Genesis Journal of Gynecology & Obstetrics

Genesis-GJGO-1(1)-7
Volume 1 | Issue 1
Open Access

Global Strategy to Reduce Cesarean Section Rates-Part II

Dr. Grace Lalana Christopher*
Consultant Pediatrician, Grace Specialist Clinic, #4, 4th Main, Horumavu Main Road, Banswadi, Bangalore 560043, South India

***Corresponding author:** Dr. Grace Lalana Christopher, MBBS, DCH (CMC&H, Vellore, S. India) (DNB-ped), Consultant Pediatrician, Grace Specialist Clinic, #4, 4th Main, Horumavu Main Road, Banswadi, Bangalore 560043, South India

Citation: Christopher GL. Global Strategy to Reduce Cesarean Section Rates – Part II. Genesis J Gynaecol Obstet. 1(1):1-46.

Received: December 01, 2025 | **Published:** December 15, 2025

Abstract

Background: Rapidly rising rate of Lower Segment Cesarean Section (LSCS) worldwide, primarily due to increasing primary LSCS and repeat LSCS in subsequent pregnancy is alarming with attendant high maternal and neonatal morbidity and mortality more so in emergency LSCS when compared to vaginal delivery.

Aim: To determine global strategy to decrease primary LSCS and so reduction of repeat and hence overall LSCS rate

Objective: The objective of the study was to investigate maternal and newborn risk factors associated with emergency, elective LSCS and vaginal delivery to formulate global strategy to reduce LSCS rate thereby impacting both primary and repeat LSCS.

Method: Among 2750 consecutive live births from January 1st 2015 to 31st May 2017 were included in the study were analyzed for prepartum, intrapartum and postpartum neonatal high-risk factors linked to emergency LSCS versus vaginal delivery presenting by number or percent (%) and binary logistic regression with statistical significance set at 0.05 using SPSS Version 21.

Results: Dramatic rise of LSCS rate to 42.1% in 2015-'17 cohort from 13% in 1983 cohort, contributed mainly by high 53.8% primary LSCS rate with 32.6% repeat LSCS, majority 65% being emergency LSCS. High risk factors for emergency LSCS include 43.50% primigravida, 51.58% older mothers aged ≥ 25years, high incidence 12.05% Premature Rupture of Membranes (PROM), (OR 2.17 [95% CI 1.59, 2.96]; *p*<0.001), 7.15% Gestational Diabetes Mellitus (GDM), (OR 2.46 [95% CI 1.63, 3.70]; *p*<0.001), 9.14%

Pregnancy Induced Hypertension (PIH), (OR 2.41 [95% CI 1.68, 3.46]; $p<0.001$), 55.2% neonatal morbidity (OR4.20 [95% CI3.48,5.07]; $p<0.001$), 61.19% birth asphyxia, (OR 4.90 [95% CI 3.94, 6.10, 3.46]; $p<0.001$), 12.72% early onset neonatal sepsis (EONS) (OR 1.81 [95% CI 1.35, 2.41]; $p<0.001$), 22.36% Low Birth Weight (LBW) ≤ 2499g, 16,76% prematurity ≤ 36 weeks (OR1.91 [95% CI 1.46, 2.49]; $p<0.001$). Peak 28% live births and 36.6% elective LSCS occurred at 38 weeks gestation while peak 25% emergency LSCS and 29.8% vaginal delivery took place at 39 weeks' gestation.

Conclusion: The current high rate of 42.1% LSCS in 2015-'17 contrasted to low LSCS rate of 13.2% during eighties as a result of high 53.8% primary LSCS rate with 32.6% repeat LSCS. High incidence of obstetric and neonatal risk factors in emergency LSCS versus vaginal delivery included primiparity, older mothers ≥25 years (p<0.001), PROM (p<0.001), PIH (p<0.001), GDM (p<0.001), neonatal complications of LBW, prematurity ≤ 36 weeks (p <0.001), birth asphyxia (p<0.001) and EONS (p <0.001). Peak 28% live births and 36.6% elective LSCS occurred at 38 weeks term gestation, contrasted to peak 25% emergency LSCS and 30% vaginal delivery at 39 weeks. Global strategy by easy vaginal delivery at peak 38 weeks gestation, obviating peak 35.4% emergency LSCS, 28% elective LSCS and 43% traumatic vaginal delivery between 39 to 42 weeks gestation, aimed at reducing primary LSCS especially emergency LSCS, more so in primigravida improving outcome of both mother and baby.

Keywords
Global Strategy; Primary LSCS; 38 weeks Asian Due Date for Delivery (ADD).

Introduction

Global rise in Lower Segment Cesarean Section (LSCS) rate is linked to increased morbidity and costs, without overall improved maternal and neonatal outcome, being one of the commonest surgical procedures performed after 28 weeks of pregnancy [1-3]. US reported 500% increased LSCS rate up to 32.2% in 2014 from 5.5% in 1970, and 20-30% increase to 31% in UK [4, 5]. India reported a high LSCS rate over 60%, 16.7% rise doubling over the last decade with high incidence of 71.1% emergency to 28.9% elective LSCS [6]. Other countries around the world also reported high LSCS rate of 60-80% [7].

High primary or first time LSCS contributes to increased repeat LSCS accounting for the rising global LSCS rate more so in emergency LSCS. US reported increase of primary LSCS rate to 60% to 32% in 2021 from 20.7% in the eighties US [8] and UK ranging from 14% to over 40% in other countries [9, 10] leads to increase repeat LSCS resulting in a vicious cycle of perpetuating rise in global LSCS rate with several studies reporting high incidence of 62.5% emergency to 37.5% elective LSCS [11], 74.87% emergency to 25.13% elective LSCS [12], 78.3% emergency to 21.6% elective LSCS [13], while Croatia reported 52% emergency to 48% elective LSCS [14] and Australia 64.14% emergency to 35.8% elective LSCS [15].

Ethical concerns emanate from elective LSCS by maternal request and the growing concerns for malpractice litigations leading to lower threshold for interventions by obstetricians in high-risk pregnancies [16-20] and the continuing increase in LSCS rate more so emergency LSCS carries considerable disadvantages when compared to vaginal delivery, incidence of more than 10-15% LSCS is not justified in any region of the world [21,22], especially among ethnic Asians comprising about 7 billion of the current 8.2 billion world population and India with nearly 1.5 billion is the world's most populous country [23].

Methods

Design

The assessment of various prepartum risk factors or events occurring before birth include maternal age and gravida, intrapartum risk such as PROM of amniotic sac and chorion prior to onset of labor, PIH, GDM as well as mode of delivery and postpartum or neonatal risk factors of birthweight, gestation, gender, birth asphyxia, early onset neonatal sepsis and other morbidities were analyzed, linked to emergency, elective LSCS and vaginal delivery.

Setting

Among 2,750 consecutive live births during January 1st 2015 to 31st May 2017 included in the study at Shifa hospital, a multispecialty center in the Metropolitan city of Bangalore, South India. Data was obtained from Labor room records, NICU register and neonatal records. Data analysis and statistical significance was done using SPSS Version 21. Mean and standard deviation were used for continuous data while frequency and percentage were calculated for categorical data. Risk factors were grouped into antepartum, intrapartum and neonatal variables.

Statistical analysis

Various maternal, obstetric and neonatal risk factors were determined by logistic regression, measures association between specific prenatal, intra-natal and neonatal risk factors by emergency, elective LCSC and vaginal delivery. P>|z| by logistic regression indicates that a relationship exists between the two categorical variables vaginal delivery versus emergency or elective LSCS and $p \leq 0.05$ indicates statistical significance, the threshold of statistical significance set at ≤0.05 using SPSS Version 21.

Results

Rising incidence of LSCS

Incidence of LSCS in present study among a total 2,750 consecutive live births from January 1st 2015 to 31st May 2017 is 42.1% contrasted to 13.2% for 4426 live births in 1983 seen in (Figure 1).

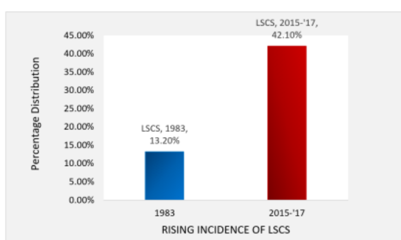

Figure 1: Rising incidence in LSCS over three decades 2015-'17 and 1983.

Distribution of births in relation to mode of delivery

The distribution according to mode of delivery during study period from 2015-'17, majority 1,450 (52.77%) were spontaneous vaginal normal delivery with 1159 (42.17%) caesarean LSCS deliveries, indicate that almost one in two births were LSCS, mostly 65% emergency LSCS and 35% elective LSCS. Instrumental vaginal delivery included vacuum extraction 3.6% and Low Perineal Forceps delivery 1.46%. The primary

LSCS rate is 53.8% and repeat LSCS 32.6%. The percentage distribution of births according to mode of delivery 2015-'17 is seen in (Figure 2).

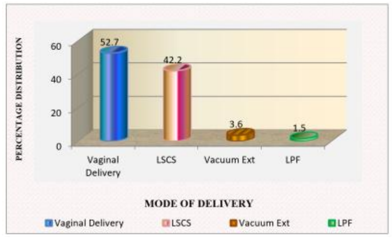

Figure 2: Percentage distributions of births by mode of delivery 2015-17.

Incidence of emergency and elective LSCS

However, among a total of 2609 births by the three modes of delivery, most common 55.5% (n=1450/2609) was vaginal delivery, 56.1% (n=755/1159) emergency LSCS and 15.5% (n= 404/1159) elective LSCS. Percentage distribution of emergency and elective LSCS in 2015-'17 seen in (Figure 3).

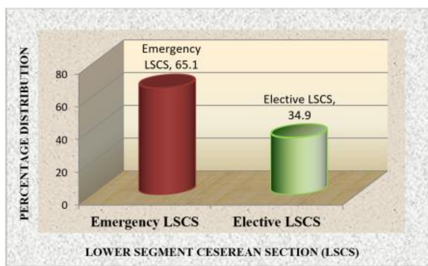

Figure 3: Incidence of Emergency and Elective LSCS 2015-'17.

Gestation at birth

Distribution of total peak 28% (*n*=745/2660) livebirths occurred at 38 weeks gestation, next 25.6% (*n*=682/2660) at 39 weeks, difference of 2.4% (p<0.001) while only 15.8% (*n*=420/2660) at 37 weeks. Majority 71.6% (*n*=1905/2660) were term ≥37 weeks gestation and 28.4% (*n*=755/2660) preterm ≤36 weeks gestation. The distribution of live births by weeks of gestation in 2015-'17 cohort seen in (Figure 4).

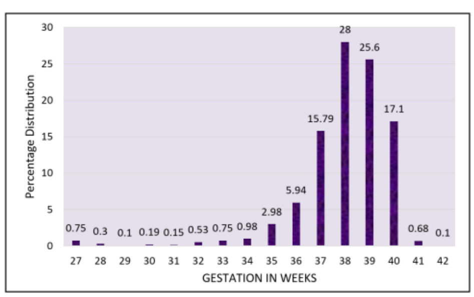

Figure 4: Distribution of consecutive live births by week of gestation 2015-17.

Gestation at birth by vaginal delivery and LSCS

The percentage distribution revealed peak 29.8% vaginal delivery occurred at 39 weeks gestation contrasted to peak 29.8% LSCS at 38 weeks, while LSCS progressively decreased to 20.7% and 14% at 39- and 40-weeks' gestation, at 37 weeks 19.6% LSCS was higher than 13.3% vaginal delivery. Percentage distribution of births by vaginal delivery and LSCS, 2015-'17 seen in (Figure 5).

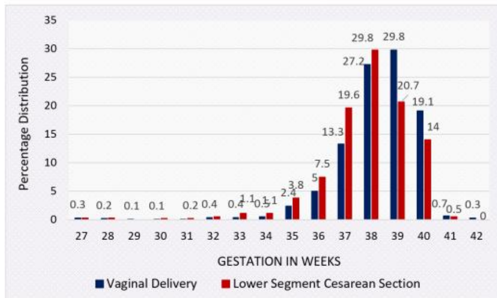

Figure 5: Percentage distributions of live births by weeks of gestation by vaginal delivery and cesarean section 2015-17.

Gestation by mode of delivery

Percentage distribution of births by gestation according to mode of delivery revealed majority 24% (n=180/715) emergency LSCS peaked at 39 weeks gestation, so also 29.2% (n=412/1386) vaginal delivery including 30.7% (n=12/40) LPF births and 29.4% (n=29/99) vacuum extractions plateaued out at both 38- and 39-weeks gestations. In contrast 36.6% (n=141/382) elective LSCS peaked at 38 weeks gestation. More preterm 16.7% (*n*=118/686) emergency LSCS to 9.52% (*n*=132/1386) vaginal delivery (OR 1.19 [95% CI 1.46, 2.49]; *p*<0.001) including 11.78% (*n*=45/382) elective versus emergency LSCS (OR 1.51 [95% CI 1.04, 2.18]; *p*<0.029) being highly statistically significant. Percentage distribution by mode of delivery according to gestation seen in (Figure 6).

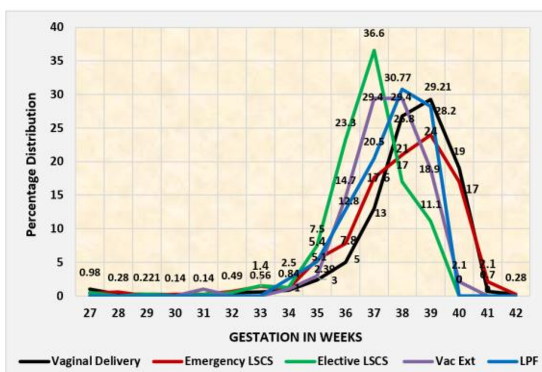

Figure 6: Percentage distribution of by gestation to mode of delivery 2015-17.

Mean and 25th, 50th and 75th Percentile Gestation by mode of delivery

The mean gestation for 1424 vaginal delivery was term 38.3 weeks, it was 37.96 weeks for total 1086 LSCS, while it was 38.04 weeks for 704 emergency LSCS and 37.85 weeks for 382 elective LSCS. However mean gestation by two-sample t test with equal variances revealed vaginal delivery versus total LSCS difference of 0.4 to be highly statistically significant (*p*=0.003), vaginal delivery versus emergency LSCS difference of 0.31 to be highly statistically significant (*p*=0.0045), vaginal delivery versus elective LSCS difference of 0.45 to be highly statistically significant (P=0.0019), while emergency LSCS and Elective LSCS difference of 0.14 was not statistically significant (*p*=0.3541). However, the 75th percentile for all modes of delivery was 39 to 40 weeks gestation and 50th percentile being term 38-39 weeks. The distribution according to mode of delivery, numbers mean gestation, standard deviation (S.D.) and 25$^{th\%}$, 50$^{th\%}$ and 75$^{th\%}$ gestation seen in (Table 1).

Mode of Delivery	No.	Mean	S.D.	25$^{th\%}$	50$^{th\%}$	75$^{th\%}$
Vaginal delivery	1424	38.45	2.05	38	38.6	39.5
Total LSCS	1086	37.96	2.44	37.2	38.2	39.2
Emergency LSCS	704	38.04	2.13	37.2	38.3	39.3
Elective LSCS	382	37.85	2.9	37.3	38	39
Vacuum Extraction	95	38.4	1.34	38	39	39.6
Low Perineal Forceps	40	38.75	1.34	38.1	39	40

Table 1: Mean gestation, standard deviation (S.D.) 25th$^{\%}$, 50$^{th\%}$ and 75$^{th\%}$ according to mode of delivery in 2015-’17 cohort.

Intrauterine growth curves

The intrauterine growth curves for 2,708 consecutive live births during twenty-nine months from January 2015 to May 2017 at Bangalore revealed a mean birthweight of 2873g compared to 2881g in the 1983 study, a difference of 8g due to demographic shift with younger mothers having small family in 2015-’17 cohort compared to 50% older mothers having three or more pregnancies in 1983. Steady fetal intrauterine weight gain noted till 38 weeks term gestation term gestation and thereafter increases in weight gain crosses 10th to 15th percentile up to 42 weeks, predisposes to cephalopelvic disproportion causing prolonged labor with impaction in second stage resulting in increased maternal and fetal morbidity and mortality. Thus, it’s best to effect delivery at optimum 38 weeks term gestation term gestation being peak gestation for best outcome for both mother and baby.

The intrauterine growth curve for the 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentile growth charts in 2015-’17 for all births and for boys and girls met all the standard requirements to obtain an ideal reference growth chart, the data included singleton babies from mono-ethnic group and most importantly the best method for gestational age estimation was 1st trimester ultrasound dating in all patients, as well as the gold standard LMS method was used for estimating the centiles and for smoothing of the centile curves. The 5th, 10th, 25th, 50th, 75th, 90th and 95th percentile intrauterine growth curves in 2015-’17 cohort seen in (Figure 7).

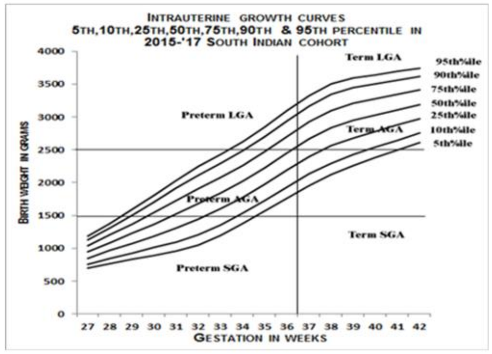

Figure 7: Intrauterine growth curves for ethnic Asians in 2015-’17 cohort (Reference Chart).

Asian due date (ADD)

Implementing Asian Due Date (ADD) at peak births 38 weeks term gestation term gestation will result in marked reduction of LSCS by 35.4% (n=384/1086), emergency LSCS by 39% (n=277/704), elective LSCS by 28% (n=107/382) including high risk traumatic vaginal delivery after 38 weeks term gestation term gestation by one half 50% (n =693/1386). Thus eliminating 43% high risk births in ethnic Asian-Indian population beyond 38 weeks term gestation term gestation with easy vaginal delivery of a small healthy baby term who after birth will feed avidly and gain weight, resulting in healthy mother and baby, consequently reducing the high prevailing maternal, perinatal, neonatal and under five mortality rates in many Low and Middle income developing Asian countries with limited resources without resort to hi-tech intensive care.

Logistic regression of preterm and term for vaginal delivery, emergency and elective LSCS

Logistic regression for prematurity ≤36 weeks by vaginal delivery to emergency LSCS was highly statistically significant (p<0.001), however vaginal delivery to elective LSCS versus was not statistically significant, elective versus emergency LSCS was significant (p=0.029) Logistic regression between preterm ≤36 weeks and term gestation by vaginal delivery versus emergency and elective LSCS seen in (Table 2).

