

Effects of Delivery Mode on Short-term Neonatal Outcomes

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ABSTRACT

Introduction: The risk of morbidity and mortality increases in neonates admitted to the neonatal intensive care units (NICUs). Various factors contribute to the prognosis of these newborns. In the current study, we aimed to investigate the role of mode of delivery on short-term neonatal outcomes.

Methods: This retrospective study was conducted on 215 neonates admitted to the NICU of Shohada-e-Tajrish Hospital in 2007 and 2008. The respiratory distress syndrome (RDS), mortality, birth weight, gestational age, and Apgar score were compared between two groups born via natural vaginal delivery (NVD) and c-section (CS), respectively.

Results: In the current study, of 126 CS cases, 46.8% had a gestational age of more than 37 weeks, 52.4% were low birth weight (LBW) infants, 29.3% had severe RDS, 17.7% had an Apgar score less than 7, and 9.7% of the infants passed away. Of 89 NVD cases, 44.9% had a gestational age of more than 37 weeks, 48.3% were LBW infants, 18.4% had an Apgar score less than 7, 27.9% had severe RDS, and 10.1% of the infants passed away. The mean length of hospital stay was 8.39 and 7.84 days in CS and NVD groups, respectively. In CS and NVD groups, 27.8% and 22.5% had markers of infection. These factors had no significant association with the mode of delivery.

Conclusion: Mode of delivery has no impact on the Apgar score, mortality, length of hospital stay, RDS, and infection markers in neonates admitted to the NICU.

Keywords: CS, Mode of delivery, Neonates, NVD, RDS

Introduction

There has been a great deal of controversy regarding the optimal mode of delivery in some situations. Some studies have demonstrated the benefits associated with cesarean section (c-section or CS) such as lower mortality rate, higher 1-minute Apgar score, and less intraventricular hemorrhage, particularly in preterm infants. However, other studies showed no improvement in the mortality rate and neonatal outcomes in c-section. Despite the uncertainties about the advantages of this mode of delivery, the prevalence of c-section has increased in recent years (1).

The choice of the optimal mode of delivery for mothers with preterm vertex neonates has been a controversial topic in the obstetric and neonatal care communities for decades. However, the advantages of c-section in preterm labour are quite unclear (1, 2), and no robust randomized control trial has been conducted in this regard.

The main aim of the present study was the evaluation of the effect of mode of delivery on short-term neonatal outcomes in infants admitted to the neonatal intensive care unit (NICU). The neonates were admitted due to various reasons, which are mentioned in the next sections, with regard to their prevalence in the study location. Respiratory distress syndrome (RDS) frequency, respiratory need, birth trauma, and asphyxia are among the contributing factors affecting neonatal outcomes in infants admitted to NICU. In this study, the effect of mode of delivery on these factors is assessed.

Considering the higher prevalence of RDS in neonates born via CS, the negative or various effects of CS on RDS, and the protective effect of NVD against it, this study aimed to assess the effect of mode of delivery on the prognosis of the neonates. In addition, due to the recent increased prevalence of CS among families and gynecolo-

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gists, collecting data about the effects of mode of delivery on neonates can be of great significance in our hospitals.

In this study, 215 cases, who were admitted to NICU in one year, were assessed regarding the following factors: mode of delivery, gestational age, Apgar score at birth, sex, birth weight, RDS, respiratory needs, infection markers (positive CRP, positive BC, leukocytosis, and thrombocytopenia), age of admission, being born in Shohada Hospital (or referral from another location), and mortality.

The analysis of the outcomes and the comparison with the data from other studies are presented in later sections. The main purpose of this study was the evaluation of the effect of mode of delivery on short-term neonatal outcomes in infants admitted to the NICU of Shohada-e-Tajrish Hospital over a one-year period (from September 2007 to September 2008). Our hypothesis was that NVD results in better neonatal outcomes in some circumstances.

Materials and Methods

The current study is a retrospective cohort survey with a sample size of 215 neonates, who were admitted to the level 3 NICU of Shohada-e-Tajrish Hospital in Iran (from September 2007 to September 2008). The neonates were divided according to the mode of delivery (126 CS and 89 NVD cases). In the CS group, data were analyzed in 2 sub-groups: emergency CS, and elective CS.

Afterwards, the neonates were categorized according to gestational age, Apgar score at birth, sex, birth weight, RDS, respiratory needs, infection factors, and mortality. In addition, the reasons for NICU admission and causes of CS or NVD selection were included. The gestational age (in completed weeks) was determined considering the last menstrual period, prenatal ultrasonography, and postnatal examination.

