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ASSOCIATION OF MODE OF DELIVERY WITH NEONATAL INTENSIVE CARE UNIT ADMISSION IN DELIVERIES AT TERM

Rabia Manzoor[1], Momina Afzal[2], Aqsa Anwar[3], Sajida Imran[4], Mehreen Ilyas[5], Farrukh Zaman[6]

[1,2,5]MBBS, PG Trainee Gynaecology and Obstetrics, Hameed Latif Hospital Lahore, Pakistan
[3]MBBS, Medical Officer Gynaecology and Obstetrics, Hameed Latif Hospital Lahore, Pakistan
[4]MBBS, FCPS, Consultant Gynaecology and Obstetrics, Hameed Latif Hospital Lahore, Pakistan
[6]MBBS, FCPS, Professor Gynaecology and Obstetrics, Hameed Latif Hospital Lahore, Pakistan
*Corresponding author: Rabia Manzoor, Email: drmalik262@gmail.com

ABSTRACT
Objective: To determine the association of mode of delivery (cesarean section) with Neonatal intensive care unit admission in deliveries at term
Study design: Cohort study
Study place and period: Department of Obstetrics & Gynecology, Hameed Latif Hospital, Lahore from 16 August 2025 to 15 February 2026.
Methodology: One hundred and twenty females were included from labor room and delivery was conducted. Females were divided in two groups i.e. exposed and unexposed. After delivery, neonates were examined and if there were presence of any indication (for admission to NICU. All this information was recorded in proforma and analysed in SPSS version 25.0. 2x2 table was generated to calculate relative risk between NICU admission and mode of delivery with RR>1 as significant.
Results: The mean age of females in exposed group was 26.50 ± 5.64 years and in unexposed group was 29.70 ± 5.89 years. NICU admission was noted in 45 (75.0%) cases in exposed group while in 24 (40.0%) females in unexposed group. There was 4 times more risk of NICU admission in females who underwent cesarean section with Odds ratio of 4.500 (95% CI; 2.063, 9.816, p-value<0.0001).
Conclusion: It has been concluded that the risk of NICU admission increases four time if females delivered via cesarean section.

KEYWORDS: cesarean section, neonatal intensive care unit, hypoglycemia, respiratory distress, meconium aspiration, Transient Tachypnea of the newborn.

INTRODUCTION

Numerous serious, curable disorders make the first 28 days of an infant's existence, known as the neonatal phase, a sensitive time. As specialized facilities that offer medical treatment to newborns, neonatal intensive care units (NICUs) have emerged as a crucial component of the delivery of critical care to newborns who encounter unique postpartum problems.[1] It is rare for term infants to be admitted to the NICU. A NICU admission puts the newborns at imminent risk for morbidity and death, puts their families through emotional strain, and comes at a great expense to the healthcare system.[2, 3] Newborns admitted to NICUs are at an increased risk of morbidity and mortality. A number of factors influence these infants' prognosis.[4]

Since there is little information on the reasons why term babies are admitted to the NICU, it has been noted that the neonates' hospitalization indications are influenced by the way of birth. Preterm birth can be prevented and managed with improved maternal care and the avoidance of risk factors. [5, 6] Understanding the newborn illness pattern, which varies by time and location, is crucial to lowering morbidity and death. Healthcare professionals can develop more effective methods by analyzing the neonatal admission pattern.[7, 8] NICU admissions and respiratory morbidities are known to be more common in infants born via elective cesarean birth.[2, 9] Infectious and respiratory disorders are frequent reasons for NICU admission in term newborns. According to a big study, for instance, the most common diagnoses were birth asphyxia (13.1%), respiratory distress syndrome (24.9%), and newborn sepsis (27.3%). Other common reasons include severe hyperbilirubinemia, hypoglycemia, meconium aspiration syndrome, and temporary tachypnea of the baby, particularly following cesarean birth.[4, 10]

This study was aimed to ascertain whether cesarean sections are associated with admission to the neonatal critical care unit in cases where deliveries took place at term. Research indicated that the mode of delivery had no bearing on NICU admissions. However, neonates born by cesarean section typically have higher rates of NICU admissions. However, there is no proof in the local literature. In order to determine whether NICU admissions are related to the way of delivery, we wish to perform this study in order to gather evidence for the local setting. In the future, we can apply the findings of this study in the local setting. This would validate the scope of the issue among the local community and assist us in improving our practices.