Gestation	No. (%)	No. (%)	Odds Ratio	(95% Conf. Interval)	P>|z|
Vaginal delivery vs Emergency LSCS					
≤36 weeks ≥37 weeks	132 (9.52) 1254 (90.48)	118 (16.76) 586 (83.24)	1.91 Ref	1.46, 2.49	<0.001
Vaginal delivery vs Elective LSCS					
≤36 weeks ≥37 weeks	132 (9.52) 1254 (90.48)	45 (11.78) 337 (88.22)	1.26 Ref	0.88, 1.81	0.194
Elective LSCS vs Emergency LSCS					
≤36 weeks ≥37 weeks	45 (11.78) 337 (88.22)	118 (16.76) 586 (83.24)	1.51 Ref	1.04, 2.18	0.029

Table 2: Logistic regressions of preterm ≤36 weeks and term gestation by vaginal delivery, emergency and elective LSCS 2015-17.

Birthweight distribution by vaginal delivery, emergency and elective LSCS

The distribution of newborn birthweight in 500g categories revealed that majority 39.4% (*n*=567/1439) by vaginal delivery weighed 2500-2999g, however elective LSCS peaked 40.2% (n=160/398) and 34.5% (*n*

=258/747) emergency LSCS also 2500-2999g. The mean overall birth weight was 2836g, however lower 2831g mean birth weight by vaginal delivery compared to 2850g by LSCS, difference of 19g is highly statistically significant (*p*<0.001). However, the mean birth weight of 2887g in emergency LSCS to 2810g by elective LSCS is higher by 77g being statistically significant *p*=0.047, but the risk for LBW was higher in 22.6% (*n*=167/1327) emergency LSCS versus to 19.6% (*n*=282/1439) vaginal delivery was not statistically significant (*p*=0.13), so also vaginal delivery to 14.8% (*n*=59/398) elective LSCS not of statistical significance (*p*=0.13), however LBW in elective versus emergency LSCS (OR 1.65 [95% CI 1.19, 2.29]; *p*<0.002) was highly statically significant. Birthweight distribution by vaginal delivery, versus emergency and elective LSCS seen in (Figure 8).

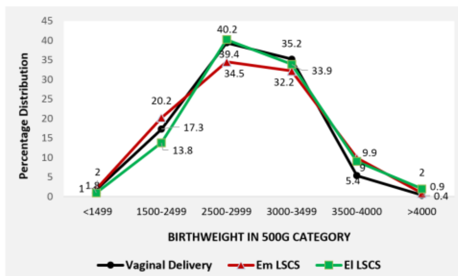

Figure 8: Percentage distribution of birthweight by vaginal delivery, emergency and elective LSCS 2015-17.

Logistics Regression for LBW by vaginal delivery, emergency and elective LSCS

Logistic regression for Low Birth Weight (LBW) 19.6% (n=282/1439) ≤2499 g was almost similar to 22.36% (*n*=167/747) was not statistically significant (*p*=0.13) but versus 14.82% (*n*=59/398) elective LSCS was not significant (*p*=0.13), as opposed to LBW in emergency LSCS versus elective LSCS being highly significant (*p*=0.002) Logistic regression of LBW between vaginal delivery, emergency and elective LSCS 2015-'17seen in (Table 3).

Birth weight	No (%)	No (%)	Odds Ratio	(95% Conf. Interval)	P>|z|
Vaginal delivery vs Emergency LSCS					
≤2499 g ≥2500 g	282 (19.60) 1157 (80.40)	167 (22.36) 580 (77.64)	1.18 Ref	0.95, 1.46	0.130
Vaginal delivery vs Elective LSCS					
≤2499 g ≥2500 g	282 (19.60) 1157 (80.40)	59 (14.82) 339 (85.18)	0.71 Ref	0.52, 0.96	0.031
Elective LSCS vs Emergency LSCS					
≤2499 g ≥2500 g	59 (14.82) 339 (85.18)	167 (22.36) 580 (77.64)	1.65 Ref	1.19, 2.29	0.002

Table 3: Logistic regression of LBW by vaginal delivery, emergency and elective LSCS 2015-17.

Neonatal complications

Neonatal complications complication of birth asphyxia, sepsis, transient, tachypnea of newborn, meconium aspiration syndrome hypoglycemia, hyperbilirubinemia etc among 2750 consecutive live births, 2015-'17, revealed the highest incidence of neonatal complications 55.2% (n= 417/755) occurred among emergency LSCS, common indication being fetal distress, to 22.69% (n=329/1450) vaginal delivery (OR 4.20 [95% CI 3.48, 5.07]; p<0.001) highly statistically significant including vaginal delivery versus

28.47% (n=115/404) elective LSCS (OR 1.35 [95% CI 1.05, 1.73]; p<0.016) was significant including emergency versus elective LSCS (OR 3.10 [95% CI 2.39, 4.01]; p<0.001) being statistically significant. The percentage distribution of newborns with and without complications by vaginal delivery, emergency and elective LSCS seen in (Figure 9).

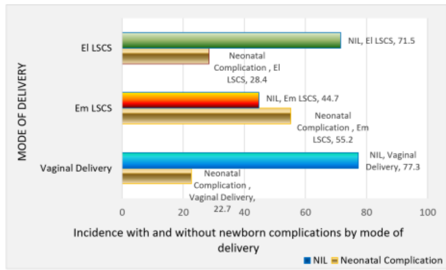

Figure 9: Percentage distribution of neonatal complications by vaginal delivery, emergency and elective LSCS 2015-17.

Logistics Regression for neonatal complications by vaginal delivery, emergency and elective LSCS

Logistic regression for high 45.90 % (n=532/1159) neonatal complication in total LSCS to low 22.69% (n=329/1450) was highly statistically significant (P<0.001), so also, between maximum 55.2% (n=417755) by emergency LSCS was also highly statistically significant (p<0.001). However, between low 28.47% (n=115/404) by elective LSCS to 22.69% (n=329/1450) and incidence of neonatal complication by elective and emergency LSCS and vaginal delivery and was not statistically significant, in contrast incidence of neonatal complications though elective versus emergency LSCS statistically significant (p<0.001). Logistic regression for neonatal complications between vaginal delivery, emergency and elective LSCS seen in (Table 4).

Neonatal Complications	**No. (%)**	**No. (%)**	**Odds Ratio**	**(95% Conf. Interval)**	**P>|z|**
Vaginal delivery vs Emergency LSCS					
Yes No	329 (22.69) 1121 (77.31)	417 (55.23) 338 (44.77)	4.20 Ref	3.48, 5.07	<0.001
Vaginal delivery vs Elective LSCS					
Yes No	329 (22.69) 1121 (77.31)	115(28.47) 289 (71.53)	1.35 Ref	1.05, 1.73	0.016
Elective LSCS vs Emergency LSCS					
Yes No	115(28.47) 289 (71.53)	417 (55.23) 338 (44.77)	3.10 Ref	2.39, 4.01	<0.001

Table 4: Logistic regression of neonatal complications by vaginal delivery, emergency and elective LSCS 2015-17.

Birth asphyxia

The overall incidence of birth asphyxia was 21.2%, (n=583/2748) among consecutive singleton live births. A high incidence 61.2% (n=462/755) of birth asphyxia by emergency LSCS with common indication of fetal distress contrasted to low 11.45% (n=166/1450) vaginal delivery (OR 4.90 [95% CI 3.94, 6.10]; p<0.001) was highly statistically significant. In contrast low incidence of birth asphyxia in both, vaginal delivery and

13.12% (n=53/404) elective LSCS was not of statistical significance (p=0.358). However low incidence 13.12% in elective LSCS to very high 61% in emergency LSCS (OR 4.20 [95% CI 3.03, 5.80]; p<0.001) being highly statistically significant.

Instrumental delivery by vacuum extraction usually undertaken late in second stage with arrested labor due to impacted vertex with undetected cephalopelvic disproportion had high 60.6% birth asphyxia, while low perineal forceps delivery to cut short second stage of labor had lower 27.5% birth asphyxia. The incidence of birth asphyxia by mode of delivery seen in (Figure 10).

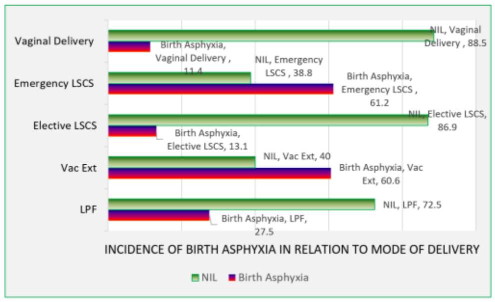

Figure 10: Incidence of birth asphyxia by mode of delivery 2015- ’17.

Peak gestation of asphyxiated births

Peak 25% (*n*=138/547) asphyxiated births occurred at 39 weeks followed by 23% (*n*=128/547) at 38 weeks term gestation term gestation, contrasted to peak 28.5% (*n*=585/2055) healthy births at 38 weeks term gestation followed by 25.7% (*n*=529/2055) at 39 weeks. Majority 89.3% term ≥37 weeks’ gestations were healthy while 86% preterm were asphyxiated at birth. Those between 32-35 week’s gestations, 13.3% suffered to 10.1% without birth asphyxia. Extreme prematurity ≤31 week’s gestation had almost equal distribution 0.7% asphyxiated births to 0.6% healthy newborns. Thus peak 25% asphyxiated births took place later at 39 weeks gestation contrasted to 28.5% healthy births at 38 weeks gestation indicating early delivery healthy newborns at 38 weeks as opposed to later delivery at 39 weeks with increased susceptibility to asphyxial birth injury due to increased fetal weight gain leading to difficulty in delivery with prolonged traumatic vaginal delivery causing fetal distress resulting often in emergency LSCS. Thus, easy vaginal delivery by 38 weeks gestation with small mature newborn will obviate birth asphyxia with reduced emergency LSCS. The peak percentage distribution of healthy and asphyxiated births by week of gestation seen in (Figure 11).

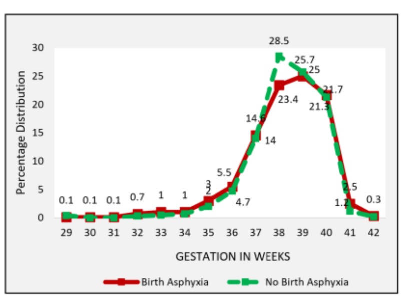

Figure 11: Peak percentage distribution of healthy and asphyxiated births by week of gestation 2015-17.

Birthweight distribution of asphyxiated newborns

Birthweight distribution revealed higher incidence of birth asphyxia in LBW ≤2499g, however birth asphyxia peaked 32% in 2500-2999g with 40% of healthy newborns. Higher birthweight 3000-3499g comprise 31% of asphyxiated to 35.6% well newborns. However, 3500-3999g and ≥ 4000g slightly more 8.4% and 3.7% had birth asphyxia to 6.8% and 0.3% well newborns.

The mean birth weight in asphyxiated newborns was 2874.11g, S.D.± 582.82g, being 6 g higher than healthy newborn at 2868.08g, S.D.±487.61g. The 25th, 50th and 75th percentile birth weight in asphyxiated newborns was 2500g, 2900g and 3240g and healthy newborns was 2600g, 2920g and 3180g respectively. Birth asphyxia peaked 32% in 2500-2999g to 31% in 3000-3499g to 39.5% and 35.6% well newborns respectively. However, 3500-3999g and ≥ 4000g slightly more 8.4% and 3.7% asphyxiated to 6.8% and 0.3% well newborns. These large babies ≥3500g are predisposed to difficult delivery due to cephalopelvic disproportion (CPD) etc at 39 weeks gestation, hence easy vaginal delivery by 38 weeks gestation will result in healthy neonates and decrease emergency LSCS.

Distribution of gravida and maternal age in relation to birth asphyxia

Primigravida had high 44.5% comprising nearly half of all asphyxiated newborns, second, third and fourth gravida had higher incidence of healthy babies 31.4%, 23.2% and 19.2 % to 24.1%, 15.1% and 9.7% asphyxiated newborns respectively. Multipara 5+ slightly higher 6.3% birth asphyxia to 5.7% well newborns. Older mothers above 35 years had slightly higher asphyxiated to young mother 20-24 years with healthy newborns. Thus, older primigravida are more prone to birth asphyxia due to undetected CPD and difficult labor.

Logistic regression of birth asphyxia by vaginal delivery, emergency and elective LSCS

Logistic regression of asphyxiated and healthy newborns between 11% vaginal delivery versus 30% total LSCS was highly statistically significant (p<0.001), so also vaginal delivery versus high 61% asphyxiated newborns by emergency LSCS also highly statistically significant (p<0.001) However almost equal low incidence 11.4% birth asphyxia by vaginal delivery to 13% elective LSCS was not statistically significant (p=0.358), however incidence of birth asphyxia by emergency versus elective LSCS was highly statistically significant (p<0.001). Logistic regression of birth asphyxia between vaginal delivery, emergency and elective LSCS seen in (Table 5).

Birth Asphyxia	**No. (%)**	**No. (%)**	**Odds Ratio**	**(95% Conf. Interval)**	**P>|z|**
Vaginal delivery vs Emergency LSCS					
Yes Nil	166 (11.45) 1284 (88.55)	462 (61.19) 293 (38.81)	4.890 Ref	3.93, 6.07	<0.001
Vaginal delivery vs Elective LSCS					
Yes Nil	166 (11.45) 1285 (88.55)	53 (13.12) 351 (86.88)	1.151 Ref	0.82, 1.60	0.401
Emergency LSCS vs Elective LSCS					
Yes Nil	462 (61.19) 293 (38.81)	53 (13.12) 351 (86.88)	4.245 Ref	3.07, 5.86	<0.001

Table 5: Logistic regression of birth asphyxia by vaginal delivery, emergency and elective LSCS 2015-17.

Early onset neonatal sepsis (EONS)

The overall incidence of 8.7% (n=227/2609) early onset neonatal sepsis among consecutive live births increased dramatically to 12.7% (n=96/755) for emergency LSCS to 7.4% (n=108/1450) vaginal delivery (OR 1.81 [95% CI 1.35, 2.41]; p<0.001) highly statistically significant, however EONS by vagina delivery to even lower 5.69% (n=23/404) elective LSCS was not statistically significant (p=0.225). However, emergency to elective LSCS (OR 2.41 [95% CI 1.50, 3.86]; p<0.001) highly statistically significant.

In contrast healthy 92% (n=1342/1450) newborns by vaginal delivery compared to 87% (n=659//755) by emergency LSCS with maximum 94.3% (n=381/404) healthy births by elective LSCS. It should be noted that emergency LSCS per say is not the causative factor for EONS but as a consequence of in-utero infection commonly indicated by fetal distress resulting in quick judicious obstetric surgical emergency intervention, however intrapartum infection through breach in skin integrity is acquired by horizontal transmission during labor. Incidence of early onset neonatal sepsis among total consecutive live births and by vaginal delivery, emergency and elective LSCS seen in (Figure 12).

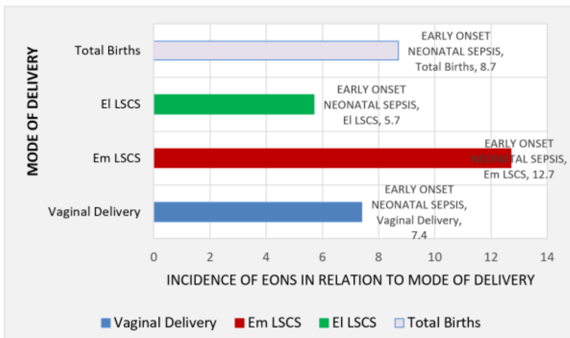

Figure 12: Incidence of Early Onset Neonatal Sepsis by vaginal delivery, emergency and elective LSCS 2015-17.

Maternal age and parity in newborns with EONS

Newborns with younger mothers were more prone to develop early onset sepsis with over half 57.4% mothers being younger than 24 years. Nearly half 48.8% septic newborns were born to primigravida mothers. Thus, younger, primigravida mothers were associated with high incidence of septic newborns.

Gestation of newborns with EONS

Mean gestation was 37.68 weeks, S.D. 4.9016 compared to 38.39 weeks, S.D. 1.565 in well newborns, difference of 0.7 weeks being highly statistically significant p<0.001. The 25th, 50th and 75th percentile in EONS cases was 36.6 weeks, 38.1 weeks and 39.2 weeks compared to well newborns with longer duration of gestation at 37.6 weeks, 38.4 weeks and 39.4 weeks respectively. While among 91.29% (n=2382/2609) well newborn, peak births occurred at 38 weeks term gestation contrasted to lower peak of 8.7% (n=227/2609) complicated by EONS at 39 weeks. However, preterm newborns 22.5% (n=51/227) had complications of EONS being nearly three times compared to 6.7% (n=176/2609) term well newborns, being statistically significant (p <0.001).

Mean birth weight in newborns with EONS

The mean birth weight in newborns with EONS was less 2674.75g, S.D. 607.9726 compared to 2888.34 g, S.D. 494.4190 in well newborns, difference of 213.56g being highly statistically significant p<0.001. While the mean birth weight at 25th, 50th and 75th percentile was 2280g, 2740g and 3105g compared to a slightly higher 2600g, 2920g and 3200g respectively in healthy newborns. Percentage distribution of newborns by 500g birth weight category revealed that 28.1% of newborns with EONS weighed 2000-2499g being nearly twice as much 13.95% well newborns. Thus, higher incidence of LBW and prematurity was associated with EONS.

Logistic regression of EONS by vaginal delivery, emergency and elective LSCS

Logistic regression between 7.4% newborns with EONS vaginal delivery contrasted to high 12.7% emergency LSCS (p<0.001), including emergency to elective LSCS (p<0.001) being statistically significant. However vaginal delivery to elective LSCS was not statistically significant (p=0.225), Logistic regression of newborns with EONS by vaginal delivery, emergency and elective LSCS seen in (Table 6).

EONS	No. (%)	No. (%)	Odds Ratio	(95% Conf. Interval)	P>|z|
Vaginal delivery vs Emergency LSCS					
Yes Nil	108 (7.45) 1342 (92.55)	96 (12.72) 659 (87.28)	1.840 Ref	1.37, 2.46	<0.001
Vaginal delivery vs Elective LSCS					
Yes Nil	108 (7.25) 1342 (92.55)	23 (5.61) 381 (94.39)	0.759 Ref	0.47, 1.19	0.225
Emergency LSCS vs Elective LSCS					
Yes Nil	96 (12.72) 659 (87.28)	23 (5.69) 381 (94.39)	2.41 Ref	1.50, 3.86	<0.001

Table 6: Logistic regression of newborns with EONS by vaginal delivery, emergency and elective LSCS 2015-17.