The major objective of the study was the evaluation of the effect of mode of delivery on short-term neonatal outcomes in infants admitted to NICU. In addition, the relationships between the mode of delivery and Apgar score, RDS, mortality, NICU admission, infection markers, and *length of hospital stay* were analyzed.

Data regarding the mentioned variables were collected using a checklist, filled by the researcher. In order to analyze the data and the association between the variables, Chi-square, Fisher's exact test, and Mann-Whitney U tests were performed using SPSS version 13.

Results

In total, 215 neonates were delivered during this period in this center, out of whom 116 (54%) and 99 (46%) were preterm and full-term (more than 37 weeks of gestation) infants, respectively. In total, 58.6% and 41.3% of the subjects had c-section and NVD, respectively. One hundred and thirteen neonates (52.6%) were male and 102 cases (47.4%) were female ($P > 0.05$).

Fifty-five neonates (25.6%) were born via elective CS, 71 cases (33%) via emergency CS, and 89 (41.4%) subjects were born through NVD. In the CS group, 110 (87.3%) and 16 (12.7%) neonates were delivered due to maternal and neonatal factors, respectively. There was no significant difference in the basic antenatal profile between the groups.

The most common reasons for NICU admission were respiratory distress [77 cases, (35.8%)] and prematurity [50 cases, (23.3%)]. Premature rupture of membranes (PROM), maternal chorioamnionitis, preeclampsia, sepsis, and meconium aspiration syndrome accounted for 1.4% (3 cases), 0.9% (2 cases), 0.9% (2 cases), 2.3% (5 cases), and 3.7% (8 cases) of NICU admissions, respectively.

No significant difference was observed between NVD and CS groups in more than 37 weeks of gestational age ($P > 0.05$).

The overall mortality rate until discharge was 6.9%, and no significant difference was observed between NVD and CS groups in terms of mortality and morbidity. In 126 CS and 89 NVD cases, 17.7% and 18.4% had a low Apgar score (score < 7), respectively. This factor had no significant association with the mode of delivery; the Apgar score was not different among the 3 groups ($P > 0.05$).

In 126 CS and 89 NVD cases, 52.4% and 48.3% were LBW infants, respectively. Similarly, this factor had no significant association with the mode of delivery ($P > 0.05$) in 126 CS and 89 NVD cases, 29.3% and 27.9% had severe RDS, respectively; RDS had no significant association with the mode of delivery ($P > 0.05$).

In total, CRP was positive in 19 cases (8.8%). In the elective CS, emergency CS, and NVD groups, 5.5%, 5.6%, and 13.5% had positive CRP, respectively, which was not significantly different between the groups ($P > 0.05$). In 126 CS and 89 NVD cases, 27.8% and 22.5% had markers of infection in CS and NVD groups, respectively; no significant correlation was found between this factor and mode of delivery.

In total, BC was positive in 8 cases (3.7%). About 1.9% in the elective CS group, 2.8% in the emergency CS group, and 5.6% in the NVD group had positive BC, which was not significantly different between the groups ($P>0.05$). In 126 CS and 89 NVD cases, 27.8% and 22.5% had markers of infection, respectively; no significant association was observed between this factor and mode of delivery.

Overall, 55 neonates (25.6%) presented with leukocytosis. Approximately, 27.3% in the elective CS group, 28.2% in the emergency CS group, and 22.5% in the NVD group had leukocytosis, with no significant difference ($P>0.05$) (Table 8).

146 neonates (67.9%) were inborn. 52.7% in the elective CS group, 78.9% in the emergency CS group, and 68.5% in the NVD group were inborn with no significant difference ($P>0.05$) (Table 6).

In total, 15 cases (7%) passed away. About 5.5% in the elective CS group, 4.2% in the emergency CS group, and 10.1% in the NVD group died, which was not significantly different between the groups ($P>0.05$). In 126 CS and 89 NVD cases, 9.7% and 10.1% died, respectively (Table 5).

In total, the mean length of hospital stay was 8.16 days, and the mean neonatal age of admission was 1.9 days. The mean length of hospital stay was 7.56, 9.03, and 7.84 days in the elective CS, emergency CS, and NVD groups, respectively; in this regard, no significant difference was observed between the groups ($P>0.05$). The mean length of hospital stay was 8.39 days in the CS and 22.5% 7.84 days in the NVD group. The mean neonatal age of admission was 2.1, 1.58, and 2.03 days in the elective CS, emergency CS, and NVD groups, respectively; again no significant difference was observed between these groups ($P>0.05$).

Discussion

The main finding of this study was that NVD delivery did not enhance the neonatal survival or decrease the morbidity of the infants. In fact, these factors had no significant association with the mode of delivery. However, our hypothesis was that NVD leads to better neonatal outcomes in certain conditions, particularly in case of RDS (since RDS is more prevalent in neonates delivered via CS).

