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A study of respiratory disorders in neonates in emergency caesarean section, elective caesarean section and normal vaginal delivery at term

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Abstract
Background: Previous studies indicate that new-borns delivered by elective caesarean section are more prone to respiratory morbidity after birth.
Objective: To find out whether the mode of delivery is associated with the neonatal respiratory outcomes.
Methods: In this observational study, following three groups of pregnant women (30 in each group) were included a) normal vaginal delivery b) elective LSCS and c) emergency LSCS. Respiratory morbidity (Tachypnoea, chest retraction, grunting, and nasal flaring) and APGAR scores were compared between three groups.
Results: Respiratory morbidity was higher in elective and emergency LSCS groups compared to normal vaginal delivery group. However, the differences were not statistically significant. APGAR scores at 1 and 5 minutes were similar in three groups. NICU admissions were higher in elective caesarean groups as compared to the other two groups.
Conclusion: Higher incidence of respiratory distress syndrome was noted in babies born to mothers who have undergone elective caesarean section.

Keywords: Respiratory morbidity, new-born, caesarean, tachypnoea, APGAR

Introduction
Healthy neonate and healthy mother is the mainstay of the good pre and perinatal care. Respiratory distress syndrome (RDS) is one of the common causes of adverse neonatal outcomes and a prime reason for which a neonate needs emergency admission in neonatal intensive care unit (NICU) [1]. Neonatal RDS can be defined as any respiratory distress developing at or shortly after the neonate is born, it increases in severity and necessitates ventilator support or oxygen therapy for> 1 hour [2]. Some of the important risk factors for developing respiratory distress syndrome in neonates are prematurity, maternal chorioamnionitis, caesarean section, meconium-stained liquor (MSAF), gestational diabetes mellitus, pregnancy induced hypertension, oligohydramnios or polyhydramnios and congenital structural lung abnormality of the foetus [3].
Failure to clear lung fluid is common in new born after she/he is delivered out of the safe mother's womb and is a leading cause of respiratory morbidity. New-borns delivered by elective caesarean section are more prone to this problem as they are not exposed to labour [4, 5]. Labour plays a key role in respiratory changes of the foetus. During labour through amiloride sensitive sodium channels in epithelial cells of alveoli, trans-epithelial reabsorption occurs. Foetal adrenal gland of term infants secretes large amounts of glucocorticoids which very strongly regulate the expression of sodium channel genes in the alveolar epithelium thus helping in the fluid clearance of lung. In foetal blood increased levels of cortisol has also been found to be linked with labour. Hypothesis says that stages of labour causes high level of corticosteroids in mother which allows the lung to switch to fluid absorption from fluid secretion phase. In elective caesarean section this process is disrupted as there is no other source of corticosteroids. Some studies show that endogenous catecholamines in high levels at the time of delivery might be an important cause for alveolar fluid clearance. Elective caesarean section has 2-4 times higher risk of overall RDS in neonates as compared to vaginal delivery. The study was undertaken to find out whether the mode of delivery has any correlation with the neonatal respiratory outcome in the full-term new borns.

Materials and methods

Study design and study setting

In this observational cross-sectional study, pregnant women attending department of obstetrics and gynaecology at Dr. D.Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune were included.

Study Participants

Inclusion Criteria

1. Single foetus gestation
2. Registered patient
3. Above 37 weeks of gestation

Exclusion Criteria

1. Gestational diabetes mellitus
2. Fetal distress already present
3. Patient was meconium-stained liquor.

Study Duration

The study was conducted from August 2018 to September 2020. After collection of data, the data entry forms were checked for their completeness and missing and incomprehensible data was rechecked.

Sample size and sampling technique

The sample size for the study was 30 pregnant women in each of the three groups. Hence, we studied 90 pregnant women coming for delivery in department of obstetrics and gynaecology, Dr. D. Y Patil Medical College, Hospital and Research Center, Pimpri, Pune. Consecutive eligible pregnant women were included in the study.