Premature Rupture of Membranes (PROM)

Among 2609 consecutive live births the overall incidence of PROM prior to onset of labor was 7.2% (n=188/2609) increased dramatically to 12.1% (n=91/755) for emergency LSCS compared to 5.93% (n= 86/2814) vaginal delivery (OR 2.17 [95% CI 1.59, 2.96]; p<0.001), being highly statistically significant, including 5.93% vaginal delivery to even lower 2.7% (n=11/404) for elective LSCS, (OR 0.44 [95% CI 0.23, 0.83]; p<0.013), was statistically significant, as also emergency to elective LSCS, (OR 4.89 [95% CI 2.58, 9.26]; p<0.001), highly statistically significant, 9.5% (n=9/95) vacuum extraction and 7.8% (n=3/39) in low perineal forceps. Incidence of PROM by vaginal delivery, emergency and elective LSCS seen in (Figure 13).

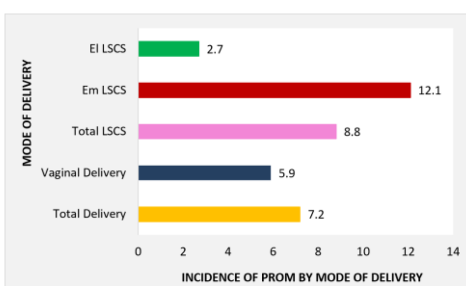

Figure 13: Incidence of PROM for total births, vaginal delivery, total LSCS, emergency and elective LSCS 2015- '17.

PROM in relation maternal age, parity and birthweight

Young mothers 20-24 years majority 43% (n=77/180) had PROM, and over half 51% (n=103/201) were primigravida. However, birthweight distribution was similar for both 38% (n=76/201) with PROM to 38% (n=966/2560) with intact membranes for 2500-2499g. Meconium staining of liquor occurred in 9.1% of 207 pregnancies with PROM compared to only 7.2% in overall births.

Logistic regression of PROM by vaginal delivery, emergency and elective LSCS

Logistic regression between 5.93% (n=89/1489) PROM in vaginal delivery to higher 12% (n=91/755) emergency LSCS was highly statistically significant (p<0.001). However, 6% PROM among vaginal delivery to low 2.7% elective LSCS was not statistically significant. However, 12.05% emergency versus 3% elective LSCS with PROM was highly statistically significant (p<0.001. Logistic regression of PROM by vaginal delivery, emergency and elective LSCS seen in (Table 7).

PROM	No. (%)	No. (%)	Odds Ratio	(95% Conf. Interval)	P>|z|
Vaginal delivery vs Emergency LSCS					
Yes Nil	89 (5.93) 1364 (94.02)	91 (12.05) 664 (87.95)	2.130 Ref	1.56,2.89	<0.001
Vaginal vs Elective LSCS					
Yes Nil	89 (5.93) 1364 (94.07)	11 (2.72) 393 (97.28)	0.433 Ref	0.22, 0.81	0.010
Emergency LSCS vs Elective LSCS					
Yes Nil	91 (12.05) 664 (87.95)	11 (2.72) 393 (97.28)	4.911 Ref	2.95,9.29	<0.001

Table 7: Logistic regression of PROM by vaginal delivery, emergency and elective LSCS 2015-17.

Pregnancy Induced Hypertension (PIH)

The overall incidence of PIH was just prior to onset of labor was 5.8% (n=162/2640) increased dramatically to 9.1% (n=69/755) for emergency LSCS, while it was 4% (n=58/1450) for vaginal delivery, to 5.9% (n=24/404) elective LSCS. Total LSCS had incidence of 8% (n=93/1159). Incidence of PROM according to mode of delivery seen in (Figure 14).

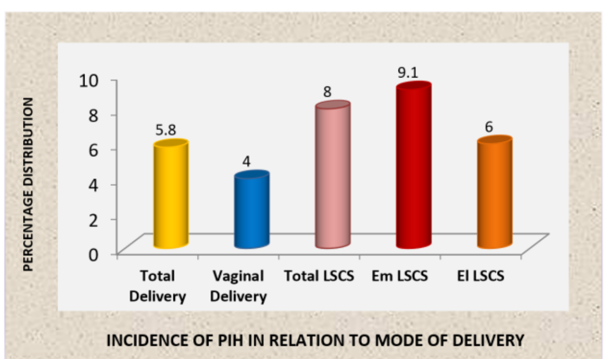

Figure 14: Incidence of PIH for total births, vaginal delivery, total LSCS, emergency and elective LSCS 2015-‘17.

Mean Gestation in PIH

The mean gestation in pregnancy complicated by PIH was 37.5 ± 2.0 weeks with overall 24.8% preterm to 75.2% term newborns compared to 38.4 ±1.6 weeks gestation in uncomplicated pregnancy with 10.3% preterm to 89.7% term newborns being highly statistically significant (p<0.001).

Maternal age and parity in PIH

The distribution of births with PIH complicating pregnancy in relation to maternal age revealed over half 57% (n=57/149) were older age group 25-29 years to 42% (n=1006/2388) younger mothers aged 20-24 years, in contrast primigravida 31% (n=365/811) had PIH to 31.1% (n=446/811) primigravida uncomplicated with PIH.

Birthweight distribution in PIH

Birthweight distribution in PIH complicated pregnancy, peak 33% (n=53/162) weighed 3000-3499g compared to 38.4% (n=998/2601) in lower birthweight category 2500-2999g in uncomplicated pregnancy.

Logistic regression of PIH by vaginal delivery, emergency and elective LSCS

Logistic regression in pregnancy with PIH complication only 4% (n=58/1450) were vaginal delivery compared to twice 8% (n=93/1159) total LSCS being highly statistically significant p<0.001. Similarly, versus 9% (n=69/755) emergency LSCS was also highly statistically significant p<0.001. However, comparatively low 6% (n=24/404) elective LSCS was not statistically significant p=0.096. Also, elective versus emergency LSCS was not statistically significant p=0.058). Logistic regression of PIH complicating pregnancy by vaginal delivery, emergency and elective LSCS seen in (Table 8).

PIH	No. (%)	No. (%)	Odds Ratio	(95% Conf. Interval)	P>|z|
Vaginal delivery vs Emergency LSCS					
Yes	58 (4.00)	69 (9.14)	2.41	1.68, 3.46	<0.001
Nil	1392 (96.00)	686 (90.86)	Ref		
Vaginal delivery vs Elective LSCS					
Yes	58 (4.00)	24 (5.94)	1.51	0.92, 2.47	0.096
Nil	1392 (96.00)	380 (94.06)	Ref		
Elective LSCS vs Emergency LSCS					
Yes	24 (5.94)	69 (9.14)	1.59	0.98, 2.57	0.058
Nil	380 (94.06)	686 (90.86)	Ref		

Table 8: Logistic regression of PIH by vaginal delivery, emergency and elective LSCS 2015-17.

Incidence of Gestational Diabetes Mellitus (GDM)

Incidence of GDM was 5.3% (n=137/2609) among consecutive live births, while 3.03% (n=44/1450) vaginal delivery to 7.15% (n=54/755) emergency LSCS (OR 2.46 [95% CI 1.63, 3.70]; p<0.001) highly statistically significant. Vaginal delivery contrasted to high incidence of 9.65% (n=39/404) elective LSCS (OR 3.41 [95% CI 2.18, 5.33]; p<0.001) also highly statistically significant. However, emergency to elective LSCS (p=0.1370 not statistically significant. While total LSCS incidence of GDM averaged 8% (n=93/1159). Incidence of GDM by vaginal delivery, emergency and elective LSCS seen in (Figure 15).

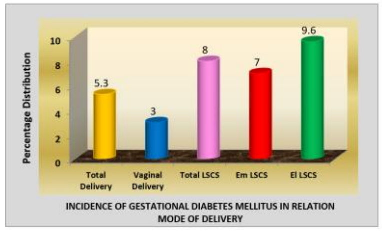

Figure 15: Incidence of GDM for total births, vaginal delivery, total LSCS, emergency and elective LSCS 2015-'17.

Mean gestation in relation to GDM

The mean gestation in GDM was 37.7 ± 1.4 weeks with overall 27% preterm to 73% term newborns compared to 38.4 ±1.6 weeks in uncomplicated pregnancy with 11% preterm to 89% term newborns, is highly statistically significant (p<0.001).

Maternal age and parity in relation to GDM

There was almost equal distribution of 42.7% mothers aged 25-29 years to 42% younger mothers aged 20-24 years, in contrast 32.7% primigravida had slightly higher incidence to 31% second gravida mothers with pregnancy complicated by GDM.

Birthweight Distribution in infants of Diabetic mothers (IDM)

However, equal birthweight distribution 33% IDM weighing 2500-2599 and 3000-3499g contrasted to 38.4% uncomplicated pregnancy in lower birthweight category 2500-2999g.

Logistic regression of GDM in relation to vaginal delivery, emergency and elective LSCS

Logistic regression GDM complicating 3% (n=44/1450) vaginal delivery versus 8% (n=93/1159) total LSCS was highly statistically significant (p<0.001). Similarly, vaginal delivery versus 7% (n=54/755) emergency LSCS was highly statistically significant (p <0.001). Also, vaginal delivery versus 9.6% (n =39/404) elective LSCS was also highly statistically significant (p<0.001). However, elective versus emergency LSCS was not statistically significant (p =0.137). Logistic regression with and without gestational diabetes complicating pregnancy by mode of delivery seen in (Table 9).

GDM	No. (%)	No. (%)	Odds Ratio	(95% Conf. Interval)	P>|z|
Vaginal delivery vs Emergency LSCS					
Yes	44 (3.03)	54 (7.15)	2.46	1.63, 3.70	<0.001
Nil	1406 (96.97)	701 (92.85)	Ref		
Vaginal delivery vs Elective LSCS					
Yes	44 (3.03)	39 (9.65)	3.41	2.18, 5.33	<0.001
Nil	1406 (96.97)	365 (90.35)	Ref		
Elective LSCS vs Emergency LSCS					
Yes	39 (9.65)	54 (7.15)	0.72	0.46, 1.10	0.137
Nil	365 (90.35)	701 (92.85)	Ref		

Table 9: Logistic regression of GDM by vaginal delivery, emergency and elective LSCS 2015-17.

Distribution of Gravida in relation to vaginal delivery, emergency and elective LSCS

Among 2575 consecutive live births, majority 31.9% (*n*=811/2575) were primigravida (*p*<0.001) followed by 30.2% (*n*=780/2575) second gravida, 21.9% (n=565/2575) third gravida, 10.3% (*n*=266/2575) fourth gravida and 5.9% (*n*=153/2575) multigravida 5+. Overall vaginal delivery comprised 55.6% (*n*=1433/2575), of the remaining 44.3% (*n*=1142/2575) LSCS, majority 64.6% (*n*=738/1142) were emergency to 35.4% (*n*=404/1142) elective LSCS. Primigravida 31.12% (*n*=446/1433) by vaginal delivery to 43.50% (*n*=321/738) emergency LSCS to ≥ 2+gravida (OR 1.70 [95% CI 1.41, 2.04]; $p<0.001$) as highly statistically significant. So also, vaginal delivery to low 10.89 (*n*=44/404) elective LSCS (OR 0.27 [95% CI 0.19, 0.37]; $p<0.001$) and emergency versus elective LSCS (OR 6.29 [95% CI 4.45, 8.89]; $p<0.001$) being highly statistically significant in primigravida when compared to ≥ 2+gravida. Percentage distribution of gravida according to vaginal delivery, emergency and elective LSCS seen in (Table 10).

Gravida	Vaginal Delivery	Emergency LSCS	Elective LSCS	Total
1	446	321	44	811
2	450	194	136	780
3	288	137	140	565
4	157	49	60	266
5 +	92	37	24	153
Total	1433	738	404	2575

Table 10: Distribution of births by vaginal delivery, emergency and elective LSCS in relation to Gravida.

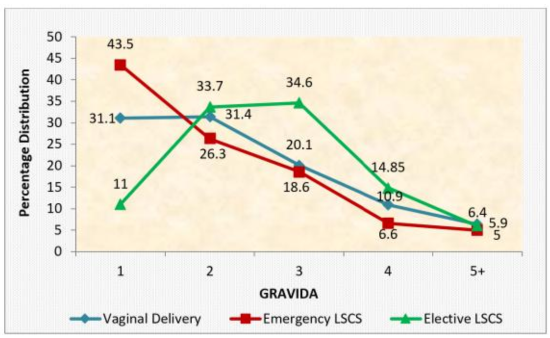

Figure 16: Percentage distributions of births by vaginal delivery, emergency and elective LSCS in relation to gravida 2015- '17.

Logistic regression in relation to Gravida

Logistic regression of vaginal delivery in relation to gravida revealed equal distribution of 31% for primigravida compared to second gravida and above versus similar total LSCS therefore of no statistical significance $p=0.649$. However vaginal delivery 31% (*n*=446/1433) versus emergency LSCS 43.5% (*n*=321/738) was highly statistically significant $p<0.001$ as also to low 10.9% (*n*=44/404) elective LSCS being highly statistically significant $p<0.001$. Hence also, low incidence of elective LSCS to high emergency LSCS in primigravidae was highly statistically significant $p<0.001$. Logistic regression of gravida by vaginal delivery, emergency and elective LSCS seen in (Table 11).

Parity	No. (%)	No. (%)	Odds Ratio	(95% Conf. Interval)	P>|z|
Vaginal delivery vs Emergency LSCS					

1 2+	446 (31.12) 987 (68.88)	321 (43.50) 417 (56.50)	1.70 Ref	1.41, 2.04	<0.001
Vaginal delivery vs Elective LSCS					
1 2+	446 (31.12) 987 (68.88)	44 (10.89) 360 (89.11)	0.27 Ref	0.19, 0.37	<0.001
Elective LSCS vs Emergency LSCS					
1 2+	44 (10.89) 360 (89.11)	321 (43.50) 417 (56.50)	6.29 Ref	4.45, 8.89	<0.001

Table 11: Logistic regression of parity by vaginal delivery, emergency and elective LSCS 2015- '17.

Maternal age in relation to vaginal delivery, emergency and elective LSCS

Among 2483 consecutive live births in relation to maternal age, teenage pregnancy ≤ 19 years comprised 8.6% (n=214/2483), while mothers aged 20-24 years peaked 38.9% (n=967/2483) and together ≤24-years comprise 47.5% of total births. Next 34.7% (n=862/2483) were aged 25-29 years, 15.9% (n=369/2483) 30-34 years and 1.7% (n=44/2483) above 35 years. Thus, younger mother ≤ 24 years comprised nearly half of all births of total 2483 births. Most vaginal delivery 52.1% (n=730/1399) occurred in younger mothers below 24 years of age, decreased to 39.1% (n= 446/1139) in 25-29-year-old thereafter to 14.4% (n=202/1399) in older mothers aged 30-34-year-old to minimum 1.5% (n=21/1399) in those ≥ 35 years of age.

Consequently, 48.42% (n=337/696) emergency LSCS to 52.18 (n=730/2068) vaginal delivery in younger mothers ≤24-years (OR 0.65 [95% CI 0.55, 0.76]; p<0.001) being highly statistically significant. As also vaginal delivery to 29.38% (n=114/388) elective LSCS (OR 0.38 [95% CI 0.29, 0.48]; p<0.001), and emergency versus elective LSCS (OR 2.25 [95% CI 1.73,2.93]; p<0.001) for young mothers aged ≤24-years to older ≥ 25 years of age, being highly statistically significant.

While mothers aged 25-29 years 38.3% (n=416/1084) underwent LSCS with 37.2% (n=259/696) emergency LSCS, while elective LSCS 40.5% (n=157/388), common indication being repeat LSCS. While in older mothers ≥30 years, 20% (n=217/1084) LSCS with only 14.3% (n=100/696) emergency LSCS, doubled 30.1% (n=117/388) elective LSCS mainly being repeat LSCS due to prior LSCS, also ≥ 35 years elderly mothers prefer LSCS to vaginal delivery. Distribution of mother's age in relation to vaginal delivery, emergency and elective LSCS seen in (Table 12).

Maternal Age	Vaginal Delivery	Emergency LSCS	Elective LSCS	Total
≤ 19	132	71	11	214
20-24	598	266	103	967
25-29	446	259	157	862
30-34	202	89	105	396
≥ 35	21	11	12	44
Total	1399	696	388	2483

Table 12: Distribution of maternal age in relation to vaginal delivery, emergency and elective LSCS.

Thus, overall percentage distribution by mode of delivery in teens ≤ 19 years comprised 9.4% (*n*=132/1399) vaginal delivery, emergency LSCS 10% (*n*=71/696) and elective 2.8% (*n*=11/388). Mothers aged 20-24 years had high 42.7% (*n*=598/1300) vaginal delivery to peak 38.2% (*n*=266/696) emergency LSCS which comprised 72% (*n*=266/369) total LSCS, (*p*<.001), contrasted to 26.5% (*n*=103/388) elective LSCS. In age group 25-29 years, peak 40.5% (*n*=157/388) elective LSCS followed by 37.2% (*n*=259/696) emergency LSCS with 31.9% (*n*=446/1399) vaginal delivery. Among those above 30 years most 30% (*n*=117/388) was elective LSCS followed by 15.9% (*n*=223/1399) vaginal delivery and 14.3% (*n*=100/696) emergency LSCS.

The preponderance of 52% vaginal delivery, 48.4% emergency LSCS and 29.3% elective LSCS in younger mother's ≤24 years, contrasted to older mothers ≥ 25 years with majority 70.5% elective LSCS followed by 51.6% emergency LSCS and 47.8% vaginal delivery, high lights the importance of implementing strategy to reduce primary LSCS among young mothers ≤24 years thereby decreasing high repeat elective and emergency LSCS in older ≥ 25 years mothers allowing instead for easy vaginal delivery The overall percentage distribution of vaginal delivery, emergency and elective LSCS by maternal age seen (Figure 17).

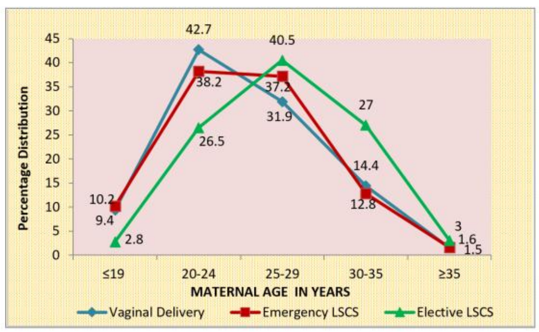

Figure 17: Percentage distribution of births by vaginal delivery, emergency and elective LSCS in relation to maternal age 2015- '17.

