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Caesarean Section Versus Vaginal Delivery in Singletons with Preterm Labour - Prospective Cohort Study

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Abstract

Background: Subset of cases of preterm birth are because of preterm onset of labour pains in mother with no obvious risk factors. The optimal mode of delivery for women with preterm onset of labour without any obvious risk factor is controversial. *Aim:* To assess the outcome of newborns born by caesarean delivery versus vaginal birth for women with preterm onset of labour pains with no other risk factors. *Settings and design:* This prospective cohort study was conducted in a level III neonatal unit of a teaching hospital. *Methods and material:* Infants included in the study were all preterm babies less than 37 weeks of gestation, born to mother with preterm onset of labour pains without any obvious risk factors and admitted to neonatal unit within 48 hours of life. Exclusion criteria included infants with congenital malformations, multifetal gestation and infants born to mother with any bad obstetric history apart from preterm onset of labour pains. Our primary outcome measures were incidence of birth injury to the infant and birth asphyxia. *Results:* Incidence of birth injury, birth asphyxia, perinatal death and neonatal mortality was more in vaginal delivery group. However, there was no significant statistical difference between the two groups. *Conclusions:* We believe that planned caesarean section cannot be recommended as the routine mode of delivery in cases of preterm onset of labour without any other risk factors unless there are other recognized maternal or fetal indications.

Keywords: Birth Asphyxia; Birth Injury; Planned Caesarean Section; Preterm Labour; Vaginal Delivery.

Introduction

The birth of a preterm baby is a potential neonatal emergency. Preterm birth can occur because of several reasons, both maternal as well as fetal. Maternal factors responsible for preterm birth include any bad obstetric history in the form of maternal infections, uteroplacental insufficiency or endocrine problems. Whereas, fetal factors include congenital malformations or multifetal gestation. In most of these cases mode of delivery is usually an emergency caesarean section.

Subset of cases of preterm birth are because of preterm onset of labour pains in mother with no obvious risk factors. The optimal mode of delivery for women with preterm onset of labour without any obvious risk factor is controversial.

The concept of planned caesarean section for woman in preterm labour implies that it is possible to perform caesarean section very early in labour. In reality, this may not be the case as often women thought to be in preterm labour deliver weeks later, even few at term gestation. Thus, a policy of planned caesarean section may increase the number of babies born preterm.

Sometimes a planned caesarean cannot happen because labour progresses too quickly and sometimes, even though vaginal delivery is planned, complications arising during labour may make a caesarean section necessary.

There is not enough evidence to show the effects of a policy of planned immediate caesarean delivery rather than a policy of planned vaginal delivery for the birth of premature babies. This controversy reported in the literature prompted us to evaluate the outcomes of delivery in singleton preterm fetuses in our institution and assess the advantage, if any, of caesarean section over vaginal delivery in case of preterm onset of labour pains without any other risk factors.

Methodology

This prospective cohort study was conducted in a level III neonatal unit of a teaching hospital between January 2016 and December 2016. The study was approved by Institutional ethics committee.

Infants included in the study were all preterm babies less than 37 weeks of gestation, born to mother with preterm onset of labour pains without any obvious risk factors and admitted to neonatal unit within 48 hours of life. Gestational age was assessed by last menstrual period and supported by modified Ballard score. Exclusion criteria included infants with congenital malformations, multifetal gestation and infants born to mother with any bad obstetric history apart from preterm onset of labour pains.

At a reported average prevalence of preterm birth of 6%, sample size required at a confidence interval of 95% was 87. Total infants included in study were 84 and were divided into two groups, caesarean section group included 44 infants while vaginal delivery group included 40 infants. All data was recorded in a predesigned structured proforma.

Our primary outcome measures were incidence of birth injury to the infant and birth asphyxia. Secondary outcome measures included incidence of perinatal/neonatal death, respiratory distress syndrome (RDS), seizures, proven early onset sepsis (EOS), hemodynamically significant patent ductus arteriosus (HS-PDA), broncho-pulmonary dysplasia (BPD), necrotising enterocolitis (NEC), intraventricular haemorrhage (IVH), neonatal hyperbilirubinemia (NNH), need of surfactant, respiratory support, time taken to reach full enteral feeds and time required to regain birth weight.