Study procedure

Three groups of pregnant women included in the study were

a. Patients undergoing normal vaginal delivery
b. Patient posted for elective LSCS
c. Patients who are undergoing emergency LSCS

A predesigned proforma was prepared based on objectives of the study. Piloting of proforma was done among 10 patients to understand the reliability and feasibility of the questionnaire. After piloting, correction was made in the proforma based on the understand ability of the participants and the necessary information required for the study.

A thorough history including name, age, socioeconomic status, residence, parity and outcome of the neonate, the APGAR score of the new-born were taken and analysed. These patients were categorized on the basis of mode of delivery and respiratory outcome of the new-borns were compared across the three groups.

Ethical issues

The study protocol was approved by the Scientific and Ethical Committee of the Institution in 2018. All the participants were informed about the study procedure and informed consent was taken. A strict confidentiality was maintained during the whole study.

Statistical analysis

Data were entered using Microsoft excel and all statistical analysis was performed using SPSS 17.0 software. Categorical variables were presented as frequencies and percentages. Continuous variables were presented as mean or median depending on normality of data. Respiratory outcomes between the three groups were compared using Chi squared test and a P value of less than 0.05 was considered as statistically significant.

Results

A total of 90 pregnant women were included; thirty mothers each in normal vaginal delivery group, elective caesarean section group and emergency group. Mean age was 24.1 years in normal vaginal delivery mothers compared to 26.4 years and 23.9 years in elective and emergency caesarean groups respectively (Table-1).

Table 1: Age distribution across groups

Groups	Mean age in years	SD
Normal vaginal delivery	24.1	3.7
Elective caesarean section	26.4	4.2
Emergency caesarean section	23.9	3.4

In normal vaginal delivery group, 50% of mother were of rural background. In elective and emergency caesarean groups 46.7% and 53.3% were from rural areas. In normal vaginal delivery group 86.7% were home makers. In elective and emergency caesarean groups, 86.7% and 93.3% were home makers respectively. 13.3% and 6.7% were employed in skilled work in elective and emergency caesarean groups respectively.

Table 2: Socioeconomic status of study participants

Socioeconomic status	Normal vaginal delivery		Elective caesarean section		Emergency caesarean section		Total	P value
	n	%	n	%	n	%		
Class 3	10	33.3	11	36.7	10	33.3	31	0.9
Class 4	20	66.7	19	63.3	20	66.7	59	

*Chi square test used

Regarding socio-economic status, in normal vaginal delivery group 33.3% belonged to Class 3 and the rest 66.7%% belonged to Class-4. In elective and emergency caesarean groups, 36.7% and 33.3% belonged to Class 3 respectively. 63.3% and 66.7% belonged to Class-4 in elective and emergency caesarean groups respectively.

Table 3: Gravida of study participants

Gravida	Normal vaginal delivery		Elective caesarean section		Emergency caesarean section		Total	P value
	n	%	n	%	n	%		
Primi	10	33.3	5	16.7	16	53.3	31	0.01
Multi	20	66.7	25	83.3	14	46.7	59	

In normal vaginal delivery group, ten mothers (33.3%) were primigravida whereas in elective and emergency caesarean groups, 16.7% and 53.3% respectively were primigravida. The difference was statistically significant (p value<0.05).

Table 4: Gestational age

Gestational age	Normal vaginal delivery		Elective caesarean section		Emergency caesarean section		Total	P value
	n	%	n	%	n	%		
37 weeks	6	20.0	9	30.0	12	40.0	27	0.2
≥38 weeks	24	80.0	21	70.0	18	60.0	63	

In normal vaginal delivery group, 80% of mothers had crossed 38 weeks. In elective caesarean group, 70% were in 38 or more weeks of gestation at the time of delivery whereas in emergency caesarean group 60.0% of mothers were in 38 or more weeks of gestation. In normal vaginal delivery group, 60% (n=18) were female babies. In elective caesarean group, 40% (n=12) were female babies whereas in emergency caesarean group 46.7% (n=14) were female babies.