Maternal age in relation to prematurity

Preterm gestation ≤ 36 weeks in mothers' ≤29 years was 9.6% compared to 11.5% in mothers' ≥30 years. While 90.4% mothers were ≤29 years had term, gestation compared to 88.5% ≥30 years. The mean gestation among mother's ≤30 years was 38.4 ± 1.6 weeks and >30 years 38.1 ± 1.5 weeks being highly statistically significant (p=0.005).

Logistic regression in relation to maternal age

Logistic regression in relation to mothers age ≤24 years and ≥25 years in relation to 52% (n=730/1399) vaginal delivery versus 48.4% (n=451/1084) emergency LSCS was not statistically significant p=0.105, thereby indicating that young mothers had similar exposure to risk of emergency LSCS as vaginal delivery. In contrast 29.4% (n=114/388) elective LSCS versus vaginal delivery was highly statistically significant p<0.001, as also elective versus emergency LSCS p<0.001. Logistic regression of mother's age by vaginal delivery, emergency and elective LSCS seen in (Table 13).

Mother's age	No. (%)	No. (%)	Odds Ratio	(95% Conf. Interval)	P>|z|
Vaginal delivery vs Emergency LSCS					
≤24 ≥25	730 (52.18) 669 (47.82)	337 (48.42) 359 (51.58)	0.86 Ref	0.71, 1.03	0.105
Vaginal delivery vs Elective LSCS					
≤24 ≥25	730 (52.18) 669 (47.82)	114 (29.38) 274 (70.62)	0.38 Ref	0.29, 0.48	<0.001
Elective LSCS vs Emergency LSCS					
≤24 ≥25	114 (29.38) 274 (70.62)	337 (48.42) 359 (51.58)	2.25 Ref	1.73, 2.93	<0.001

Table 13: Logistic regression of maternal age to vaginal delivery, emergency and elective LSCS 2015- '17.

Sex Distribution in relation to vaginal delivery, emergency and elective LSCS

Overall equal male and female ratio of M: F: 1:1, similarly so also elective LSCS ratio of M: F:1:1. However slightly more males were delivered by emergency LSCS, ratio of M: F:1.1:1, while vaginal delivery revealed slightly higher females' ratio of M: F:1:1.1,

Percentage distribution of 51% (n=746/1443) female preponderance for vaginal delivery compared to male predominance for both 53% (n=391/739) emergency and to 51% (n=200/395 elective LSCS. Sex distribution according to mode of delivery seen in (Figure 18).

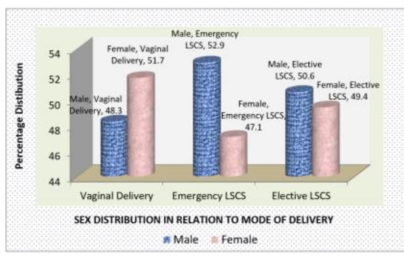

Figure 18: Percentage Sex distributions in relation to vaginal delivery, emergency and elective LSCS.

Discussion

The proportion of LSCS to total births is rising steadily worldwide, increase of around 20-30% in the west upto 60-80 reported from other countries is considered as one of the important indicators of emergency obstetric care [1-7]. Present series noted increase in LSCS rate to 42.2% in 2015-'17 from 13.2% during 1983, clearly indicating in recent times, one in every two births is by LSCS and rising, in fact, world-wide LSCS rate is up 60-80% [7].

High 32% primary LSCS reported in US in 2021 and ranging from 14% in UK to over 40% in other countries [8-10], resulting in increased repeat LSCS is a vicious cycle perpetuating rising global LSCS rate, despite improvements in obstetric practice such as continuous electronic fetal monitoring, cardiotocography etc. does not reflect any substantial improvement in maternal or neonatal immediate as well as long term outcomes with subsequent pregnancies subjected to LSCS. Hence high primary LSCS rate is unacceptable and not validated which needs to be urgently addressed in determining a global strategy for reduction of LSCS rate. The earlier dictum of first LSCS is always is presently resort to trial of labor after cesarean

(TOLAC) with reported 65.89% successful vaginal birth after cesarean (VBAC) but 34.11% repeat unplanned urgent emergency LSCS [26].

However, TOLAC in later pregnancies is practiced only in absence of any contraindications such as cephalopelvic disproportion, contracted pelvis, malpresentation, placenta previa, oligohydramnios, preeclampsia, APH, etc. have elective LSCS without trial of labor. Emergency repeat cesarean section (ERCS) commonly indicated by fetal distress due to intrapartum hypoxia and failure to progress have high post op complications such as uterine rupture, risk of thinned out lower uterine segment, bladder advancement/oedema with difficulty in delivery of baby, extension of uterine incision, maternal morbidity such as fever, surgical site infection, hemorrhage requiring blood transfusion, UTI adhesions, paralytic ileus, deep vein thrombosis etc, with higher neonatal morbidity after ERCS compared to VBAC, challenges the choice of vaginal delivery in prior LSCS with scarred uterus. ACOG recommends target 23.9% primary LSCS in nulliparous term singleton vertex cesarean delivery [27].

In the present study overall high 53.8% primary LSCS with 32.6% repeat LSCS, primarily due to high 43.5% emergency LSCS in primigravida resulted in peak repeat 34% elective LSCS in second gravida, raises the question how best to safely reduce primary LSCS thereby avoiding risks of TOLAC and VBAC.

Investigations of various risk factors linked to emergency, elective LSCS and vaginal delivery classified as prepartum of maternal age and parity, intrapartum obstetric factors of prelabor or premature rupture of membrane (PROM) of amniotic sac and chorion prior to onset of labor Gestational Diabetes Mellitus (GDM), Pregnancy Induced Hypertension (PIH) and neonatal risk factors of birth weight, gestation, intrauterine growth pattern, peak births, complications of birth asphyxia, EONS, gender etc. to derive global strategy in decreasing overall LSCS rates.

Prepartum criteria of parity reveal, majority 32% primigravida had highest 43.5% emergency LSCS to 31% vaginal delivery and minimal 11% elective LSCS. In contrast 30.2% second gravida mothers, maximum 33.7% were elective LSCS, reduced 26.3% emergency LSCS to 31.4% vaginal delivery. So also, in 21.9% third gravida, peak 34.6% elective LSCS contrasted to 18.6% emergency LSCS and 20.1% vaginal delivery. Thereafter in fourth and fifth gravida elective LSCS still fared highest 14.8% ro minimal 6% emergency LSCS with vaginal delivery 10.9%. Declined in fifth gravida to 6.4% elective LSCS, still figured highest mode of delivery. The distribution among fifth+ gravida, most 6.4% elective LSCS, followed by 5.9% vaginal delivery to least 5% emergency, indicating that high 53.8% primary LSCS with 32.6% repeat LSCS caused by high 43.5% emergency LSCS in primigravida contributes to high LSCS rates resulted in peak elective LSCS in second gravida mostly repeat LSCS and subsequent decrease vaginal delivery and emergency LSCS.

Emergency LSCS 43.5% in primigravida (OR 1.70 [95% CI 1.41, 2.04]; $p<0.001$) was highly statistically significant to vaginal delivery, similarly to low 10.9% elective LSCS (OR 6.92 [95% CI 4.45, 8.89]; $p<0.001$) in primigravida versus 2+ gravida, including vaginal delivery to elective LSCS (OR 0.27 [95% CI 0.19, 0.37]; $p<0.001$) highly statistically significant. Thus, effective strategy to reduce high incidence of primary LSCS by decreasing emergency LSCS in primigravida will have major impact on reduction in global LSCS rate with consequent decrease in repeat elective LSCS in higher parity with increase in safe vaginal delivery.

Young mothers, 47.5%, ≤24 years, most underwent 47% emergency LSCS to 52.9% vaginal delivery was not statically significant however emergency to 29.3% elective LSCS (OR 2.25 [95% CI 1.73, 2.93]; p<0.001) as well as vaginal delivery to elective LSCS (OR 0.38 [95% CI 0.29, 0.48]; p<0.001) being highly statistically significant compared to older mothers ≥ 25 years.

However, among 34.7% mothers aged 25-29 years, peak 40.5% elective LSCS, reduced 37.2% emergency LSCS being mainly repeat LSCS had lower 31.9% vaginal delivery. Similarly, 15.9% aged 30-34 years, most 27% had elective LSCS to least 12.8% emergency LSCS with 14.4% vaginal delivery.

Comparison to 1983 cohort, majority 40% older mothers aged 25 to 29 years had 73.7% LSCS with PMR of 44.8‰, while in teenagers PMR OF 40.8‰ decreased to a minimum 17.4‰ in younger 20-24-year old's; further 45.8‰ in 30-34 years to high 60.6‰ above 35 years by LSCS. Vaginal delivery also noted high PMR of 57.1‰ in teenagers decreased to 36.8‰ in 20-24 years, 27.5‰ in 25-29 years with gradual increase to 59.6‰ in 30-34 years and 66.7‰ for ≥35 years. Indicating that low PMRs in twenties increased in teenage and elderly mothers [28].

The mean maternal age in 2015-'17 cohort for emergency LSCS was 27.8 ± 6.07 years increased to 31.5 ± 6.54 years in elective LSCS, the difference being statistically significant (*p*<0.001). Another study reported mean age of 25 years in emergency LSCS and older 28 years in elective and [9]. Indicating that majority younger mothers underwent emergency LSCS representing high primary LSCS rate.

Others have reported that of the two types of LSCS, emergency LSCS had statistically significant associations with young mothers *p*<0.001, maternal illiteracy *p*= 0.049, primiparity *p*=0.005, inadequate prenatal care *p*<0.001, referral cases with pregnancy complications or delivery *p*<0.001, LSCS under general anesthesia *p*<0.001, low birth weight *p* <0.016, neonatal morbidity and mortality *p*<0.001 but NICU admission *p*=0.024. Perinatal mortality was 10.2 per 1000 births with 5 fresh stillbirths and 1 early neonatal mortality related to birth asphyxia all delivered by emergency LSCS also noted higher incidence of prematurity, P = 0.029, birth asphyxia, *p*= 0.045 and respiratory morbidity *p*= 0.020 compared to elective LSCS [29].

Also reported mean gestational age of 38 and half weeks being similar for both emergency and elective LSCS with lower birth weight of 3258 ± 614 g in emergency to 3111 ± 687 g in elective LSCS being statistically significant P = 0.016. Common indications in elective LSCS were 47.18% previous LSCS and 17.61% fetal macrosomia while emergency LSCS it was 30.49% fetal distress and 29.82% previous cesarean section in labor [30]. Another study reported most 77.7% young 20-30 years mothers higher 82% elective LSCS due to complications of 37.88% GDM and pre-DM, 16.83% hypertensive disease of pregnancy, 12.63% anemia, 11.57% thyroid diseases and 3.15% other medical morbidities. In contrast 62% of emergency LSCS had antenatal complications of GDM, 22.61% Pre-DM, 15.01% PIH, 13.78% anemia, 9.54% thyroid diseases and 8.74 % other medical morbidities [31]. Similarly, in another study in 48.7% elective LSCS had antenatal complications of 21.1% GDM and 11.8% PIH [32].

Yet other studies have reported that young 18-25-year-old had high 58% emergency LSCS contrasted to high 42% of elective LSCS in 26-30 years. Also, 30-45 years old had more 46% elective to 35.8% emergency

LSCS. This association between age and type of LSCS was significant $p<0.01$. Higher maternal deaths in emergency LSCS contrasted to low 1.72% in elective LSCS [33]. While others reported 75% of mothers younger than 35 years have 2.56 times increased chance to undergo emergency LSCS being statistically significant, $p = 0.005$, and elective LSCS progressively increased from 5% for teenagers to 27% in older mothers indicating repeat LSCS for prior section as well as mother's preference for LSCS as opposed to vaginal delivery. Thus, older mothers were more subjected to elective LSCS often repeat LSCS [34]. The maternal mortality was 0.44% in emergency LSCS compared to 0.34% for total cesarean section [35]. Yet others reported more maternal deaths in emergency LSCS to low 1.72% perinatal deaths in elective LSCS [36].

Though relationship of age with the type of LSCS is difficult to decipher but high incidence of emergency LSCS in younger mothers may indicate the tendency of the attending obstetrician to allow vaginal deliveries in these mothers as long as this is feasible with a view to preserving their future reproductive performances and resorting to LSCS if threat to either the mother or the fetus. On the other hand, it is accepted that the older mothers tend to have more previous LSCS, which may automatically require elective LSCS. Present series n 2015-'17 cohort noted emergency and elective LSCS was performed in over half, 54.5% primiparous mothers. Other studies found high 55.48% LSCS with 42.15% emergency LSCS being statistically higher in primiparous mothers to 28.87% elective LSCS, P = 0.005 [37].

However globally, emergency LSCS were performed in younger mothers with a mean age of 27.8 ± 6.07 years while elective LSCS performed in older mothers with a mean age of 31.5 ± 6.54 years, this difference in the ages being statistically significant $p< 0.001$ [38] Another study reported mean age of 28 years in elective and 25 years in emergency LSCS and more elective versus emergency cesarean was statistically associated to GDM, $p = 0.003$ and PIH, $p= 0.041$ [39]. Also 67.18% mothers with adequate prenatal care only 67.59% had emergency LSCS versus higher 92.75% with inadequate 3 or less prenatal care being statistically significant $p< 0.001$. Referral cases comprised 15.70% of emergency versus 2.11% elective LSCS, difference being statistically significant $p< 0.001$. Including all elective LSCS were done under regional anesthesia, while 8.52% emergency LSCS was under general anesthesia [40].

Yet, another study reported 30.2% LSCS rate with 78.37% emergency to 21.63% elective LSCS most common indication was repeat LSCS in both groups,76.87% elective to 46.44% emergency LSCS with higher maternal complications in emergency compared to elective LSCS, such as blood transfusion 22% to 5%, $p<0.000$, fever 65 to 1%, $p<0.000$, urinary tract infection 10% to 2%, $p<0.000$, wound infection 27% to 12%, $p<0.000$ respectively, as well as birth asphyxia, meconium stained liquor and NICU admission in emergency P=0.05 [41] including extended incision, thin lower uterine segment, bladder advancement, hemorrhage etc in intra op in emergency LSCS [42]. Others noted fetal head impaction in almost one third of cesarean delivery and greater blood loss, maternal mortality 0.44% in emergency to 0.34% overall LSCS but perinatal mortality and respiratory morbidity were similar in both groups [43].

Spontaneous rupture of membranes (ROM) in labor is a normal component of childbirth. While PROM is premature rupture of amniotic sac before labor begins. Preterm premature rupture of membranes (PPROM) occurs before 37 weeks. Management of PROM varies from induction in term pregnancy to expectant in preterm PROM with corticosteroids between 23-34 weeks for lung maturation antibiotics to prevent infection etc. [40]. PROM is related to number of adverse maternal and neonatal outcomes commonest being chorioamnionitis, endo-myometritis, wound infection, pelvic abscess, bacteremia and postpartum hemorrhage [44]. In fact, one of the most serious consequences of PROM-related maternal infection is early onset neonatal sepsis acquired prenatally is associated with increased neonatal morbidity and mortality [45]. Another adverse outcome of prelabor rupture of membranes is the increased risk of emergency LSCS [46].

Incidence of PROM was 7.2%, emergency LSCS had high 12.1% to 5.9% for vaginal delivery and even lower 2.7% for elective LSCS but was 9.5% in vacuum extractions and 7.8% in low perineal forceps delivery. Over half 51% primigravida had PROM and 43% aged 20-24 years while 9% had meconium staining of liquor in 2015-’17 study. Other studies reported PROM among 63% primigravidae and 37% in multigravida [47]. Also, 28% PROM had LSCS, common indication being fetal distress, mal-presentation, cephalopelvic disproportion, failed induction etc. [48]. Maternal complications of PROM include chorioamnionitis, retained placenta and postpartum hemorrhage [49].

Logistic regression of PROM between 12% emergency LSCS to 5.9% vaginal delivery (OR 2.130 [95% CI 1.56, 2.89]; $p<0.001$) and 2.6% elective LSCS (OR 4.911 [95% CI 2.95, 9.29]; $p<0.001$), as well as vaginal delivery to elective LSCS, (OR 0.433 [95% CI 0.22, 0.81]; $p<0.01$) was statistically significant in 2015-’17 cohort. Yet another study reported high PROM in emergency with nil PROM in elective LSCS, difference being highly significant, $p=0.000$ [50]. Literature reports increased risk of LSCS associated with PROM, common indication being fetal distress especially with meconium staining, no progress in labor that may even convert an elective to emergency LSCS or preclude induction of labor as risk of infection is high and planned early birth at 37 weeks versus expectant management or delay in PROM [51, 52].

However, another study reported no significant differences in maternal age of 27.8±4.7 vs. 28.3±5.0, $p>0.05$ with PROM and intact membranes, gestation at delivery 38.1±2.1 vs. 38.9±1.9, $p>0.05$, body mass index (BMI) 28.4±2.1 vs. 27.9±3.7, $p>0.05$ respectively. A significantly higher incidence of a miscarriage history of 40.2% vs. 37.5%, $p<0.05$, GDM 5.9% vs. 4.3%, $p>0.05$, intrauterine growth restriction 0.47% vs. 0.48, $p>0.05$, chronic hypertension 0.13% vs. 0.41%, $p>0.05$, anemia 3.36% vs. 2.43%, $p >0.05$, thyroid dysfunction 0.87% vs. 0.47%, $p>0.05$. Lower amniotic fluid index AFI values 9.4±4.7 vs. 10.9±3.9, $p<0.05$), and PPH significantly higher with PROM 55.1% vs. 42.5%, $p<0.05$ associated with higher LSCS rate, 55.1% vs. 42.5%, $p<0.05$).

Neonatal complications include birth asphyxia 3.2% vs. 2.2%, $p<0.05$, neonatal jaundice 0.21% vs. 0.08%, $p<0.05$ and 0.27% neonatal infection rate with PROM 0.27% vs. 0.06%, $p<0.05$. Also, newborn birth weight 3.23±0.81 vs. 3.27±0.56, $p>0.05$), length 49.5±2.7 vs. 49.7±2.9, $p>0.05$), Apgar score at 1 min 8.2±0.6 vs. 8.6±0.9, $p>0.05$, at 5 min 9.2±0.4 vs. 9.2±0.4, $p>0.05$ [53]. Commonest cause of PROM was ascending vaginal infection being a main risk factor in preterm PROM. Prophylactic antibiotics with cephalosporins or erythromycin if was allergic to cephalosporins within 12 hours after the onset of PROM [54].

