high in the states with low CS rates<sup>12</sup>. A recent cross sectional study (National Family and Health Survey) between 2015-16 reported the disparity in CS rates among various states and concluded that the CS rate in India is more among affluent groups and developed states and more research is necessary to understand the rapid rise of Caesarean section rates<sup>13</sup>. Caesarean section rates were reported to vary between Govt and Private organizations. A

very high rate of 53% in Peru and 86% in Brazil were reported in private hospitals<sup>14,15</sup>.

At tertiary care Institutes CS rate of 33.2% from Punjab was reported by Preetkamal et al<sup>16</sup> 34% from Assam by Banerjee et al<sup>17</sup> and 46% from Tamil Nadu by Poovathi et al<sup>18</sup>. The current study has a much lower rate (24.5%) even though it is a high volume tertiary care centre with 15,000 to 18,000 deliveries per year. The commonest indication in this study was fetal distress as reported from Assam where as it was previous caesarean section in the study from Punjab and cephalopelvic disproportion in the study from Tamil Nadu. A study from China reported CS rate of 55% and the most common indication as maternal request (28.4%) followed by cephalopelvic disproportion (14%)<sup>19</sup>. In the current study no caesarean sections were done at maternal request as per the policy of the department. A recent study from rural medical college, India, where CS rate was 48%, reported 2.5% of Caesarean sections for maternal request<sup>20</sup>. A study from Urban tertiary care reported 6% CS at maternal request<sup>21</sup>.

Most of the Caesarean sections were performed as emergency in various studies. Banerjee and colleagues reported 24.4% to have had elective CS and in the current study only 19% had elective CS. The most common reason for elective CS was prior Caesarean section (59.4%) and emergency CS was fetal distress (30%)<sup>22</sup>. This is consistent with the current study in that 85% of the elective caesareans were for prior scarred uterus and 55.7% of emergency Caesareans were for fetal distress.

An analysis of urgency of Caesarean sections by Nair and colleagues<sup>23</sup> revealed Category IV (failed induction) as the most common followed by Category II. This is in contrast with the current study in which category II was the most common followed by Category I. With respect to gestational age 9.9%, 85% and 5.2% were performed at preterm, term and post term respectively in the study by Das and Colleagues<sup>24</sup> where as in the current study it is 18%, 82% and only 0.5% post-term. Gestational age in the current study is consistent with that of Poovathi and colleagues who reported preterm CS of 18%, and term 82%. Singh et al reported 50% to be preterm in a cohort of 150 women who underwent Cs<sup>21</sup>.

Previous 2 or more caesarean sections as an indication accounted for 7% in the current study where as it was 12.38% in the study of Das and colleagues. Scar tenderness accounted for 20% of all emergency CS but and Das and colleagues reported it among 20% of all CS. Repeat Caesarean section as the leading indication was reported by Preetkamal et al (30%), Das et al (30%) and Singh et al (27%). In the current study prior caesarean was associated in 32.8% by Banerjee et al. In the current study 55.7% of emergency LSCS were performed for fetal distress and this amounts to 45% of total CS. A prospective observational study undertaken in women who underwent LSCS for fetal distress diagnosed by Cardiotocography not responding to intrauterine resuscitative measures concluded that neonatal outcomes did not correlate with diagnosis of fetal distress and the diagnosis has to be more precise and accurate prior to taking decision to perform CS<sup>25</sup>. Regarding decision to delivery interval it was concluded that universally agreed evidence-based decision-to-delivery targets without compromising maternal or foetal safety are necessary and future research should focus on accurate means of diagnosing fetal distress.<sup>26</sup> In the current study 50% of late preterm and 10% of term babies required NICU care. But the data on neonatal morbidity and mortality could not be

collected with accuracy and this is the limitation of the study. As the fetus-neonate spontaneously corrects acidosis and also with resuscitative measures, the neonatal outcomes will not be correlating with abnormal fetal cardiotocograms all the time.

Obstetric indications constituted only 8%<sup>18</sup> and in the current study 19.3% including malpresentations. Malpresentations as a sole indication was reported in 8%<sup>21</sup> and in the current study it is 10.5% and 18% in the study by Preetkamal. Other associated conditions which significantly impacted the CS rate were pre-eclampsia, Diabetes mellitus and Obesity<sup>22</sup>. Das and colleagues reported medical disorders to be the reason in 0.95% and Recurrent pregnancy loss in another 0.95% and in the current study co-morbid conditions were associated in 20.9% and recurrent pregnancy loss in 1.44%. Caesarean section rate in pregnancies following prolonged infertility and IVF/ICSI is high and the reasons being advanced maternal age and maternal request<sup>27</sup>. In the current study 2.9% of Caesarean sections were associated with treatment for infertility and ART and the exact indication was not clear in these women though many factors like medical disorders, advanced maternal age may be responsible.

On the whole fetal indications for CS were reported in 46.5% by Preet kamal<sup>16</sup>, 47% by Banerjee and colleagues and in the current study it accounted for 62.25% when recurrent pregnancy loss and ART pregnancies were included. A recent review (1950-2020) regarding the increased rate of caesarean sections has highlighted 4 main reasons for 80-85% of Caesarean sections. Viz: Elective caesarean sections for breech presentations, Previous caesarean section, emergency caesarean sections for suspected fetal growth restriction, fetal distress and failure of induction<sup>3</sup>. An increase in CS rate of 5% over 10 years was found to decrease PNMR from 33 per 1000 to 17 per 1000 live births.<sup>28</sup> Interventions to reduce CS rates include clinical and non-clinical and these strategies should be implemented as per WHO<sup>29</sup> regarding infrastructure, training health care professionals and education of the couple and at large the Society.

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