Table 5: APGAR scores at 1 minute and 5 minutes

Groups	APGAR at 1 min		APGAR at 5 min	
	Mean	SD	Mean	SD
Normal vaginal delivery	7.0	0.8	9.6	0.7
Elective caesarean section	7.1	0.5	9.5	0.7
Emergency caesarean section	6.8	0.6	9.2	0.7
P value	0.13		0.11	

Mean APGAR score at 1 minute was 7.0, 7.1 and 6.8 in normal vaginal delivery group, elective and emergency caesarean groups respectively. Mean APGAR score at 5 minutes was 9.6, 9.5 and 9.2 in normal vaginal delivery group, elective and emergency caesarean groups respectively. Median APGAR score at 5 minutes was 10, 10 and 9 in normal vaginal delivery group, elective and emergency caesarean groups respectively.

Table 6: Respiratory rate and chest retraction in new-born

Variable	Normal Vaginal Delivery		Elective Caesarean Section		Emergency Caesarean Section		Total	p-value
	n	%	n	%	n	%		
Respiratory rate								
≤60	29	96.7	28	93.3	29	96.7	86	0.7
>60	1	3.3	2	6.7	1	3.3	4	
Chest retraction								
None	29	96.7	28	93.3	30	100	87	0.4
Present	1	3.3	2	6.7	0	0	3	
Grunting								
None	29	96.7	28	93.3	29	96.7	86	0.77
Present	1	3.3	2	6.7	1	3.3	4	
Nasal flaring								
None	30	100	28	93.3	29	96.7	87	0.35
Present	0	0	2	6.7	1	3.3	3	

*Chi square test used

Tachypnoea (RR>60 per minute) was observed in 3.3% (n=l) babies in normal vaginal delivery group. In elective and emergency caesarean groups, two babies (6.7%) and one baby (3.3%) had tachypnoea respectively. Chest retraction was observed in 3.3% (n=l) babies in normal vaginal delivery group. In elective caesarean groups, two babies (6.7%) had chest retraction. None had tachypnoea in emergency caesarean group. Incidence of tachypnoea and chest retraction were not significantly different between the groups.

Grunting was observed in 3.3% (n=l) babies in normal vaginal delivery group. In elective and emergency caesarean groups, two babies (6.7%) and one baby (3.3%) had grunting respectively. None of the babies had nasal flaring in normal vaginal delivery group. In elective and emergency caesarean groups, two babies (6.7%) and one baby (3.3%) had nasal flaring respectively.

Of 30 babies in normal vaginal delivery, one baby (3.3%) was admitted in NICU. Two babies (6.7%) in elective caesarean group were admitted in NICU where as one baby (3.3%) from the emergency caesarean group was admitted in NICU. The difference in NICU admission across the three groups was not statistically significant (p value>0.05).

Discussion

In our study, the mean age at delivery was 24.1 years in normal vaginal delivery mothers where as it was 23.9 years emergency caesarean group. The mean age was slightly on a higher side among mothers who were in elective caesarean group (mean of 26.4 years).

Ecker JL *et al.* reported increase in caesarean delivery rates with increase in maternal age (< 25 years, 11.6%; > or = 40 years, 43.1%). Caesarean delivery without labour was seen more likely in older age women (< 25 years, 3.6%; > or = 40 years, 21.1%). A research done by Renuka *et al.* at a medical college hospital in Khammam reported that the emergency C-section rates (62.7%) were more common in the age group of 18-24 years than the elective C-section (49.3%) [6]. She compared foetal outcomes in emergency and elective LSCS. Whether the labour was spontaneous or induced failure of labour to progress or fetal distress was a lot more common in older women leading to increased rates of caesarean section. Our study findings of higher mean age in elective Caesarean group is similar to this study.

A previous study conducted by Thakur V *et al.* carried out in

Indore, Madhya Pradesh observed that emergency C-section rates (58.15%) were common among 18-24 years than elective C–section (52.01%) [7]. Higher C-section rates among the younger age groups was reported in other studies from India as reported in this study.