Parameters such as preterm premature rupture of membranes (PPROM), birth asphyxia, perinatal death, HIE (modified Sarnat staging), RDS, meconium aspiration syndrome (MAS), transient tachypnea of newborn (TTNB), HS-PDA, BPD, EOS were defined as per standard guidelines. Intraventricular hemorrhage (IVH) was defined according to Papile et al grading. Necrotizing enterocolitis (NEC) was defined according to Bell staging.

After confirming the homogeneity of data, the study population was divided into two groups vaginal or caesarean section. All continuous variables were reported as mean and standard deviation. Whereas all categorical variables were expressed as frequencies/percentages. The differences between groups for continuous variables was evaluated using independent student t-test and categorical variables was analysed using Fisher exact test/chi-square test. Association between variables was analysed using correlation analysis (Pearson's/Spearman); where a R square value >0.700 was considered as reportable. A $p<0.05$ was considered as significant difference. All statistical analysis was done using Statistical Package for Social Sciences (SPSS), version 17.0 for windows, IBM Computers, New York, USA.

Results

Total number of babies included in the study were 84, of which 44 babies were born by caesarean section while 40 babies were born by vaginal delivery.

The mean birth weight and gestational age at birth were significantly higher in caesarean section (CS) group as compared to vaginal delivery group (Table 1).

It was inferred that days to reach full feeds and days to reach birth weight were less in

Table 1: Baseline characteristics of both groups

Sr. No	Variable	Caesarean Delivery (n=44)	Vaginal Delivery (n=40)	P Value
1	Birth Weight	1782.61 ± 531.17	1354.75 ± 398.07	<0.001
2	Gestational Age	32.98 ± 2.38	31.05 ± 2.64	0.001
3	Male (%)	20 (45.5%)	26 (65.0%)	0.083

Table 2: Outcome measures in both the groups

Sr. No	Variable	Caesarean Delivery (n=44)	Vaginal Delivery (n=40)	P Value
01	Birth injury (%)	0 (0.0%)	2 (5.0%)	0.224
02	Birth Asphyxia (%)	5 (11.4%)	7 (17.5%)	0.537
03	Perinatal Death (%)	0 (0.0%)	2 (5.0%)	0.224
04	Neonatal Mortality (%)	3 (6.8%)	5 (12.5%)	0.204
05	Neonatal Seizures (%)	3 (6.8%)	9 (22.5%)	0.060
06	RDS (%)	25 (56.8%)	29 (72.5%)	0.173
07	MAS (%)	0 (0.0%)	1 (2.5%)	0.476
08	TTNB (%)	9 (20.5%)	2 (5.0%)	0.052
09	Pneumonia (%)	5 (11.4%)	2 (5.0%)	0.437
10	Need of Mechanical Ventilation (%)	16 (36.4%)	18 (45.0%)	0.506
11	Need of CPAP (%)	24 (54.5%)	28 (70.0%)	0.180
12	Need of Supplemental Oxygen (%)	25 (56.8%)	21 (52.5%)	0.827
13	Stay on Ventilator (days)	6.81 ± 10.29	6.78 ± 6.40	0.991
14	Stay on CPAP (days)	2.79 ± 1.76	6.11 ± 8.43	0.051
15	Oxygen supplementation (days)	11.33 ± 2.88	21.20 ± 10.23	0.164
16	Duration of Respiratory Support (days)	6.38 ± 9.23	10.09 ± 12.44	0.170
17	Early Onset Culture Positive sepsis (%)	4 (9.1%)	8 (20.0%)	0.215
18	HS-PDA (%)	9 (20.5%)	12 (30.0%)	0.328
19	BPD (%)	1 (2.3%)	2 (5.0%)	0.603
20	NNH (%)	42 (95.5%)	36 (90.0%)	0.418
21	Duration of Phototherapy (days)	3.50 ± 2.01	4.31 ± 2.50	0.120
22	Exchange Transfusion (%)	1 (2.3%)	1 (2.5%)	1.000
23	NEC Stage			
	Stage I	0 (0.0%)	4 (10.0%)	0.047
	Stage II	2 (4.5%)	1 (2.5%)	1.000
	Stage III	1 (2.3%)	3 (7.5%)	0.343
	Normal	41 (93.2%)	32 (80.0%)	0.106
24	IVH			
	Stage I	2 (4.5%)	3 (7.5%)	0.665
	Stage II	0 (0.0%)	2 (5.0%)	0.224
	Stage IV	1 (2.3%)	1 (2.5%)	1.000
	Normal	41 (93.2%)	34 (85.0%)	0.298
25	Time regain birth weight (days)	15.61 ± 7.34	21.17 ± 8.74	0.004
26	Time to reach full feeds (days)	6.02 ± 4.51	10.47 ± 5.88	<0.001