METHODOLOGY

After approval from ethical review board, this cohort study was carried out in the Department of Obstetrics & Gynecology, Hameed Latif Hospital, Lahore from 16 August 2025 to 15 February 2026.By using WHO calculator, sample size of 120 females; 60 in each group is calculated with 5% significance level, 80% power of study and percentage of NICU admission i.e. 74.6% in exposed and 52.2% in unexposed females.[5] All the females who fulfilled following criteria were enrolled by using non-probability, consecutive sampling technique.

Inclusion: Females aged 18-40 years, parity<5, presenting at gestational age >37 weeks were enrolled. Exposed group was composed of females who had delivery via cesarean section (by giving incision in lower abdomen under spinal anesthesia). Unexposed group was composed of females who had vaginal delivery.

Exclusion: Females with pre-pregnancy genital and extragenital disease, goiter, anxiety and depressive disease, drug addiction, multiple pregnancy, fetuses with anomalies, premature rupture of membranes, obstetric conditions that may cause premature or emergency delivery were not included in the study.

All the females were included from labor room. Informed consent was obtained. Demographic data (name, age, BMI, gestational age, parity, number of vaginal deliveries, inter-pregnancy interval, hypertension (BP≥140/90 mmHg pre-pregnancy or in first trimester, gestational diabetes, preeclampsia was recorded. Then delivery was conducted and females was divided in two groups i.e. exposed and unexposed. After delivery, neonates were examined and if there were presence of any indication (respiratory distress syndrome, transient tachypnea of the newborn, meconium aspiration, congenital heart disease, hypoglycemia, hypothermia and jaundice), then neonate was admitted to NICU and noted. All this information was recorded in proforma.

SPSS version 25.0 was used to enter and analyze the collected data. Mean and standard deviation were calculated for quantitative variable like age, BMI, gestational age, inter-pregnancy interval. Frequency and percentage were calculated for parity, number of vaginal deliveries, history of hypertension, preeclampsia, NICU admission and indications for NICU admission. 2x2 table was generated to calculate relative risk between NICU admission and mode of delivery with RR>1 as significant. Data was stratified for age, gestational age, BMI, parity, inter-pregnancy interval, number of vaginal deliveries, hypertension, preeclampsia, and gestation diabetes. Post-stratification, 2x2 table was generated to calculate relative risk between NICU admission and mode of delivery in each stratum with RR>1 as significant.

RESULTS

In this study, we included females of reproductive age group. The mean age of females in exposed group was 26.50 ± 5.64 years and in unexposed group was 29.70 ± 5.89 years. There were mostly females of age 18-29 years. The mean gestational age at delivery was 38.92 ± 1.43 weeks in exposed group and 39.15 ± 1.41 weeks in unexposed group. In exposed group, there were 36 (60%) obese and 24 (40%) non-obese females. In unexposed group, there were 32 (53.3%) obese and 28 (46.7%) non-obese females. In exposed group, 15 (25%) were primigravida, 11 (18.3%) were primiparous and 34 (56.7%) were multiparous. In unexposed group, 9 (15%) were primigravida, 10 (16.7%) were primiparous and 41 (68.3%) were multiparous. In exposed group, 23 (38.3%) females had pregnancy induced hypertension, 24 (40%) females had preeclampsia and 32 (53.3%) females had gestational diabetes. In unexposed group, 29 (48.3%) females had pregnancy induced hypertension, 26 (43.3%) females had preeclampsia and 29 (48.3%) females had gestational diabetes. Number of previous vaginal deliveries is given in table below. Short inter-pregnancy interval (<12 months) was observed in 18 (30.0%) vs. 13 (21.7%) females respectively. Table-I

Out of 120 neonates, 69 (57.5%) were admitted to NICU. Figure-1

NICU admission was noted in 45 (75.0%) cases in exposed group while in 24 (40.0%) females in unexposed group. There was 4 times more risk of NICU admission in females who underwent cesarean section with Odds ratio of 4.500 (95% CI; 2.063, 9.816, p-value<0.0001). Table-II.