Working women have more difficulty in availing antenatal care and therefore giving rise to pregnancy related complications. Majority of women in our study group were not involved in any employment. A study conducted in 2017, carried out by Kusuma Naik *et al.* observed that work conditions for women working more than 40 hours/week and social stress index were found to be a significant risk factor for adverse pregnancy outcomes [8].

In our study, 80% of mothers had crossed 38 weeks of gestation in normal vaginal delivery group. In elective caesarean group, 70% were in 38 or more weeks of gestation at the time of delivery whereas in emergency caesarean group 60.0% of mothers were in 38 or more weeks of gestation. Akanksha *et al.* in Gujarat studied about the obstetric and neonatal outcome in post section pregnancy, it included all women between 37-40 weeks of gestation [9].

In the present study, median APGAR score at 1 minute was 7 in all the three groups (normal vaginal delivery group, elective and emergency caesarean groups). The study by Renuka *et al.* at a medical college hospital Khammam reported that the Apgar score of <7 at 1 minute, was present in 16.3% of (n=25) of new born in elective caesarean sections and 18.3% (n=28) in emergency caesarean sections [10]. In our study also, mean and median APGAR score at 1 minute was similar and comparable indicating good practices during operative deliveries.

Regarding APGAR at 5 minutes, our study reported median APGAR score at 5 minutes was 10, 10 and 9 in normal vaginal delivery group, elective and emergency caesarean groups respectively. It is well documented that due to the effect of anaesthesia on the new-borns, babies delivered through caesarean birth have lower APGAR scores. Also, the baby mostly would have been already in distress for which emergency section was done.

Respiratory distress in the new born is defined as one or more signs of increased work of breathing, such as tachypnoea, chest retractions, nasal flaring or grunting. Tachypnoea is a compensatory mechanism for hypercarbia, hypoxemia, or acidosis (both metabolic and respiratory), making it a common but nonspecific finding in a large variety of respiratory, cardiovascular, metabolic, or systemic disease. In the study by Chunduri S *et al.* in 2017 which determined respiratory morbidity and its correlation to the gestational age and respiratory morbidity in term infants following elective C-section reported that 17.6% of babies born in 37th week, 5.6% of 38th week, 5.1% of 39th week and 2.8% of babies born >40weeks had developed respiratory illness [11]. Authors concluded that respiratory morbidity increases in elective C-sections and as gestation progresses the respiratory morbidity decreases.

Similar findings on respiratory morbidity were reported by Bhosale P *et al.* in 2018 in his study conducted in Pune, India. Of total 140 term neonates following the elective caesarean section included in the study, 11 babies had developed respiratory morbidity requiring NICU admission. 19.01% of babies born in 37th week, 12.55% of 38th week, 7.88% of 39thweek and 4.67% of babies born >40weeks had developed respiratory illness [12]. With increase in gestational age, decreasing trend in occurrence of respiratory morbidity was seen.

In a study from Mumbai (Gurunule *et al.*), out of 300 mothers who underwent elective LSCS, 12 new born had respiratory distress compared to 21 babies in emergency LSCS group [13]. Compared to this study, our study findings suggest higher incidence of respiratory distress. These differences in the incidence of respiratory distress between the studies could be due to smaller sample size in the present study which included only 30 mothers in each of the groups. Respiratory distress is very common perinatal complication in the babies born by LSCS and this finding is consistent across the studies.

Conclusion

In our study there was higher incidence of respiratory distress syndrome in new-borns born to mothers who have undergone elective caesarean section as compared to normal vaginal delivery and emergency caesarean section. Also, there are higher incidences of low APGAR scores in new-borns and NICU admissions in elective caesarean groups as compared to the other two groups. It seems that stress of labour helps in lung maturity of the foetus thus having lesser cases of neonatal RDS in emergency caesarean section and normal vaginal delivery. Hence obstetricians should try their best to avoid elective caesarean section as far as possible.

Acknowledgement

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