CS group as compared to vaginal delivery group. There was significant statistical difference between the two groups.

Incidence of birth injury, birth asphyxia, perinatal death and neonatal mortality was more in vaginal delivery group. However, there was no significant statistical difference between the two groups.

Amongst other outcome measures present study demonstrated that incidence of neonatal seizures, RDS, culture positive early onset sepsis and hemodynamically significant PDA was less in CS group compared to vaginal delivery group. However, there was no significant statistical difference between the two groups.

Though not statistically significant, incidence of TTNB and NNH was more in CS group as compared to vaginal delivery group. However mean duration of phototherapy required was more in vaginal delivery group.

There was no statistically significant difference in the overall incidence of NEC and IVH in both groups. However, incidence of stage I NEC was significantly higher amongst infant born through vaginal delivery as compared to CS.

Discussion

World wide an estimated 11.1% of all live births are preterm, with over 60% of preterm births occurring in sub-Saharan Africa and South Asia and ten countries accounting for 60% of preterm births worldwide [1]. India tops the list of 10 nations

contributing to 60% of the world's premature deliveries. The rate of preterm birth in India is approximately 21% and is rising [2]. Globally preterm birth is a major cause of mortality [3], with preterm birth estimated to be a risk factor in at least 50% of all neonatal deaths [4] and long-term loss of human potential amongst survivors.

Preterm birth can occur because of several reasons, both maternal as well as fetal. In most of these cases mode of delivery is usually an emergency caesarean section. However, subset of cases of preterm birth are because of preterm onset of labour pains in mother with no obvious risk factors. The incidence of preterm labour is between 5% and 10% in most developed nations [5]. Incidence of preterm labor is 23.3% in India [2]. Up to 75% of preterm labor occurs either spontaneously or following PPROM. The goal of management of preterm labor should not be to merely prolong pregnancy but to improve neonatal outcome and to reduce morbidity and mortality. The optimal mode of delivery for women thought to be in preterm labour, for both cephalic and breech presentation is controversial.

The usual complications associated with vaginal preterm delivery are entrapment of a relatively large after coming head, cord prolapse, in-coordinate labour, intrapartum hypoxia, aspiration pneumonia and traumatic injuries. Studies in term babies with breech presentation have highlighted that there is still a significantly higher risk of perinatal deaths in the planned vaginal delivery group when compared with those babies delivered by elective caesarean section [6,7].

Caesarean section (CS) is a surgical intervention which is being conducted in emergencies to save the lives of mother and child when natural delivery is not possible or is risky for mother or/and child. In recent years, the rate of CS has increased in different parts of the world, both in developed and developing countries[8].

C-section in preterm pregnancies is also particularly problematic regarding surgical technique, given that the lower segment may not be formed and, thus, a vertical incision in the upper part of the uterus may be required. In this situation, further complications may occur, including increased blood loss and increased risk of uterine rupture in subsequent pregnancies [9].

According to some studies, caesarean section requires a longer recovery time and operative complications such as lacerations and bleeding may occur at rates varying from 6% for elective caesarean to 15% for emergency caesarean. Other risks are neonatal depression due to general anaesthesia, fetal injury during hysterotomy and/or delivery, increased likelihood of respiratory distress even at term, and breastfeeding complications.