GDM diagnosed between 24 to 28 weeks of pregnancy with increase in blood sugar by oral glucose tolerance test (OGTT), however, it can happen at any stage of pregnancy but disappears after birth. In present 2015-'17 study, GDM 5.3% incidence peaked to high 9% in elective LSCS, 7% emergency LSCS to lower 3% for vaginal delivery. However, 36.5% emergency LSCS in GDM patients contrasted to high 57% vaginal delivery in uncomplicated pregnancy. Logistic regression revealed low 3% vaginal delivery for GDM to emergency LSCS, (OR 2.46 [95% CI 1.63, 3.70]; $p<0.001$) highly statistically significant. Low incidence in vaginal delivery contrasted to high incidence in elective LSCS (OR 3.41 [95% CI 2.18, 5.33]; $p<0.001$) also highly statistically significant. However, emergency to elective LSCS ($p=0.137$) not statistically significant.

The mean gestation in GDM was 37.7 ± 1.4 weeks, to 38.4 ±1.6 weeks uncomplicated pregnancy ($p<0.001$). Around one-third 33% infants of diabetic mothers weighed between 2500-2599g and 3000-3499g, contrasted to peak 38.4% in lower 2500-2999g without GDM with 42.7% older 25-29 years to 42% in younger 20-24 years mothers, and 32.7% primigravida to 31% second gravida, attributed to increase obesity and body mass index as excess body fat predisposes to insulin resistance that worsens in pregnancy also pregnancy hormones increase insulin resistance in addition to increase in free fatty acids in these women who may already have insulin resistance predisposing to chronic low-grade inflammation, preterm delivery and gestational hypertension and higher risk of type 2 diabetes, cardiovascular disease etc. developing later in life [55-57].

Increase in LSCS in pregnancy complicated with GDM and pre-gestational diabetes (PGDM) is mainly due to increasing global obesity as well as improved fetal surveillance and induction of labor either to prevent stillbirth or excessive fetal growth with its attendant complications that results in increased perinatal mortality compared to healthy pregnancy thus, glycemic control and optimal delivery is recommended around 37 weeks, as most stillbirths occur at 33 weeks mean gestation [58], most 64% of the stillbirths occur before 36 weeks and 40% prior to 34 weeks in Type 1 diabetes pregnancy reported in a Danish study [59], hence even strategy at 38 weeks delivery will still not prevent the majority of stillbirths but will result in improved perinatal outcomes by reducing fetal weight gain [60].

United Kingdom reported audit of 80% stillbirths in type 1 and type 2 diabetes at ≤36 weeks of gestation while California ranged from 36 to 42 weeks being higher in women with GDM to healthy women 17.1 vs. 12.7/10,000 deliveries; RR 1.34, 95% CI 1.2–1.5 [59]. Also, stillbirth rates at 36 to 39 weeks in women with GDM had a statistically significant elevated RR compared to those without GDM, ranging from RR, 1.45 (95% CI, 1.1–1.9) at 38 weeks to RR 1.84 (95% CI 1.5–2.3) at 37 weeks. Obviously earlier delivery will decrease risk of excessive fetal weight gain or macrosomia with perinatal complications including perinatal mortality, shoulder dystocia, birth trauma and Cesarean delivery [61, 62].

Fetal estimated weight based on clinical estimations, height of the fundus of the uterus and ultrasound scanning is not accurate, or even previous history of macrosomia, maternal obesity, maternal weight gain during pregnancy, multiparity and male fetus, hence macrosomia identified at delivery and birthweight is the only accurate identification. Thus, timing of elective delivery at 37 gestations in diabetic pregnancies based on estimated fetal weight to reduce risk of sudden fetal death, by reducing fetal macrosomia and risks of shoulder dystocia, trauma such as fractures and brachial plexus injury and severe cephalo-pelvic disproportion with associated maternal mortality and morbidity with increased risk of LSCS [63]

Though even earlier induction in poorly controlled GDM with a PreGDM phenotype of elevated BMI, marked insulin resistance manifested by insulin requirements, polyhydramnios and increased fetal abdominal circumference is recommended and expectant management in “low risk” well-controlled primiparous GDM with unfavorable cervix. However, insulin-treated and diet-treated GDM pregnancies should not be sole criterion to decide timing of delivery with induction of labor at 37 weeks as opposed to expectant management is ideal to reduce macrosomia or large-for-dates fetus as high blood sugar cases excessively large babies increasing risk of birth injuries with higher incidence of emergency LSCS [64].

Induction in GDM is recommended of an earlier 37 weeks to prevent stillbirths, fetal macrosomia, decreased amniotic fluid and placental aging associated with expectant management that might increase the need for intrapartum LSCS due to dystocia or non-reassuring fetal heart rate. However inherent risks of induction before 39 weeks in the absence of any maternal or fetal indications of fetal distress due to uterine hyperstimulation, chorioamnionitis and neonatal respiratory morbidity compared to longer labors or augmentation causes severe morbidity, serious perineal trauma, fetal death and neonatal complications including long term risks of diabetes and cardiovascular disease in childhood and adult compared to women with spontaneous onset of labor exits with increased resort to LSCS [65].

Pregnancy Induced Hypertension (PIH), preeclampsia is one of the leading causes of maternal and perinatal mortality worldwide, especially in LMIC complicates 2-8% of pregnancies globally and definition of new onset of hypertension after 20 weeks of gestation with systolic blood pressure of >140 mmHg or diastolic blood pressure of >90 mmHg on two occasions, least interval of four hours, accompanied by significant proteinuria of >300 mg in 24-hour urine collection or protein/creatinine ratio of >0.3 mg/dL or dipstick reading of >2+, or abnormalities from other laboratory tests or clinical results of organ damage (e.g., thrombocytopenia, renal insufficiency, impaired liver function) that accounts for almost 26% of maternal deaths in Latin America and the Caribbean and 9% in Africa and Asia [66].

In the present 2015-’17 study 5.8% incidence of PIH was 4% in vaginal delivery increased to 9.1% in emergency LSCS, (OR 2.14 [95% CI 1.68, 3.46]; $p<0.001$) highly statistically significant. The mean gestation in pregnancy complicated by PIH was 37.5 ± 2.0 weeks to 38.4 ±1.6 weeks in uncomplicated pregnancy being statistically significant ($p<0.001$). A study reported mean gestation at delivery with PIH was 37.7 weeks and mean birth weight was 2945g, small for gestational age infants in 8.9% with no fetal death [67].

Birthweight distribution in present series revealed 33% infants of mothers with PIH weighed 3000-3499g contrasted to peak 38.4% in lower birthweight category 2500-2999g in uncomplicated pregnancy. Also, most, 57% of mothers with PIH were aged 25-29 years compared to 42% younger mothers aged 20-24 years while 38% were primigravida and 32.6% in second and more gravida mothers. Maternal age, mainly 57% were 25-29 years compared to 42% younger mothers aged 20-24 years, in contrast primigravida PIH mothers comprised 38% contrasting to lower incidence 32.6% for second gravida and above. Peak PIH complicated pregnancy 33% in birthweight category 3000-3499g contrasted to 38.4% in lower birthweight category 2500-2999g in uncomplicated pregnancy.

Other studies reported almost double increased rate of 15.4% LSCS with preeclampsia, RR 1.8, 95%CI 1.5-2.2, yet another study observed that preeclampsia significantly increased the risk of LSCS by 2.2 times [68]. Though preeclampsia is not an absolute indication for LSCS, rate is usually high due to the severity of the disease resulting in severe maternal complications and fetal morbidities necessitating immediate emergency LSCS. Thus, an increased rate of LSCS in preeclampsia reported despite not being an indication though vaginal delivery may be accomplished.

A study reported increasing risk of LSCS by 2.2 times to 15.4% LSCS with preeclampsia, RR 1.8, 95% CI 1.5-2.2, though preeclampsia is not an absolute indication for LSCS, is usually high due to the severity of the disease resulting in severe maternal complications and fetal morbidities often necessitating immediate emergency LSCS. [69].

Incidence of 34.5% neonatal complications of birth asphyxia, sepsis, transient, tachypnea of newborn, meconium aspiration syndrome hypoglycemia, hyperbilirubinemia etc. in present series to high 55.2% in emergency LSCS contrasted to 22.7% in vaginal delivery (OR 4.20 [95% CI 3.48, 5.07]; $p<0.001$), as also emergency versus 28.4% elective LSCS (OR 3.10 [95% CI 2.39, 4.01]; $p<0.001$) being highly statistically significant. Other studies also report higher 78.6% neonatal risks of respiratory distress, meconium aspiration, sepsis, five perinatal deaths four in emergency compared to one in elective LSCS [70].

Early Onset Neonatal Sepsis (EONS) increased dramatically from overall 8.7% to 12.7% in emergency LSCS to 7.4% by vaginal delivery and even lower 5.7% by elective LSCS, maternal risk factors include PROM, chorioamnionitis, UTI etc, Prematurity with mean gestation 37.68 weeks, S.D. 4.9016 contrasted to 38.39 weeks, S.D. 1.565 in well newborns, difference of 0.7 weeks was statistically significant ($p<0.001$). The 25^{th}, 50^{th} and 75^{th} percentile in EONS cases was 36.6 weeks, 38.1 weeks and 39.2 weeks compared to well newborns with longer duration of gestation at 37.6 weeks, 38.4 weeks and 39.4 weeks respectively. Incidence of EONS among preterm was 22.5% being nearly three times compared to 6.7% term well newborns ($p<0.001$) [71].

The mean birth weight in EONS neonates was 2674.75g, S.D. 607.9726 compared to 2888.34 g, S.D. 494.4190 in well newborns, difference of 213.56g being highly statistically significant ($p<0.001$). While the mean 25^{th}, 50^{th} and 75^{th} percentile was 2280g, 2740g and 3105g with EONS compared to 2600g, 2920g and 3200g respectively in healthy newborns. Most 28.1% of newborns with EONS weighed 2000-2499g being nearly twice as much 13.95% well newborns. Average birth weight 2887g by emergency LSCS is 77g more to 2810g by elective LSCS, ($p=0.047$) being statistically significant, risk for LBW and prematurity was higher in emergency LSCS.

Intrapartum events do have more impact than antepartum factors as various studies show placental insufficiency decreases oxygen supply to the fetus during contractions as fetal blood supply during the latter part of the second stage of labor decreased by uterine contractions or termination by cord compression, causing hypoxia and hypercapnia with residual neurological deficits [72, 73]. Globally birth asphyxia constitutes leading cause of perinatal mortality with around 7,000 newborns dying every day with almost similar stillbirths [74]. However, India being the most populous country in the world, 4-6% fail to establish spontaneous respiration at birth [75], while WHO reports that globally 29% neonatal deaths are caused by birth asphyxia [76, 77]. Deaths being tip of the iceberg with up to half of survivors having permanent neurological deficits from mild perinatal hypoxia resulting in substantial proportion of adults with low IQ score < 80 and poor scholastic performance to severe neurologic deficits such as cerebral palsy, mental retardation, seizures, blindness or severe hearing impairment, to mild effects of autism, cognitive impairment, inability to develop fine motor skills, memory and mood disturbances reduced intelligent quotient scores, depending on the extent of insult, despite reduction in neonatal mortality [78-80].

The overall incidence of birth asphyxia in present series 2015-17 was 21.2%, with maximum 61.2% by emergency LSCS (OR 4.890 [95% CI 3.94, 6.07]; $p<0.001$) to 11.4% by vaginal delivery and 13% elective LSCS (OR 4.890 [95% CI 3.94, 6.07]; $p<0.001$) being highly statistically significant. Birth asphyxia noted in 44.5% primigravida and 37% between 20-29 years. High 11.3% in PIH (OR 2.981 [CI 95%] 2.14-4.16, $p=0.0001$) statistically significantly, to 8.2% with PROM and 6.3% GDM.

Peak 25% asphyxiated births occurred at 39 weeks to peak 28.5% well newborns at 38 weeks. Mean gestation being 38.33 weeks, S.D. ± 2.59 in birth asphyxia to 38.38 weeks, S.D.± 2.06 in well newborns. Mean birth weight with birth asphyxia was 2874.11g, S.D.± 582.82g, being 6 g higher than 2868.08g, S.D.±487.61g for well newborns [81]. LBW had higher statistically significant risks (OR 1.51 [CI 95%] 1.21-1.98, $p=0.0001$) for birth asphyxia.

The average birth weight in South Indian newborns over three decades was almost similar 2,881g in 1983 and 2,873g in 2015-17, despite vast technological and economic revolution which has influenced all sections of society in India clearly indicating an inherent genetic predisposition at play and that Indian babies will continue to be small, majority asymmetrically growth retarded infants with low energy reserves, less well equipped to cope with any physiological insults compounded by increased susceptibility to birth asphyxia [82,83].

Many studies have reported low intra uterine growth potential with ultrasound demonstration of unusual fetal growth patterns and shorter duration of pregnancy in ethnic Asian-Indians [84,85]. In contrast, distinct inherent genetic predisposition of longer duration of pregnancy with peak Caucasian births occurring later at 41 weeks and around 500g higher birth weight of 3.5 to 4 kg at births [86,87]. It is therefore appropriate Asian Due Date (ADD) at 38 weeks as opposed to common Expected Date of Delivery (EDD) at 40 weeks for the wellbeing of ethnic Asian fetuses and newborns and maternal outcome facilitating easy vaginal delivery of the small, mature Asian baby [88]. Thus, ethnic Asian obstetricians should be advised to allow uterine contractions prior to 40 weeks EDD to progress to delivery with implementation of Asian Due Date at 38 weeks and not label “False labor pains” instead of prolonging pregnancy with difficult delivery.

Though LSCS is increasingly perceived as a low risk procedure, there are significant increased maternal morbidity and mortality compared to vaginal delivery with threefold higher incidence of placental abnormalities, such as placenta previa increasing from 1% in one previous LSCS to almost 3% in three or more prior LSCS complicated by placenta accreta in around 40% as well as adverse neonatal outcomes with neonatal intensive care unit admission and perinatal death, with increased maternal mortality and other adverse health risks to both mother and baby [89-93]. Including increased risk to gut microbiota, food allergy, asthma, type 1 diabetes and obesity, respiratory, metabolic and immune diseases [94]. Also, women after LSCS are more likely to have delayed breastfeeding with poor milk production and early weaning [95].

The rise in LSCS over the last 20 years, especially the impact in rising trend of second stage emergency LSCS performed after cervix is fully dilated but vaginal delivery is not possible due to cephalopelvic disproportion. [96]. Most emergency LSCS are unplanned and traumatic undertaken after a difficult, long second stage or cord prolapse and technically challenging with increased to both mother and baby, commonly indicated by non-progression of labor, fetal distress or profoundly impacted head of the fetus in the pelvis, oligohydramnios or no amniotic fluid left and meconium staining of liquor, atonic hematuria, prolonged catheterization, febrile illness causing prolonged hospitalization etc. with maternal risks of hemorrhage and intra-op complications of uterine incision extension reported in 12.6%, thin lower uterine segment with uterine tears extending to broad ligament hematoma, bladder advancement and injury, infection leading to longer hospital stay with up to 2.6 times intraoperative traumatic complications [97].

Neonatal morbidities comprise of birth asphyxia, NICU admission, meconium aspiration syndrome etc fresh stillbirth 5% to neonatal death 1.5%, while prolonged labor was high in vaginal delivery, significant maternal complications such as wound infection, surgical injury, maternal death was high particularly when LSCS performed in labor, though postpartum hemorrhage was not associated with mode of delivery [96]. Yet another study reported fetal distress in 30.3% emergency LSCS in contrast more 46% emergency and 78.8% elective done in repeat LSCS [99].

In the present series four fifths elective and half of emergency LSCS may be avoided by promoting safe vaginal delivery at 38 weeks term gestation, thereby reducing overall LSCS rate, reflecting a decrease in both primary and repeat LSCS, including 30% traumatic prolonged vaginal delivery between 39-42 weeks gestation with resort to emergency LSCS with negative health consequences, both short and long term for mother and child as well as an economic burden to society. The simple global strategy of vaginal delivery at 38 weeks term gestation, by implementing ADD, as opposed to EDD with easy, quick delivery of a small baby through birth canal, after birth will feed avidly and gain extra uterine weight, instead of intrauterine increase of around 500g up to 1000g by prolonging pregnancy to 40-42 weeks [90]. Thus, Asian obstetricians should desist from the universal practice of prolonging pregnancy to EDD or 40 weeks gestation as defined for Caucasian population, stated in standard western test books, thereby avoiding LSCS in women with no indicated risk or complication in pregnancy. Though surgical obstetric intervention maybe lifesaving whether emergency or elective needs to be appraised as worldwide increasing trend of emergency LSCS will result in ill effects for both women and children is concerning.

However both emergency and elective LSCS have higher fetal morbidity, more so in emergency LSCS, despite recent obstetric advances such as wireless fetal monitoring, advanced 3D, transvaginal ultrasounds for detailed view of fetus, minimally invasive laparoscopic and robotic surgery options for LSCS, safer and faster recovery time, including prevention of preterm births with progesterone supplements, cervical cerclage in cervical incompetence, genomic medicine and management of genetic risks for informed decision making etc. Another study revealed similar results of 78% elective LSCS in previous LSCS contrasted to 30.3% emergency LSCS, indications of fetal distress [100] also 75% multigravida women underwent elective caesarean section for Planned repeat caesarean delivery (PRCD) [101]. Also, it was reported that emergency repeat LSCS with onset of labor occurred more often by 38 weeks gestation converting elective LSCS at 39 weeks [102].

Planned elective LSCS before the onset of labor for indications of maternal medical and obstetric complications of preeclampsia, diabetes, placenta previa etc. as vaginal delivery would be risky, ensures improved obstetrics, anesthetic, neonatal and nursing services for favorable maternal outcome. However, at times elective LSCS may be undertaken after onset of labor associated with regular contractions and cervical dilation, but still has a better outcome when compared to emergency LSCS.

Primary LSCS is the chief indication for repeat LSCS. Thus, prevention of first LSCS will lower the overall LSCS rate. Primary LSCS rate is proportion of first time LSCS minus repeat LSCS divided by total number of births including vaginal delivery to women who never had LSCS multiplied by 100 is considered as one of the important indicators of emergency obstetric care. In the present study primary LSCS was a high 53.8% among total LSCS of 1159 minus 378 repeat LSCS divided by 1450 vaginal deliveries. Thus, overall high 42.1% LSCS rate indicate that LSCS that for any significant reduction in LSCS, needs to be aimed at reducing primary or first time LSCS especially emergency LSCS, more so among young primigravidae.