The major indications for NICU admission were also noted. In exposed group, the major indication was hypoglycemia (15.6%), followed by respiratory distress (22.2%), meconium aspiration (13.3%), Transient Tachypnea of the newborn (11.1%), jaundice (6.7%) and one neonate had congenital heart disease (2.2%). In unexposed group, the major indication was respiratory distress (33.3%) and meconium aspiration (33.3%), followed by hypoglycemia (16.7%), hypothermia (12.5%), and jaundice (4.2%), while Transient Tachypnea of the newborn, and congenital heart disease were nil in this group. Table-III

Table-I: Baseline parameters of females recruited in the study (n = 120)

	Exposed	Unexposed
n	60	60
Maternal Age (years)	26.50 ± 5.64	29.70 ± 5.89
18-29 years	42 (70%)	27 (45%)
30-40 years	18 (30%)	33 (55%)
Gestational age (weeks) at delivery	38.92 ± 1.43	39.15 ± 1.41
BMI (kg/m^2)	25.52 ± 3.64	25.18 ± 4.30
Obese	36 (60%)	32 (53.3%)
Non-obese	24 (40%)	28 (46.7%)
Parity		

Primigravida	15 (25%)	9 (15%)
Primiparous	11 (18.3%)	10 (16.7%)
Multiparous	34 (56.7%)	41 (68.3%)
History of		
Pregnancy induced hypertension	23 (38.3%)	29 (48.3%)
Preeclampsia	24 (40%)	26 (43.3%)
Gestational diabetes	32 (53.3%)	29 (48.3%)
Previous vaginal deliveries		
Nil	33 (55.0%)	28 (46.7%)
1	15 (25.0%)	14 (23.3%)
2	10 (16.7%)	11 (18.3%)
3	2 (3.3%)	7 (11.7%)
Inter-pregnancy interval (months)	18.58 ± 8.92	20.70 ± 8.63
Short interval (<12 months)	18 (30.0%)	13 (21.7%)
Moderate interval (13-24 months)	27 (45.0%)	27 (45.0%)
Long interval (>24 months)	15 (25.0%)	20 (33.3%)

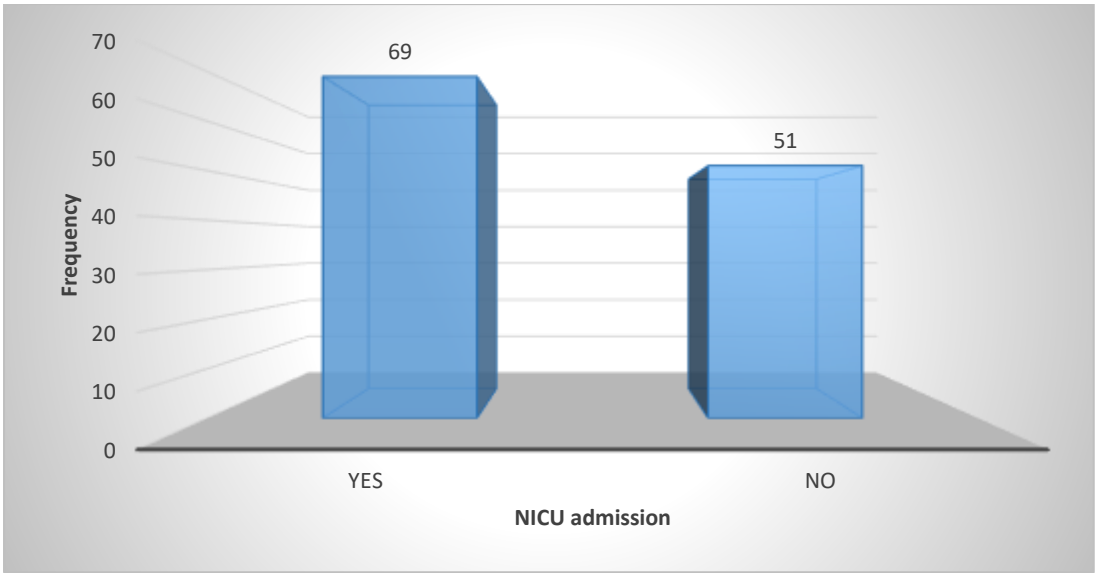

Figure-1: NICU admission in exposed and unexposed females (n = 120)

Table-II: Association of NICU admission with mode of delivery (n = 120)