Intestinal microbiota plays an essential role in the postnatal development of the immune system, the mechanisms remain poorly understood. Studies have shown that only vaginal delivery promotes the production of various cytokines implicated in neonatal immunity. Another study shown that, babies born vaginally were colonized predominantly by Lactobacillus, whereas caesarean delivery babies were colonized by a mixture of potentially pathogenic bacteria typically found on the skin and in hospitals, such as Staphylococcus and Acinetobacter, suggesting babies born by caesarean section are at increased risk of infection.

Various studies in literature found a link between caesarean section and disturbed intestinal colonization, occurrence of necrotizing enterocolitis, an increased risk for allergic diseases in later childhood and a delayed onset of lactation [10]. Both the non-physiological start of colonization and the missing early dietary support by delayed start of lactation might result in these long-lasting effects.

Planned caesarean delivery for women thought to be in preterm labour may be protective for the baby, also preventing an intrapartum emergency surgery with its associated complications. Claims that planned preterm caesarean delivery reduces the chances of fetal or neonatal death and birth trauma have been met by counter claims that such a policy leads to risk of serious morbidity for both mother and baby.

Lee et al., reported a survival advantage among very low birth weight (VLBW) infants delivered by the cesarean procedure, independent of many maternal medical, labor complications and demographic risk factors in a US national survey. Later the same authors also suggested that prematurity alone was not a valid indication for cesarean birth [11].

The Cochrane review [12] found that enough number of women were not recruited into these trials and, therefore, the decision whether to deliver a preterm baby either vaginally or by caesarean section, remains an opinion and a current practice within a particular hospital, rather than being evidence-based.

The caesarean section rate in our study was 52.4% in women with preterm labour. In study by A. Riskin et al., caesarean section rates were much

lower among mothers with premature contractions (26.4%), premature rupture of membranes (34.4%).

In our study, incidence of perinatal death and neonatal mortality was less in infants born by CS, though it was not statistically significant. This result was consistent with that of previous studies. Some other studies reported that the neonatal mortality was greater in infants delivered by the vaginal route, as in our study. This can be due to the mean birth weight and gestational age at birth were significantly higher in CS group as compared to vaginal delivery group. We found that incidence of RDS was more in vaginal delivery group, however the difference was not statistically significant. However, in study by Wu et al. [13], they found that incidence of RDS was more in infants born by CS and they concluded that CS is an independent risk factor for RDS. In our study increased incidence of RDS in vaginal delivery could be due to babies born by vaginal delivery were more premature and may not have received antenatal steroid coverage.

Amongst other outcome measures, we found that incidence of early onset culture positive sepsis, hemodynamically significant PDA, NEC and duration of respiratory support was more in vaginal delivery group as compared to CS group; but difference was not statistically significant. Again, the possible explanation could have been less gestational age and weight at time of birth in vaginal delivery group.

We also found that time to reach full feeds and time to regain birth weight was significantly less in CS group. Cochrane review of previous studies didn't show such a difference. The significant difference in our study could be due to significantly higher gestational age and birth weight in CS group.

The key finding of our study is that, planned caesarean delivery in case of preterm labor without any other risk factors did not enhance the neonatal survival nor did it reduce the morbidity in these infants. This is further supported by the work of Malloy et al and others [13,14,15].

One of the strengths of this study was the ability to use gestational age at delivery and not just birthweight, as gestational age is considered a better predictor of neonatal survival than birthweight. Sample size of our study was larger than other studies included in review.

There are certain limitations of our study. Firstly, because this was an observational study from a single tertiary center, so some unknown biases and confounding variables may not be accounted for. The presence of, for example, fetal distress, cord prolapse, the stage of labour at the time of admission may influence both the management and outcome of these pregnancies. This study would have been more informative if the follow up of the infants was studied at least for two years. Conducting a prospective randomized controlled study designed to answer this important clinical issue should still be the goal, which may not be feasible in practice.

We believe that planned caesarean section cannot be recommended as the routine mode of delivery in cases of preterm onset of labor without any other risk factors, unless there are other recognized maternal or fetal indications.

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