The usual indications of elective cesarean sections were dominated by 47.18% previous cesarean section and 17.61% fetal macrosomia. The most frequent indications for emergency cesarean section were 30.49% fetal distress in labor and 29.82% previous cesarean section [31]. Other Indian studies reported primary LSCS rate of 29.9% and 28.7% [21, 22]. Yet another study reported primary LSCS rate of 15.4%, majority 66% performed in primigravida, 85% being emergency LSCS for fetal distress, malposition, prolonged labor etc. probably due to undetected cephalopelvic disproportion [49]. The increase in primary LSCS rate with increased maternal morbidity and mortality in later pregnancies, has major impact on LSCS rate and its prevention is vital in reducing rate of global LSCS.

The present 2015-'17 study noted 53.8% primary LSCS with 32.6% repeat LSCS defined as percentage of LSCS out of all births to women who have not had a previous LSCS being an important indicator of emergency obstetric care. Other Indian studies reported primary LSCS rate of 29.9% mainly 66% performed in primigravida, majority 85% emergency LSCS, indicated by fetal distress, malposition, prolonged labor etc.

Primary LSCS rate in U.S. is 22.8 per 100 live births [103]. Study revealed 30.8% for primiparous women and 11.5% for multiparous women, common indications 35.4% failure to progress of which 42.6% were primiparous and 33.5% in multipara with 5cm dilation, next 27.3% non-reassuring fetal heart rate tracing and 18.5% fetal malpresentation. Among those in second stage of labor, 17.3% underwent cesarean delivery for arrest of descent before 2 hours and only 1.1% were given a trial of operative vaginal delivery. Thus, 45.6% primary LSCS were performed on primiparous women at term with a singleton fetus in cephalic presentation. Thus, overall, primary LSCS increased by 68% (95% confidence interval (CI) 67%, 69%) between 1979 (11.0%) and 2010 (18.5%). Repeat LSCS increased by 178% (95% CI 176, 179) from

5.2% in 1979 to 14.4% in 2010 [103].

Hence primary LSCS is the main cause in increase of overall LSCS rate and its prevention is vital in reducing the rate of cesarean deliveries. Also changes in obstetric practice such as reductions in mid-pelvic forceps use, increased LSCS for breech, induction, epidural anesthesia, and obstetrician preference also contribute to increase primary LSCS. IVF pregnancies have reported higher CS rates compared to the general obstetric population [104]. The overall elective primary LSCS before labor indications being fetal heart rate abnormalities due to malpresentation, antepartum hemorrhage, PIH and eclampsia, macrosomia, unengaged head, preterm gestation, maternal-choice LSCS or fear of medical liability.

Thus, four fifths elective and half of emergency LSCS may be avoided thereby reducing overall LSCS rate and preventing repeat LSCS by a simple shift to ADD with earlier vaginal delivery at 38 weeks term gestation term gestation gestations, thereby decreasing both maternal and neonatal morbidities and mortality as well as avoid performing LSCS and reduction of primary LSCS, with low risk maternal and fetal indication. as it increases short term and long-term health risk however surgical intervention in serious delivery complications is lifesaving whether emergency or elective needs to be appraised as worldwide trend to increasing rate of emergency LSCS is concerning.

Hence, LSCS should only be undertaken with clear indications. However, LSCS even with no labor complications was at 69 percent higher risk of neonatal mortality and maternal blood loss being three times more so in emergency LSCS compared to planned vaginal deliveries is important, given the rapid increase in the number of primary LSCS without a reported medical indication [107]. Successful Vaginal Birth After Caesarean (VBAC) 12.12% Vs 0 percent [105]. Maternal complications were also higher 12.76% with repeat LSCS compared to 2.74% in successful VBAC, thus trial for VBAC after a prior LSCS is a safe form of obstetrical management [106]. Others found that foetal distress was the commonest indication for emergency repeat LSCS [107] but present study 2015-17 cohort previous LSCS was found to be most common indication for LSCS. Also, fetal distress 30.49%, in contrast was most frequent indication in elective LSCS and 47.18% with prior LSCS [108]. Another study reported significant differences between emergency LSCS in younger mothers and low parity [109].

The cervical Bishop's score strongly correlates with successful induction as favorable cervix shown 18% decrease in LSCS compared with expectant management. P= 0.003 though low Bishop's score needs pre-induction cervical ripening. Other factors include parity, maternal age, maternal BMI, gestation, fetal birth weight, sonographic cervical length and fetal fibronectin though not superior to the Bishop's score [110]. Uterine hyperstimulation and non-reassuring fetal heart rate more common with Prostaglandin E2 than misoprostol with adverse neonatal outcome. Also following induction with mechanical rather than pharmacological methods withe longer duration of labor increases risk of chorioamnionitis and neonatal infection and associated with about 50% increase in the risk for LSCS compared with spontaneous delivery [111].

Bishop score assesses prelabor cervical dilation, effacement, how thin, if soft or firm, facing forward or backward and fetal station or descent of head into pelvis in relation to ischial spines, low score ≤4 indicates unfavorable cervix, requires cervical ripening with prostaglandins or Foley catheter before induction by

Pitocin aminotomy 5-7 is mid-range with mixed success and high score ≥ 8 is successful induction. The use of 50 ml fluid to inflate transcervical Foley catheter just above internal os for cervical ripening improves Bishop score better than smaller volume of 30 ml the use of 50 ml fluid to inflate Foley catheter for cervical ripening improves Bishop score better than smaller volume of 30 ml [112] or even up to 80 ml especially in primigravida with greater cervical dilation, faster labor and decreased oxytocin as mechanical methods work directly causing cervical dilation and also by releasing endogenous prostaglandins and oxytocin, though some may even need further induction oxytocin and/or amniotomy [113].

However, induction of labor in primigravida with unfavorable cervix has two-fold increased risk of LSCS, when labor has not progressed at least 6-8 hours of oxytocin infusion and ruptured membranes with failure of adequate uterine contractions progress to delivery. Bishop score can predict likelihood of success. Cervical ripening or softening by mechanical or pharmacological agents is essential before contractions if Bishop score below 6 cm. However, latent phase of labor may last longer than 24 hours which is not an indication in itself for LSCS. Active phase defined as above 6 cm cervical dilatation and 90% effaced with/or 12 – 18 hours of oxytocin after membrane rupture [114].

Induction at 38 weeks term gestation is preferable in all pregnancies except when contraindicated for safe vaginal delivery including placenta previa, vasa previa, transverse lie, oblique lie or breech, umbilical cord prolapse, multiple pregnancies, myomectomy entering the uterine cavity, previous LSCS or multiple uterine scars, non-reassuring fetal surveillance, high risk pregnancy, polyhydramnios also contraindications to vaginal delivery including cephalopelvic disproportion

However, an alternative to induction at 40 weeks gestation in many ethnic Asian women with present with lack of uterine contractions compliant by both obstetricians and pregnant women who had experienced onset of uterine contraction prior to 38 weeks term gestation as 'false labor pains' the pregnancy extended to EDD i.e. 40 weeks, with muscle relaxants, bed rest etc. needed to be induced with consequent difficult delivery and attendant high maternal and neonatal morbidity and mortality. It is recommended that spontaneous onset of uterine contractions prior to EDD from 34 weeks onwards, labor be allowed to progress till delivery with easy vaginal delivery of a small mature baby resulting in improved maternal and neonatal outcome.

The spontaneous onset of labor with peak births at 41 weeks is advocated in ethnic Caucasians with minimal interference upto 42 weeks with minimal interference as delivery is usually effected within 6-8 hours of active labor in first time and upto 4-6 hours in multigravidas as vertex with similar biparietal diameter of 9 cm in both Asian and Caucasian will pass easily through wide birth canal in the tall well-built women, the 'big' fetus with average birthweight between 3.5-4kg has adequate energy stores, to tolerate hypoxia experienced during labor without resort to anaerobic metabolism and acidosis unlike ethnic small ethnic Asian women, whose 'small' fetuses are extremely vulnerable to hypoxic birth injury with metabolic acidosis and neurological deficits with fetal distress being a common indication for surgical obstetric intervention [115].

Gestation does vary by ethnic group [86-88, 116], ethnic Asians with distinct hereditary predisposition of earlier peak 38 weeks delivery of a small, mature baby reported over three decades [80], require unique set of perinatal guidelines that I have for the first time in the world defined ethnic Asian perinatal definitions “New Perinatal Strategies for the New Millennium”, based entirely on research, published in “Recent Advances in Perinatology with special reference to Ethnicity” @ newgenparenting.com promotes the wellbeing of the vulnerable small ethnic Asian fetus, newborn as well as their mothers advocating quick, easy vaginal delivery [90].

The increased awareness of Asian obstetrician in not jeopardizing Asian fetuses in the “small’ Asian women weighing 45 to 50 kg high 60% perinatal loss while those weighing above 52 kg had associated mortality of only 7.5 %, with adjusted odds ratio [AOR] for perinatal death =1.6 for 46-50 kg and 2.9 for 40kg or less, AOR for preterm/LBW = 1.7, 2.5 and 4.9 respectively and AOR for SGA =1.7, 1.7 and 2.4 respectively.

Short stature below 150-154 cm and was significant for perinatal deaths among (AOR = 1.4), at 150-154 cm and 145-149 cm for preterm/LBW (AOR = 1.3 and 1.5 respectively) and less than 145 cm and 150-154 cm 145-149 (AOR = 1.5 and 1.3 respectively) (p<0.01). Maternal weight had higher attributable risks than maternal height for perinatal deaths37.1% vs 18.1% and for SGA 39.8% vs 16.4%. While in U.S. only 5 % of mothers had pregnancy weight less than 45.5 kg and 16 % less than 50 kg, compared to 37 % and 68 % of Indian women who weighed less than 46 kg and 51 kg respectively [117].

Mean height 167 cm and 66.67 kg weight in US [118] while in UK height is 165 cm and weight 67.6 kg [119]. In Sweden mean height was 166.1 cm with decreasing risk of CS with maternal height of 178–179 cm [120] was associated with the lowest risk of LSCS (OR = 0.76, CI95% 0.71–0.81), whereas height below 160 cm caused 7% of LSCS rate. Pregnant women with maternal height less than 156 cm demonstrated a higher BMI, i.e. overweight, in relation to women with tall mothers with same weight have lower BMI are subject to increased risks for LSCS and combination of maternal short stature and overweight was associated with a more than threefold risk of subsequent “hypoxic ischemic encephalopathy” [121] with small for gestational age (SGA) babies, thus transferring the increased risk of LSCS not through genome-mediated smallness, but through epigenetic mechanisms [122-124]. Regarding gestation, increasing maternal height had significant correlation with increasing gestational age [125].

While study from Japan revealed shorter women had higher rate of LSCS than taller women. The adjusted odds ratios (95% confidential interval) of maternal heights of <150 cm, 150–154 cm, 160–164 cm and ≥165 cm for LSCS, compared with a maternal height of 155–159 cm, were 3.56 (1.79–7.09), 1.68 (1.06–2.64), 0.63 (0.40–1.00) and 0.57 (0.30–1.01), respectively. However, the rates of maternal and neonatal morbidities in shorter women were similar to those in taller women [126].

Another study from Saudi Arabia reported mean maternal height of 156.4±6.2 cm and mean maternal weight at the time of admission was 68.6±13.7 kg, a significant inverse relationship was seen between maternal height and LSCS delivery, p=0.017, shorter mothers were more likely to have LSCS. Linear regression analysis also found an association between maternal height increase by 1 cm, the neonatal birth weight increases by an average of 12.8 g p<0.01. an increase in maternal height by 1 cm is linked to the baby's birth weight increasing by 12.8 gm p<0.01 [127], in Germany by 17 gm [128]. Mexico and Sweden by 15 gm of baby weight [120, 129].

Short adult height is an indicator of growth retardation, of poor childhood nutrition in low and middle-income countries [130]. Low height was probably caused by low weight indicating considerable maternal undernutrition being an inherent genetic predisposition determined in a study over three decades with low intrauterine growth potential of 'small' Asian Indian baby born to 'small' Asian women [82].

Thus, the average Asian woman is comparatively smaller when compared to the tall, well-built Caucasian women with greater risk to the fetus and newborns during normal childbirth with high morbidity and mortality. Also, maternal height less than 156 cm usually with higher BMI, when compared to taller women have increased risks for LSCS, thus combination of maternal short stature with relative increase in BMI have a threefold and greater risk of subsequent hypoxic ischemic encephalopathy due to severe birth asphyxia with difficult prolonged vaginal delivery due to cephalopelvic disproportion and resort to emergency LSCS with high morbidity and mortality. Hence it is best that low weight, low height with apparent increase BMI in ethnic Asian-Indian women with shortened gestation and SGA babies will benefit from early easy vaginal delivery by 38 weeks who may have onset of spontaneous uterine contraction or induced will reduce adverse neonatal hypoxial injury and HIE, thereby decreasing incidence of LSCS with improved maternal and neonatal outcome.

The head is the most difficult part to deliver, whether it comes first or last contains the delicate brain bounded by posterior and anterior fontanels and two parietal eminences, Asian fetuses are subjected to more severe molding during passage through the narrow pelvic canal as both Asian and Caucasian fetuses have similar 9.5 cm biparietal diameters [131]. The skull of the preterm infant being softer and having wide sutures may mold excessively, however the skull of the post-mature infant does not mold well and its greater hardness, tends to make the labor more difficult with cephalo-pelvic disproportion and prolonged labor, especially during the second stage, when maximum hypoxic stress experienced in the ethnic Asian fetus results in high asphyxial morbidity and mortality as opposed to big Caucasian baby with its generous energy and fat stores as evidenced by an average high mean birth weight of around 3500g with quick and easy delivery of the vertex through adequate birth passage, is well equipped to cope with any hypoxic stress of normal labor. During vaginal examination, convergent sidewalls, short sacrospinous ligament and very shallow concavity of the sacrum should indicate contracted mid pelvis posing difficult prolonged vaginal delivery often necessitating LSCS [132].

Thus, a simple strategy aimed at reducing high morbidity and mortality more so in ethnic Asian population is to establish ideal Asian date for delivery of these small fetuses is imperative for improve perinatal, maternal and neonatal outcome without resort to instrumental or operative surgical intervention by emergency LSCS as fetal distress is a common indicator. In the present series 2016-'17, peak 38.4% LSCS at 39 weeks compared to 36.2% at 38 weeks, while only 5.9% and 15.4% performed at 37 and 40 weeks respectively to low 4% at 41 weeks. Peak high-risk emergency LSCS was performed at 39 weeks indicating that more fetuses with fetal distress were rescued by urgent surgical intervention which could be avoided by easy vaginal delivery at optimal 38 weeks Asian Due Date for delivery concurring with peak births, gestation of healthy baby and mother. Also, between 39 - 42 weeks result in traumatic vaginal delivery with prolonged labor causing increase asphyxial morbidity and mortality as stillbirth rate figure one and a half times higher than the early neonatal mortality rate and high perinatal mortality rates [133].

It is possible to combine antenatal factors to identify infants at high risk of birth asphyxia include seven covariates of primiparity, obstetric complications such as PIH, GDM, oligohydramnios, intrapartum factors of PROM more than one hour prior to onset of labor, breech or transverse lie etc and birthweight, preterm gestation, are important cause of maternal and fetal morbidity associated with increased rate of cesarean section delivery. Planned delivery before intrapartum events by elective LSCS has been shown to be beneficial in high risk groups by 37- 38 weeks to remove intrapartum risk of birth asphyxia [134].

The mean birthweight of 2881g in 1983 cohort was similar to 2873g, in the 2015-2017 cohorts a difference of just -8g, mean gestation of 38.8 weeks in the former to 38.2 weeks in the latter cohort. The centile growth curves among the two cohorts revealed almost similar percentile weight gain distribution except for preterm 31-36 weeks gestation, where birthweights in the 2015- 2017 cohort were 200-300g higher compared to the 1983 cohort. However, the 90th centile curve, at term 38-40 weeks revealed an increase of 200-300g weight gain in 1983 cohort which thereafter plateaued, with 300-500g weight gain at 40-42 weeks in the 2015-2017 cohort. Indicating an inherent genetic predisposition at play with low intrauterine growth potential over decades and that Indian fetuses and newborn will continue to have lower mean birthweight with growth restriction [82], compared to Caucasian population that deserves redefinition for Asian Perinatal guidelines for wellbeing of small Asian-Indian newborns [90].

The clinical implementation of western definitions and guidelines in ethnic Asian population by prolonging pregnancy to 40 weeks thus proves derogatory resulting in difficult vaginal delivery predisposing to increased surgical emergency intervention due to increased intrauterine weight gain by up to 1000gm between 38-42 weeks gestation causing cephalopelvic disproportion with prolonged, difficult delivery, especially in primigravida with peak emergency LSCS at 39 weeks. Therefore, delivery between 34-38 weeks gestation will result in easy vaginal delivery of these small, mature babies, who will then feed avidly and gain extrauterine weight rapidly [82, 90] thereby not only avoiding LSCS, thereby reducing associated morbid complications [135] consequent decrease in primary and repeat LSCS.

Clinical studies have also demonstrated that delivery at 38 weeks by planned or elective LSCS in high risk groups have shown the lowest risk of perinatal deaths and that extending pregnancy beyond 39-43 week resulted in increased perinatal risk index due to obstetric events more so in primigravidae with greater risk of antepartum stillbirth [136]. Also non-laboring women delivered by cesarean section before 39 weeks, obviating intrapartum events noted a 83% reduction in moderate to severe encephalopathy, being one of the leading causes of HIE as well as late fetal death, signifying that early delivery preferably at 38 weeks by elective section in high risk cases will be associated not only with reduction in birth asphyxia cases but also asphyxiated stillbirths more effectively than any other strategy [137], still others advocate delivery by 37 weeks gestation [138]. In fact, a substantial number of newborns could have perinatal asphyxia attenuated or removed given timely obstetric intervention by elective section at 38 weeks would remove the risk of intrapartum HIE as well as decreased in utero death, as any reduction in perinatal asphyxia may also reduce term stillbirth rates [139]. Thus, prolonging pregnancy beyond 38 week increases the risk of stillbirth, perinatal deaths, maternal and neonatal morbidity and mortality.

It is of public health importance that a third of women in US who are pregnant beyond 39 weeks anticipate a vaginal delivery increases neonatal risk, as with increasing gestational age there is a higher risk of stillbirth and other outcomes such as PIH that rises with each additional week of gestation, as postdate induction is typically not recommended prior to 41st week. Induction of labor in women with normal pregnancies at 37 or beyond to 38 weeks term gestation will reduce maternal and perinatal risks with less chance of LSCS, compared to prolonged gestation increasing greater risk of death before or shortly after birth especially if cervix is unfavorable according to a Cochrane review of clinical trials. Thus, increasing gestation to neonatal outcome or maternal morbidity with later delivery at term questions management and duration of pregnancy beyond 39-40 [140]. The lowest risk of perinatal deaths noted at 38 weeks increased sharply among primigravida women beyond 39 weeks, because of greater risk of antepartum stillbirth with higher incidence of HIE [137].