In hospital admissions, mortality and mode of delivery affect the APGAR score and other outcomes. However, in our study, there was no significant difference between NVD and CS in terms of mortality and morbidity (as well as RDS

severity, low Apgar score, neonatal infections, and length of hospital stay).

In the current study, preterm and term infants were not separated, which might have influenced the study results. In addition, generalization based on a small sample size is not rational, and increasing the sample population can help achieve more definite outcomes. It should be noted that the median age of the infants delivered by CS was similar to the NVD group.

Sonkusare evaluated the perinatal outcomes of premature neonates, considering the mode of delivery. A total of 113 pregnant women and 124 neonates, who were delivered at 30 to 35 weeks of gestation, were enrolled in the study. The results related to 70 neonates born vaginally were compared with 54 neonates born via c-section. The neonatal mortality rate was 20% and 10% for the c-section and NVD infants, respectively.

In the mentioned study, there was no significant difference regarding neonatal morbidity between the two groups, and as it was reported, c-section cannot be routinely recommended, unless there are obstetric indications (2); the results of this research were in consistence with those of the current study.

Liston *et al* showed that c-section, compared with vaginal delivery, is more likely to be associated with an increased risk of respiratory conditions (3). However, in our study, there was no difference between NVD and CS; this discrepancy may be due to the smaller sample volume in the current study.

Benedetto *et al* found no significant differences between spontaneous vaginal delivery and caesarean section in terms of the related complications (4); the results were similar to our findings.

Quiroz *et al* showed that CS was associated with increased incidence of neonatal respiratory complications (5). This was not in congruence with our findings, which might be due to the smaller sample size in our investigation. Vilar *et al* showed that caesarean delivery had a large protective effect against fetal mortality (6). However, our data indicated different outcomes, and the mortality rate was not different between the groups. This again may be due to the smaller sample size in our study.

Zanardo *et al* showed that the risk of neonatal respiratory morbidity including RDS and transient tachypnea (TTN) was significantly higher in the infant group delivered by elective CS, compared with the NVD group (7). Their results were

different from ours, which may be due to the smaller sample size.

In the current study, gestational age >37 weeks, severe RDS, LBW, length of hospital stay, and infection were more prevalent in the CS group; however, Apgar score and mortality rate were lower compared to the NVD cases. As it was indicated, mortality rate, sepsis, and RDS did not significantly differ between the groups.

The strength of our study was that it was conducted in one single centre. However, the retrospective nature of the research and its small sample size might limit the conclusion.

Conclusion

According to the results, mode of delivery does not lead to a decrease in neonatal mortality and morbidity. Although vaginal delivery is strongly emphasized in hospitals, the decision regarding the mode of delivery depends on the individual and the interest of both mother and the infant.

Regardless of the obtained results, mode of delivery may affect neonatal outcomes. Considering the high frequency of CS complications in mothers, this mode of delivery should be selected in emergencies, and NVD is preferred in elective conditions.

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Table 1. Demographic data

	Elective CS	Emergency CS	NVD	Total
Gestational age:				
<28 weeks	(%0)0	(%4.2)3	(%3.4)3	(%2.8)6
28-32 weeks	(%1.8)1	(%19.7)14	(%5.6)5	(%9.3)20
32-37 weeks	(%43.6)24	(%35.2)25	(%46.1)41	(%41.9)90
>37 weeks	(%54.5)30	(%40.8)29	(%44.9)40	(%46)99
Total	(%100)55	(%100)71	(%100)89	(%100)215
Birth weight:				
<1000g	(%1.8)1	(%7)5	(%4.5)4	(%4.7)10
1000-1500g	(%1.8)1	(%15.5)11	(%7.9)7	(%8.8)19
1500-2500g	(%30.9)17	(%43.7)31	(%36)32	(%37.2)80
>2500g	(%65.5)36	(%33.8)24	(%51.7)46	(%49.3)106
RDS:				
mild/moderate	(%71)22	(%70.4)19	(%72.1)31	(%71.3)72
severe	(%29)9	(%29.6)8	(%27.9)12	(%28.7)29
Mortality:				
positive	(%5.5)3	(%4.2)3	(%10.1)9	(%7)15
negative	(%94.5)52	(%95.8)68	(%89.9)80	(%93)200
Apgar score <7:	(7.4%)	(25.7%)	(18.4%)	(18%)38
Mean length of hospital stay (day):	7.56	9.03	7.84	8.16
Bacteremia:	1.9%	2.8%	5.6%	8 (3.7%)
Positive CRP:	5.5%	5.6%	13.5%	19(8.8%)