		Group		Odds ratio (95% CI)
		Exposed (cesarean delivery) n = 60	Unexposed (vaginal delivery) n = 60	
NICU admission	Yes	45 (75.0%)	24 (40.0%)	4.500
	No	15 (25.0%)	36 (60.0%)	2.063, 9.816

Table-III: Indications for NICU admission in exposed and unexposed cases (n = 69)

Indication for NICU admission	Group	
	Exposed (cesarean delivery) n = 45	Unexposed (vaginal delivery) n = 24
Respiratory distress syndrome	10 (22.2%)	8 (33.3%)
Transient Tachypnea of the newborn	5 (11.1%)	0 (0.0%)
Meconium aspiration	6 (13.3%)	8 (33.3%)
Congenital Heart Disease	1 (2.2%)	0 (0.0%)
Hypoglycemia	13 (28.9%)	4 (16.7%)
Hypothermia	7 (15.6%)	3 (12.5%)
Jaundice	3 (6.7%)	1 (4.2%)

P-value = 0.221 (Insignificant)

DISCUSSION

NICU admission was noted in 45 (75.0%) cases in exposed group while in 24 (40.0%) females in unexposed group. There was 4 times more risk of NICU admission in females who underwent cesarean section with Odds ratio of 4.500 (95% CI; 2.063, 9.816, p-value<0.0001). Regardless of prior vaginal delivery experience, cesarean deliveries are more likely to result in life-threatening mother outcomes. The age ranges of expectant mothers in research examining the reasons for NICU admission based on delivery method differ throughout the literature.[11, 12] Neonatal-focused quality indicators for intrapartum care have been proposed, including unanticipated postnatal problems and unexpected admissions of term neonates to the NICU unit. Significant variance in overall hospital NICU rates has been seen in previous research; however, little is known about how obstetric practices affect these rates or whether systemic hospital procedures are responsible for variation in unplanned admissions among low-risk, term neonates.[13]

According to a study by Ulubaşoğlu et al., 52.2% of females who were unexposed (vaginal deliveries) and 74.6% of those who were exposed (cesarean deliveries) had NICU admissions. The newborn's transient tachypnea was 6.4% in vaginal delivery and 21.1% in cesarean section. Meconium aspiration was observed in 9.3% of vaginal births and 11.5% of cesarean sections. The respective rates of congenital pneumonia were 3.2% and 3.3%. However, there was no discernible difference between the two groups' NICU admission indications (p>0.05). [5] According to Finn et al., early term neonates born by elective cesarean section at 37 weeks had a 22% NICU admission rate, whereas those born at 39 weeks had a 10% rate.[14]

The particular rate of admission after cesarean section delivery was not disclosed, although the general rate of NICU admission among term newborns in a situation that is somewhat similar in Saudi Arabia is 4.1%. Nonetheless, a cesarean section was performed on half of their admitted term babies, while the other half were elective surgeries.[15] The varying admission criteria used by different institutions may account for the difference in the NICU admission rate across the globe. The kind of obstetric population, the presence of intermediate care units, which often care for newborns with lower acuity, the quality of care offered at the local neonatal intensive care units, and the existence of local hospital guidelines all have an impact on these variables. NICU admission rates are known to be greater for neonates born via cesarean section than for those born vaginally or vaginally following cesarean section.[16] More mature babies, particularly those delivered by scheduled cesarean section in the late preterm and early term categories (35-39 weeks gestation), have shown an increase in NICU admissions.[14, 17]

Eleven observational and randomized controlled studies have shown that elective cesarean sections performed between weeks 37 and 38 result in noticeably more respiratory difficulties for the newborn. According to one study, the rate of NICU admissions rose to 12.2% in early-term elective cesarean sections, while the rate in full-term cohorts was 7.5%.[18] According to data from a meta-analysis, respiratory distress is disproportionately more common in early-term and caesarean-delivered neonates, and it affects about 7% of term infants.[19] Particularly in infants born by elective caesarean section before the commencement of labor, the increased rate of respiratory distress is probably caused by insufficient alveolar fluid clearance and surfactant immaturity.[20]

CONCLUSION

It has been concluded that the risk of NICU admission increases four time if females delivered via cesarean section. On the basis of data, we have attained evidence for local population and found a significant association. Now we will implement findings of this study in local setting and counsel the mothers for NICU admissions and will plan strategies to prevent NICU admissions.

Conflict of Interest: None.

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