This awareness should spur obstetrician for active management with quick judicious obstetric intervention in especially ethnic Asian deliveries to reduce both maternal and neonatal mortality and morbidity in contrast Caucasian women require minimal interference with spontaneous onset of labor and vaginal delivery within four to six hours of active labor, even two hours with previous births unlike most small Asian women have narrow pelvis predisposes to undetected cephalopelvic disproportion often require surgical intervention to save lives of mother and/or newborn and as such early easy vaginal delivery of these small babies maybe effected without resorting to LSCS.

Hence onset of early labor contractions between 34-38 weeks gestation should not be termed as false labor pains allowing pregnancy to be continued 40 weeks but labor allowed to progress with induction by amniotomy/oxytocin for vaginal delivery. As later delivery at 40 weeks is contraindicated, often associated with lack uterine contraction that requires induction with unfavorable cervix and/or instrumental intervention by vacuum extraction, outlet perineal forceps or even resort to emergency LSCS with indications of fetal distress and attendant increased risk to both mother and neonate.

Therefore, induction at 38 weeks term gestation is preferable in all pregnancies except when contraindicated for safe vaginal delivery including placenta previa, vasa previa, transverse lie, oblique lie or breech, umbilical cord prolapse, multiple pregnancies, myomectomy entering the uterine cavity, previous LSCS or multiple uterine scars, non-reassuring fetal surveillance, high risk pregnancy, polyhydramnios also contraindications to vaginal delivery including cephalopelvic disproportion.

Ethnic Asian population with easy vaginal delivery of healthy newborns at 38 weeks gestation mandates clinical implementation of Asian Due Date of Delivery (ADD)redefining perinatal guidelines for Asian Obstetricians will not only reduce of stillbirth, perinatal deaths due to absolutely avoidable cause of birth asphyxia with CPD but also improve maternal, perinatal and neonatal morbidity and mortality, reducing fresh term stillbirths.as opposed to EDD at 40 weeks adapted to Caucasian population with longer mean gestation of 41-42 weeks as opposed to EDD at 40 weeks adapted to Caucasian population with longer mean gestation of 41-42 weeks.

Even as we are on the cusp of twenty second century in a world that has forever changed post Covid-19 pandemic. The simple clinical implementation of new ethnic Asian perinatal definition and guideline for

Asian Obstetricians, pediatrician/neonatologists and extended perinatal team will not only improve maternal, fetal and neonatal outcome in reducing maternal, perinatal and neonatal morbidity and mortality, reflecting improved infant and under five mortality rates, will go a long way in ensuring a better quality of life.

Perinatal definitions and guidelines established by World Health Organization are eminently suitable for ethnic Caucasian population as it is time tested with low maternal, perinatal and neonatal morbidity and mortality rates reported in the western literature. I have outlined after several decades of research and clinical practice, perinatal redefinitions and guidelines for ethnic Asian population, including new ethnic Asian Due Date for delivery at 38+6 weeks, corresponding to peak gestation of live birth, will result in improved parturient and neonatal well-being and also stem colossal loss due to fresh still births, due to birth asphyxia a totally avoidable cause of perinatal mortality rate.

As intrapartum factors rather than antepartum or post-partum are reported to have major impact on birth asphyxia, active management of labor with judicious intervention in rescuing endangered fetuses, lies entirely in the domain of the obstetrician, mandates Asian due date (ADD) for delivery at 38 weeks while 'Lalana Newborn Resuscitation' (LNR) methodology of effective resuscitation of asphyxiated newborns based on scientific principle of sustained or Continuous Positive Pressure Ventilation (CPPV) with oxygen supplementation, over periods of 1-3 minutes [141], as opposed to Intermittent positive ventilation (IPPV) recommended by the Neonatal Resuscitation Program (NRP) [142,143], is well adapted in transition of fetal fluid filled lungs to well aerated neonatal lungs triggering rapid complex cardiovascular changes from fetal to adult life with onset of rhythmic breathing, continuously monitored with Pulse Oximeter grading newborns I-V viz. normal and mild, moderate, severe to terminal birth asphyxia, as opposed to outdated APGAR scoring [144,145] bringing resuscitation of the newly born into the 21st century, simulating a natural first breath in asphyxiated newborns by successfully aerating fetal fluid filled lung by non-invasive sustained nasal oxygen inflation simulating natural first breath and oxygenation negating hypoxial birth injuries and its sequential lifelong neurological deficits, so that these children will be normal and along with sepsis control, thermal protection and early nutrition ensures the well-being of neonate and child.

Summary

Rising 42% LSCS rate among 2660 consecutive live births during January 1st 2015 to 31st May 2017 with high 53.8% primary LSCS and 32.6% repeat LSCS, contrasted to low 13% LSCS rate in 1983. Peak 28% live births took place at 38 weeks gestation, followed by 25.6% at 39 weeks, a difference of 2.4% being statistically significant $p<0.001$. Strikingly overall majority 24% emergency LSCS peaked at 39 weeks gestation, as also 29.79% traumatic vaginal delivery including 30.7% low perineal forceps delivery and 25.7% vacuum extractions, contrasted to peak 36.9% elective LSCSs at 38 weeks gestation. However, mean gestation in vaginal delivery was term gestation 38.3 weeks and preterm 37.96 weeks in overall LSCS, to 38.04 weeks in emergency LSCS and 37.85 weeks for elective LSCS.

The mean gestation by two-sample t test with equal variances revealed difference of 0.4 weeks between vaginal delivery versus total LSCS was highly statistically significant $p=0.003$, vaginal delivery versus emergency LSCS with difference of 0.31 weeks $p=0.0045$ including vaginal delivery vs elective LSCS with difference of 0.45 weeks $p=0.0019$ being highly statistically significant. While 75th percentile for all modes of delivery was 39 weeks and 50th percentile at 38 weeks. Prematurity ≤36 weeks was 15% in LSCS and 18% in emergency LSCS $p<0.001$ contrasted to 9% by vaginal delivery $p<0.001$ being highly statistically significant.

The intrauterine growth curves for 2,708 consecutive live births during twenty-nine months from January 2015 to May 2017 at Bangalore revealed a mean birthweight of 2873g compared to 2881g in the 1983 study, a difference of 8g due to demographic shift to younger mothers, 50% being primigravidae with small family in 2015-'17 contrasted to 50% third gravida, older mothers in 1983. In both cohorts a steady increase in fetal intrauterine weight gain noted till 38 weeks gestation and thereafter rapid increase up to 42 weeks, predisposing to undetected cephalopelvic disproportion resulting in prolonged labor, often impaction in second stage of labor causing increased maternal and fetal and neonatal morbidity and mortality. Thus, emergency LSCS in second stage of labor is an undesirable situation associated with high maternal and fetal complications, best avoided by active management of labor and early delivery at 38 weeks with judicious obstetric intervention for healthy baby and mother.

The 2015-'17 charts for 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentile growth charts for all births and for boys and girls met all the standard requirements to obtain an ideal reference growth chart, the data included singleton babies from mono-ethnic group and most importantly the best method for gestational age estimation was 1st trimester ultrasound dating in all patients, as well as the gold standard LMS method was used for estimating the centiles and for smoothing of the centile curves.

Vaginal delivery in ethnic Asians holds a three-fold increased risk of hypoxial birth injury due to a combination of adverse factors in fetal, maternal and uteroplacental unit. Fetal factors such as predominantly asymmetrical intrauterine growth retardation with diminished energy stores compounded by a shortened gestational period precludes inadequate weight gain and energy stores to cope with hypoxic stress experienced during labor resorting to anaerobic metabolism with metabolic acidosis and hypoxic birth injury. Maternal factors include the small physique, in Asian women with narrow pelvic parameters that impedes quick progress of labor and delivery of baby. The average Asian – Indian woman is comparatively small when compared to the tall, well-built Caucasian women correlates to high perinatal loss due to shorter gestation and lower birth weight, with increased susceptibility to greater risk of hypoxic ischemic encephalopathy and rising incidence of LSCS.

Implementing Asian Due Date (ADD) at peak 38+6 weeks gestation will result in marked reduction by one-third 35.4% overall LSCS, 39% emergency LSCS and 28% elective LSCS including high risk traumatic vaginal delivery by 50% from 39 weeks and above, thus eliminating nearly half 43% births in ethnic Asian population beyond 38 weeks with easy delivery of a small healthy mature baby who after birth will feed avidly and gain weight, resulting in healthy mother and baby.

Preventing unnecessary LSCS with no clear indication especially in primigravidae by delivery at 38 weeks gestation, will reduce primary LSCS and repeat LSCS subsequent TOLAC and VBAC in later pregnancies with its attendant complications, will result in marked reduction in high prevailing perinatal, neonatal and under five mortality rates in many Low and Middle income developing Asian countries often with limited resources by simple grassroot implantation of Asian Due Date at 38+6 weeks without the need for resort to expensive hi-tech gadgets and neonatal resuscitation by Lalana Newborn Resuscitation by non-invasive sustained nasal oxygen inflation monitored by continuous pulse oximetry with real time assessment of heart rate and oxygen saturation (SpO2). Thereby catering to the wellbeing of the small Asian fetuses and newborn, among ethnic Asians that well comprises four-fifths of current world population, India being the most populous country in the world.

Conclusions

Present rising high incidence 42% LSCS, majority 65% emergency LSCS and 35% elective LSCS with high 53.8% primary LSCS and 32.6% repeat LSCS. High risk factors predisposing to LSCS include primigravida 32% and older mothers 25-29 years, obstetric complications of PROM, PIH and GDM, prematurity, low birth weight and neonatal complications of birth asphyxia and early onset neonatal sepsis increased significantly in emergency LSCS. Peak 38 weeks of live births and elective LSCS, while emergency LSCS and traumatic vaginal delivery peaked at 39 weeks. Hence promoting Asian due Date for delivery with easy, quick vaginal delivery at 38 weeks gestation will obviate 35.4% emergency and 28% elective LSCS with 43% traumatic vaginal delivery 39 weeks and beyond 38 weeks, reducing LSCS rates but also will result in lower incidence of primary and repeat LSCS thereby successfully reducing global LSCS rates with better outcome for both mother and baby and reduced under five morbidity and mortality. Short statured ethnic Asian – Indian women with low weight are prone to shorter gestation and lower birthweight are at greater risk of antepartum stillbirth with higher incidence of HIE, thus, prolonging pregnancy to 40 weeks will prove counterproductive associated with high maternal, perinatal and neonatal morbidity and mortality. Clinical implementation of Asian Due Date (ADD) at 38+6 weeks for delivery in ethnic Asian population becomes imperative for well-being of both mother and baby. In conjunction with the new non-invasive "Lalana Newborn Resuscitation" (LNR) by sustained nasal oxygen inflation monitored by real-time assessment with continuous pulse oximetry, brings newborn resuscitation into the twenty first century, negating birth asphyxia and neurological hypoxic sequalae, so that these children will be normal, compounded with sepsis control, thermal protection and early nutrition ensures the well-being of newborns for healthy growth and development.

Funding

There is no external funding.

References

1. Betran AP, Ye J, Moller AB, Souza JP, Zhang. (2021) Trends and projections of caesarean section rates: global and regional estimates J. BMJ Glob Health. 6
2. Belizán JM, Althabe F, Cafferata ML. (2007) Health consequences of the increasing caesarean section rates. Epidemiology. 18(4):485-6.
3. Villar J, Valladares E, Wojdyla D, Zavaleta N, Carroli G, et al. (2006) Cesarean delivery rates and pregnancy outcomes: the 2005 WHO global survey on maternal and perinatal health in Latin America. Lancet. 367(9525):1819-29.
4. Hamilton BE, Martin JA, Osterman MJ, Curtin SC, Matthews TJ. (2015) Births: Final Data for 2014. Natl Vital Stat Rep. 2015;64(12):1–64.
5. Osterman MJ, Hamilton BE, Martin JA, Driscoll AK, Valenzuela CP. (2024) Births: Final data for 2022. Natl

Vital Stat Rep. 73(2):1-56
6. National Family health survey (NFHS-5)
7. Cesarean sections in OECD countries 2018| Statista
8. Stephenson J. (2022) Rate of first-time cesarean deliveries on the rise in US. Jama health forum. 3:(7) e222824.
9. UK C-Section Rates 2023: Stats, Perspectives & Guidance 2023Commissioned by Dr. Chrissie Yu MBBS (Lond) MD (Lond) FRCOG, Consultant Obstetrician & Specialist in Fetal-Maternal Medicine
10. Nguyen AD, Dong GTT, Do DT, Nguyen DT. (2022) Primary cesarean section rate among full term pregnant women with non-previous uterine scar in a hospital of Vietnam. Heliyon. 8(12): e12222.
11. Ali M, Hafeez R, Ahmad M. (2005) Maternal and fetal outcome; comparison between emergency caesarean section versus elective caesarean section. Prof Med J. 12(1):32-9.
12. Darnal N, Dangal G. (2020) Maternal and Fetal Outcome in Emergency versus Elective Caesarean Section. J Nepal Health Res Counc. 18(2):186-189.
13. Dasari G, Guthi VR, Bele S, Vivekannada A. (2017) A study of maternal morbidity associated with caesarean delivery in tertiary care hospital. Int J Com Med Public Health. 4(5):543.
14. Elvedi-Gasparović V, Klepac-Pulanić T, Peter B. (2006) Maternal and fetal outcome in elective versus emergency caesarean section in a developing country. Coll Antropol. 30(1):113-8.
15. McCarthy FP, Rigg L, Cady L, Cullinane F. (2007) A new way of looking at Caesarean section births. Aust N Z J Obstet Gynaecol. 47(4):316-20.
16. Mazzoni A, Althabe F, Liu NH, Bonotti AM, Gibbons L, et al. (2011) Women's preference for caesarean section: a systematic review and meta-analysis of observational studies. BJOG. 118(4):391-9.
17. Minkoff H. (2012) Fear of litigation and cesarean section rates Semin Perinatol. 36 (5): 390-4
18. Dubay L, Kaestner R, Waidmann T. (1999) The impact of malpractice fears on cesarean section rates. J Health Econ. 18(4):491-522.
19. Murthy K, Grobman WA, Lee TA, Holl JL. (2007) Association between rising professional liability insurance premiums and primary cesarean delivery rates. Obstet Gynecol. 110(6):1264-9.
20. Leitch CR, Walker JJ. (1998) The rise in caesarean section rate: the same indications but a lower threshold. Br J Obstet Gynaecol. 1998;105(6):621-6.
21. World Health Organization. (2007) WHO/MPS/07; 0. Geneva: WHO; 2007. WHO Recommended Interventions for Improving Maternal and Newborn Health
22. World Health Organization. (2006) Pregnancy, Childbirth, Postpartum and Newborn Care: A Guide for Essential Practice. Geneva: WHO.
23. Suzuki E, Pirlea AF. World population day: trends and demographic changes. Published on data blog. World Bank.
24. Boyle A, Reddy UM. (2021) Epidemiology of cesarean delivery: The scope of the problem. Semin Perinatol. 36:308-14.
25. Joseph KS, Young DC, Dodds L, O'Connell CM, Allen VM, et al. (2003) Changes in maternal characteristics and obstetric practice and recent increases in primary cesarean delivery. Obstet Gynecol. 102(4):791-800.
26. Vishwakarma K, Yadav G, Waddar P. (2020) Maternal and perinatal outcomes of delivery after previous one or two cesarean section. Indian J Obstet Gynecol Res. 7(3):308-314
27. ACOG Practice Bulletin #54: vaginal birth after previous cesarean. Obstet Gynecol. 104(1):203-12.
28. Christopher GL. (2024) Mode of delivery. Recent Advances in Perinatology with specific reference to Ethnicity. 3rd Edition.
29. Shenoy HT, Remash K, Shenoy ST. (2019) Determinants and outcomes of caesarean delivery: elective versus emergency in a tertiary care teaching institute in Kerala, India. Int J Reprod Contracept Obstet Gynecol. 8(10): 4000-4007.

30. Thakur V, Chiheriya H, Thakur A, Mourya S. (2015) Study of maternal and fetal outcome in elective and emergency caesarean section. IJMRR. 3(11):1300-5.
31. Benzouina S, Boubkraoui ME Mrabet M, Chahid N, Kharbach A, et al. (2016) A Fetal outcome in emergency versus elective cesarean sections at Souissi Maternity Hospital, Rabat, Morocco Pan Afr Med J. 23:197.
32. Al Nuaim L, Soltan MH, Khashoggi T, Addar M, Chowdhury N. (1996) Outcome in elective and emergency cesarean sections: A comparative study. Ann Saudi Med. 16(6):645-9.
33. Kambo I, Bedi N, Dhillon BS, Saxena NC. (2002) A critical appraisal of cesarean section rates at teaching hospitals in India. Int J Gynaecol Obstet. 79(2):151-8.
34. Najam R, Sharma R. Maternal and fetal outcomes in elective and emergency caesarean sections at a teaching hospital in North India. A retrospective study. Journal Of advanced researches in Biological Sciences. 5(3):5-9.
35. Agrawal GP. (2019) Primary lower segment cesarean section in multipara: materno-fetal outcomes. International Journal of reproduction, conception, Obstetrics and gynaecology.8:1.
36. Gothwal S, Meena RK, Meena R. (2020) To study incidence of primary cesarean section in primigravida and multigravida Inter J Med Biomed Studies. 4:3.
37. Barber EL, Lundsberg LS, Belanger K, Pettker CM, Funai EF, et al. (2011) Indications contributing to the increasing cesarean delivery rate. Obstet Gynecol. 118(1):29-38
38. Sukmanee J, Liabsuetrakul T, Peeyananjarassri.(2020) Rates and indications of cesarean section using the Robson classification in a university hospital in southern Thailand 2014-2016 K. J Health Sci Med Res. 38:307-319.
39. Sharma S, Dhakal I. (2018) Cesarean vs Vaginal Delivery: An Institutional Experience. J Nepal Med Assoc 56(209):535-39
40. Bergholt T, Stenderup JK, Vedsted-Jakobsen A, Helm P, Lenstrup C. (2003) Intraoperative surgical complication during cesarean section: an observational study of the incidence and risk factors. Acta Obstet Gynecol Scand. 82(3):251-6.
41. Cebekulu L, Buchmann EJ. (2006) Complications associated with cesarean section in the second stage of labor. Int J Gynaecol Obstet. 95(2):110-4.
42. Nahar K, Akhter Chowdhary SB. (2008) Outcome of pregnancy with history of previous cesarean section. The ORION Medical Journal.31: 588-590.
43. Roberts CL, Nicholl MC, Algert CS, Ford JB. (2014) Rate of spontaneous onset of labor before planned repeat cesarean section at term. BMC Pregnancy Childbirth. 14:123.
44. Caughey AB et al. Contemporary diagnosis and management of preterm rupture of membranes Rev. Obstet Gyneol 2008;1(1):11-1
45. Mark SP, Croughan-Minihane MS, Kilpatrick SJ. (2000) Chorioamnionitis and uterine function. Obstet Gynecol. 95:909
46. Cohen-Wolkowiez M. (2009) Early and late onset sepsis in late preterm infants. Pediat Infe Dise J. 28(12):1052-1056
47. Hussain. (2013) Early rupture of membranes a risk factor for cesarean section in term pregnancy FASCICULA XVIInr. 2
48. Ibishi VA, Isjanovska RD. (2015) Pre-rupture of membranes: Mode of delivery and outcome Maced J Med SCI. 24:3(2):237-40.
49. Eslamian L, Asadi M. (2002) The caesarean section rate in cases with PROM. Act Medica Iranic. 40:2
50. Charabothy B. (2013) Outcome of prelabor rupture of membranes in a tertiary care center in West Bengal. Indian J Clin Pract. 24(7)
51. Kunze M. (2011) Intrapartum management of premature rupture of membranes: effect on cesarean delivery rate. Obstet Gyneccol. 118(6):1247-54.

52. Middleton P, Shepherd E, Flenady V, McBain RD, Crowther CA. (2017) Planned early birth versus expectant management (waiting) for prelabour rupture of membranes at term (37 weeks or more). Cochrane Database Syst Rev. 1(1):CD005302.
53. Kuritani Y, Hayashi S, Yamamoto R, Mitsuda, Ishii K. (2020) Association between maternal height and mode of delivery in nulliparous Japanese women – Kuritani. J Obstet Gynecol Res. Wiley Online Library
54. Buchanan SL, Crowther CA, Levett KM, Middleton P Morris J. (2010) Planned early birth versus expectant management for women with preterm prelabour rupture of membranes prior to 37 weeks' gestation for improving pregnancy outcome. Cochrane Database Syst Rev. 3:CD004735.
55. Obesity in pregnancy (2021) ACOG Practice Bulletin, Number 230. Obstet Gynecol. 137(6): e128-e144
56. Eriksson JG, Foorsen TJ, Osmond C, Barker DJP. (2003) Pathways of infant and childhood growth that lead to type of diabetes. Diabetic care. 26(11):3006-3010.
57. Kimm, Sue YS. (2004) Fetal origins of adult disease: The Barker hypothesis revisited – 2004.Current Opinion in Endocrinology & Diabetes. 11(4): p192-196.
58. Øverland EA, Vatten LJ, Eskild A. (2014) Pregnancy week at delivery and the risk of shoulder dystocia: a population study of 2,014,956 deliveries. 121(1):34-41.
59. Nielsen KK. (2021) Migration, Gestational Diabetes and Adverse Outcome: A nation-wide study of singleton deliveries in Denmark J Clin Endocrinol Metab.
60. Friesen CD, Miller AN, Rayburn WF. (1995) The influence of spontaneous or induced labor on delivering macrosomic fetus. Am J Perinatol. 12:63-6
61. Holman N. (2014) Women with pre-gestational diabetes have a higher risk of still birth at all gestations after 32 weeks. Diabetes Med. 2014. National Institute of Health (NIH).
62. https://pmc.ncib.nlm.nih.gov/articles/pmc9995561/#CD000938-bbs2-0024
63. Thiery M, Baines CJ, Keirse MJNC. (1989) The development of methods for inducing labor. In: Chalmers I, Enkin MW, Keirse MJNC, editors(s). Effective Care in Pregnancy and childbirth. Oxford: Oxford University Press. 1989:969
64. Moses RG, Knights SJ, Lucas EM, Moses M. (2000) Gestational diabetes: is higher cesarean section inevitable. Diabetes Care. 23:15-17.
65. Ecker JL, Chen KT, Cohen AP, Riley LE, Liberman ES. (2001) Increased risk of cesarean delivery with advancing maternal age: indications and associated factors in nulliparous women. Am L Obstet Gynecol. 185(4):883-887
66. Pasokpuckdee K, Boriboonhirunsarn D. (2023) Incidence of Preeclampsia and cesarean section rate according to Robson Classification Cureus. 15(12): e49845.
67. Brown MA, Magee LA, Kenny LC. (2018) Hypertensive disorders of pregnancy: ISSHP classification, diagnosis and management recommendations for international practice. Hypertension. 72:24-43.
68. Gestational hypertension and preeclampsia. (2003) ACOG Practice Bulletin, Number 222. Obstet Gynecol. 135:0-16.
69. Sanchez MP, Guida JP, Simoes M. (2021) Can pre-eclampsia explain higher cesarean rate in the different groups of Robson's classification? Int J Gynaecol Obstet. 152:339-344.
70. Sunitha C, Sangwan A, Goel S. (2024) Comparative study on maternal and fetal outcomes in emergency versus elective cesarean section. Indian J Obste gynecol Res. 11 (4):657-60.
71. Christopher GL. (2022) Early Onset Neonatal Sepsis in South Indian newborns. Inter J Clin Experimental Med Res. 6(3):232-51.
72. McNamara H, Johnson N. (1995) The effect of uterine contractions on fetal oxygen saturation. Br. J. Obstet Gynec 102:644-647
73. Katz M, Lunenfeld E, Meizner I, Bashan N, Gross J. (1987) The effect of the duration of the second stage of labour on the acid base state of the fetus. Br. J Obstet Gynecol. 94:425

74. Reducing mortality. https://www.who.int> detail > newborn.
75. India Number of births, 1950-2018 knoema.com https://knoema.com>Fertility.
76. Neonatal mortality -UNICEF DATA data.unicef.org https://data.unicef.org>child survival
77. World Health Organization Newborns. (2020).
78. Al Mackie N, Miller SP, Hall N, Shevell M. (2009) The spectrum of abnormal neurological outcomes subsequent to term intrapartum asphyxia. Pediatr Neurol. 41:399-405.
79. Dilenge ME, Majnemar A, Shevell MI. (2001) Long term developmental outcomes of asphyxiated term neonates. J. Child Neurol. 16:781-792.
80. Odds DE, Lewis G, Whitelaw A, Gunnell D. (2009) Resuscitation at birth and cognition at 8 years of age: a cohort study. Lancet. 373:1615-1622.
81. Christopher GL. Incidence and risk of birth asphyxia in south Indian newborns. International Journal of Clinical and Medical Research 2020; 4(3): 83-92.
82. Christopher GL. (2019) Birth weight and Gestational Age Centiles in South Indian Newborns. Srilanka Journal of Child Health. 48:(2): 170-175.
83. Christopher GL. (2018) The Effect of Biological Factors on Birth weight and Gestation in South Indian Newborns. J Pediatric Neurol Med. 3(1): 97-103.
84. Kumar VS, Jeyaseelan L, Sebastian T, Regi A, Mathew J, et al. (2013) New birth weight reference standards customized to birth order and sex of babies from South India. BMC Pregnancy Childbirth. 13:38
85. Ghosh S, Bhargava SK, Madhavan S, Taskar AD, Bhargava V, et al. (1971) Intra-uterine growth of North Indian babies. Pediatrics. 47(5): 826-30.
86. Miere HB. (1981) Ultrasound demonstration of an unusual fetal growth pattern in Indians Brit J Obstet & Gynecol. 88:269
87. Papiernik E. (1986) Ethnic difference in duration of pregnancy. Am Hum Biol. 13:259-256.
88. Park GL. (1968) The duration of pregnancy. Lancet. ii: 1388.
89. David RJ. Differing Birth Weight among Infants of U.S.-Born Blacks, African-Born
90. Christopher GL. (2024) New Perinatal Strategies for the New Millennium. Recent Advances in Perinatology with specific reference to Ethnicity.
91. Kamilya G, Seal GL, Mukherji J, Bhattacharyya SK, Hazra A. Maternal mortality and cesarean delivery: An analytical observational study.
92. Sandall J, Tribe RM, Avery L. (2018) Short-term and long-term effects of caesarean section on the health of women and children. Lancet. 392:1349-57.
93. Sandie BA, Mutua MK, Sidze E, Nyakangi V, Sylla EHM, et al. (2023) Epidemiology of emergency and elective caesarean section and its association with early neonatal mortality in sub-Saharan African countries. BMJ Open. 13(10):e074995.
94. Kim G, Bae J, Kim MJ. (2020) Delayed establishment of gut microbiota in infants delivered by cesarean section. Front Microbiol. 11:2099
95. Blustein J, Liu J. (2015) Time to consider the risks of cesarean delivery for long term child health BMJ. 350:h2410.
96. Patnik N. (2020) Complications of cesarean section during second stage of labor in a tertiary care hospital. Int J Clin Obstetric Gynecol. 4(3):33-34.
97. Unterscheider J, McMenamin M, Cullinane F. (2011) Rising rates of caesarean deliveries at full cervical dilatation: a concerning trend. Eur. J. Obstet. Gynecol. Reprod. Biol. 157(2):141-4.
98. Murphy DJ, Liebling RE, Verity L, Swingler R, Patel R. (2011) Early maternal and neonatal morbidity associated with operative delivery in second stage of labour: a cohort study. Lancet.358(9289):1203-7.
99. Sung JF, Daniels KI, Brodzinsky L, El-Sayed YY, Caughey AB, et al. (2007) Cesarean delivery outcomes after a prolonged second stage of labor. Am J Obstet Gynecol. 197(3):306-e1.03.007

100. Anagha A, Jinturkar. (2014) Study of Obstetric and Fetal Outcome of Post Caesarean Section Pregnancy at Tertiary Care. Inter J Recent Trends Sci Technol. 10(3):530-537.
101. George O Ugwuetal, George O Ugwu, Chukwuemeka A Iyoke. (2014) Maternal and perinatal outcome of delivery after a previous Cesarean section in Enugu, Southeast Nigeria: a prospective observational studyInt J Womens Health. 6:301-305
102. Tahseen S, Griffiths M. (2010) Vaginal birth after two caesarean sections (VBAC-2)-a systematic review with meta-analysis of success rate and adverse outcomes of VBAC-2 versus VBAC-1 and repeat (third) caesarean sections. BJOG. 117(1):5-19.
103. Boyle A, Reddy UM, Landy HJ, Huang CC, Driggers RW, et al. (2014) Primary Cesarean Delivery in the United States. Obstetric Anesthesia Digest. 34:150-151.
104. Reubnoff BE, Samueloff A, Ben-Haim M, Friedler S. (1997) Is the obstetric outcome of in vitro fertilized singleton gestations different from natural ones? A controlled study. Fertility and sterility. 67:1077-1083.
105. Clark SL, Belfort MA, Dildy GA, Herbst MA, Meyers JA. (2008) Maternal death in the 21st century: causes, prevention, and relationship to cesarean delivery. Am J Obstet Gynecol. 199(1):36. e1-5; discussion 91-2. e7-11.
106. Daniel S, Vishwanathan M, Simi BN, Nazeema A. (2014) Study of maternal outcome of emergency and elective caesarean section in a semi- rural tertiary hospital. Nat J Med Res. 1:14-8.
107. Nigar A, Ahmad A, Khan K. (2019) A study of rate, indications and maternal morbidity associated with cesarean delivery in a tertiary care hospital. Int J Reprod Contracept Obstet Gynecol. 8:2810-5.
108. Saniyah Khan Galzie, Smitha B. (2022) Rao Comparative Study on Maternal Outcome in Emergency LSCS Versus Elective LSCS in a Tertiary Care Hospital in Karnataka Int J Cur Res Rev. 14:02.
109. Belizán JM, Althabe F, Cafferata ML. (2007) Health consequences of the increasing caesarean section rates. Epidemiology. 18(4):485-6.
110. Bishop, Edward H. (1964) Pelvic Scoring for elective induction. Obstet Gynecol. 24(2):266-268.
111. Middleton P, Shepherd E, Morris J, Crowther CA, Gomersall JC. (2020) Induction of labor at or beyond 37 weeks gestation. Cochrane Database Systemat Rev. 7:CD004945.
112. Ilevbare, Oziengbe F, Iribhogbe. (2022) Comparison of two volumes for extra-amniotic Foley catheter balloon inflation at preinduction of labor cervical ripening in nullipara. Sahel Med J. 25(3):67-73.
113. Levy R, Kanengiser B, Furman B Ben Arie A, Brown D, Hagay ZJ. (2004) A randomized trial comparing a 30 ml and an 80 ml Foley catheter balloon for preinduction cervical ripening. Am J Obstet Gynecol. 191 (5):1632-6
114. Rouse DJ, Owen J, Hauth JC. (2000) Criteria for failed labor induction: prospective evaluation of a standardized protocol. Obstet Gynecol. 96: (5Pt 1): 671-7
115. Martinez-Barge M, Madero R, Gonzalez A, Quero A, Garcia-Alix A. (2012) Perinatal morbidity and risk of hypoxic-ischemic encephalopathy associated with intrapartum sentinel events. Am J Obstet Gynecol. 206(2): 148.e1-7.
116. Patel RR, Steer P, Doyle P, Little MP, Elliot P. (2004) Does gestation vary by ethnic group? A London based study of over 122,000 pregnancies with spontaneous onset of labor. Int J Epidemiol. 33(1):107-12
117. Malvakar DV, Trivedi CC, Gray RH. (1994) Maternal weight, height, and risk of poor pregnancy outcome in Ahmadabad, India. Ind Pediatr. 31:1205-12.
118. Center for disease control and prevention (CDC).
119. Mogren I, Lindqvist M, Petersson K, Nilses C, Small R, et al. (2011) Maternal height and risk of caesarean section in singleton births in Sweden—A population-based study using data from the Swedish Pregnancy Register 2011 to 2016 | PLOS One.
120. Liljestrom L, Wikstrom AK, Agren J, Jonsson M. (2018) Antepartum risk factors for moderate to severe neonatal hypoxic ischemic encephalopathy: a Swedish national cohort study. Acta Obstet Gynecol Scand.

121. Zetterstrom K, Lindeberg S, Haglund B, Magnuson A, Hanson U. (2007) Being born small for gestational age increases the risk of severe pre-eclampsia. BJOG. 114(3):319-24.
122. Lau C, Rogers JM. (2004) Embryonic and fetal programming of physiological disorders in adulthood. Birth Defects Res C Embryo Today. 72(4):300-12.
123. Desai M, Jellyman JK, Ross MG. Epigenomics, gestational programming and risk of metabolic syndrome. Int J Obes (Lond). 2015;39(4):633–41.
124. Derraik JG, Lundgren M, Cutfield WS, Ahlsson F. (2016) Maternal Height and Preterm Birth: A Study on 192,432 Swedish Women. PLoS One. 11(4):e0154304.
125. Kuritani Y, Hayashi S, Yamamoto R, Mitsuda, Ishii K. (2020) Association between maternal height and mode of delivery in nulliparous Japanese women – Kuritani. J Obstet Gynecol Res.
126. Softa SM, Aldardeir N, Aloufi F, Alshihabi S, Khouj M, et al. (2022) The Association of Maternal Height with Mode of Delivery and Fetal Birth Weight at King Abdulaziz University Hospital, Jeddah, Saudi Arabia. Cureus. 14(7):e27493.
127. Voigt M, Rochow N, Guthmann F, Hesse V, Schneider KT, et al. (2012) Birth weight percentile values for girls and boys under consideration of maternal height (Article in German) Z Geburtshilfe Neonatol. 216:212-19.
128. Azcorra H, Mendez N. (2018) The influence of maternal height on offspring's birth weight in Merida, Mexico. Am J Hum Biol. 30:0.
129. Perkins JM, Subramanian SV, Davey Smith G, Ozaltin E. (2016) Adult height, nutrition, and population health. Nutr Rev. 74(3):149-65.
130. Normal Labor: Physiology, Evaluation and Management. National Institutes of Health (NIH).
131. Althaus JE, Petersen S, Driggers R. (2006) Cephalopelvic disproportion is associated with an altered uterine contraction shape in active phase of labor. Transaction of the twenty-sixth annual meeting for maternal-fetal medicine. 195:3:739-42
132. Malati Jadhav, Lalana G. (1986) Christopher; Perinatal mortality rates at Vellore, South India, A study of 21,585 infants. Ind. J. Pediatr. 53:353-357.
133. Caughey AB, Musci TJ. (2004) Complications of term pregnancies beyond 37 weeks of gestation. Obstet. Gynecol. 103(1): 57-62.
134. Burke C, Allen R. (2020) Complications of cesarean birth: clinical recommendations for prevention and management. MCN Am. J. Matern Child Nurs. 45: 92-99.
135. Depp R. (1995) Perinatal Asphyxia: Assessing its causal role and timing. Seminars in Pediatric Neurology.
136. Heimstead R, Romundstad PR, Eik-Nes SH, Salvesaen KA. (2006) Outcomes of pregnancy beyond 37 weeks of gestation Obstet Gynecol. 108(3pt1):500-08.
137. Hawkins GDV. (2006) “Caesarean section on request at 39 weeks: Impact on shoulder dystocia, foetal trauma, neonatal encephalopathy and intrauterine demise”. Seminars in Perinatology. 10.
138. Tita AT, Lai Y, Bloom SL, Spong CY. (2012) Timing of delivery and pregnancy outcomes among laboring nulliparous women. Am J Obstet Gynecol. (2012) 206(3): 239.el-8
139. Garfinkle J, Wintermark P, Shevell M, Plat R, Oskoui M. (2015) Cerebral Palsy after Neonatal Encephalopathy: How much is preventable? J Pediatr.
140. Christopher GL. (2021) Lalana Newborn Resuscitation Jour Clin Med Res. 2 (3):1-90.
141. Wycoff MH, Wyllie J, Aziz K, de Almedia MF, Fabres J, et al. (2020) On behalf of the Neonatal Life Support Collaborators. Neonatal life support: 2020 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Circulation. 142(1): S185-S221.
142. Maternal and Newborn Health/Safe Motherhood Unit. (1997) Division of Reproductive Health (Technical Support) Basic Newborn Resuscitation: A Practical Guide, vol. 4. Geneva: World Health Organization.
143. Leuther SR, Das UG. (2004) Low Apgar scores and the definition of birth Asphyxia. Pediatr Clin N Am. 51: 737-45.

144. Anonymous. Is the Apgar score out-moded?