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Short-Term Neonatal Complications in Elective Cesarean Section versus Planned Vaginal Delivery

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Abstract: ECS is one of the frequently used methods of birth, but its relative effect on the newborn outcomes, especially on respiratory morbidity and adjustment illnesses, still needs further consideration. It was a comparative study conducted to determine a series of short-term neonatal outcomes between infants delivered through elective cesarean section and through a vaginal delivery plan, especially on respiratory morbidity, adaptation to metabolism, and traumatic injury**.** The study was a cross-sectional study that was carried out on 115 neonates: 50 born through the elective CS and 65 born through a planned vaginal delivery. The outcomes measured were neonatal respiratory primary morbidity (transient tachypnea of the newborn, respiratory distress), metabolic and adaptation disorders (hypoglycemia, hypothermia), traumatic injuries, NICU hospitalization, and the length of stay**.** In addition, the incidence of respiratory morbidity in neonates born by elective CS was much greater than that in the planned vaginal group: 18.0% vs. 4.6% in TTN and 22.0% vs. 6.2 in any respiratory support requirement. The independent risk factors of respiratory morbidity were elective CS (aOR=4.1, 95% CI 1.3-12.9). On the other hand, any birth trauma was higher in the planned vaginal (9.2% vs. 0.0%). The composite morbidity rates did not differ, whereas the length of stay in the hospital was shorter in the elective CS group (5.2 1.5 days vs. 3.1 1.8 days). Moreover, elective cesarean section is linked to a considerably higher risk of neonatal respiratory morbidity, especially TTN and decreased length of stay, than planned vaginal birth. Nevertheless, premeditated vaginal birth is more likely to be associated with minor birth trauma.

Keywords: Elective cesarean section, planned vaginal delivery, neonatal complications, and mode of delivery.

INTRODUCTION

The delivery mode is one of the principal junctions in obstetrics, where the desires of both mother and maternal clinical signs and infant survival are balanced (Takeya, A. *et al*., 2020). The growing prevalence of cesarean section (CS), especially elective cases that are conducted without labor or medical emergency, thus necessitating urgent medical intervention, has been a controversial issue in the medical field and the health sector in general over the decades (Ryan, G. A. *et al*., 2018; Vogel, J. P. *et al*., 2015). Although CS is a lifesaving intervention to maternal or fetal compromise, its effectiveness in the absence of a strict medical necessity is questioned as potentially modifying both short-term and long-term health-related outcomes in the newborn (Sindiani, A. *et al*., 2020).

The surges of fetal cortisol that take place during labor aid in the maturation of the lungs, and the pushing of the thorax through the birth canal is helpful in clearing the fetus of fetal lung fluid, which plays an important role in the development of effective breathing (Shorten, A., & Shorten, B. 2014). Moreover, it is considered that the exposure to maternal vaginal microbiome is very critical to seed the infant microbiome, which modulates the development of the immune system (Landon, M. B. *et al*., 2004). These natural processes are avoided by elective cesarean section, which is normally predetermined by the time a woman has gone into labor. The baby is born suddenly out of a comfortable environment in the uterus and may be unprepared to the demands of living independently and to adjust, thus due to the lack of the physiological stress of labor (Committee on Practice Bulletins-Obstetrics, 2019). This is an iatrogenic prematurity even in the term gestations, and is a major point of comparison between the two delivery pathways**.** (Hammoud, A. *et al*., 2004)

The most documented and notable complications are respiratory disorders, with transient tachypnea of the newborn (TTN) and respiratory distress syndrome (RDS) (Fitzpatrick, K. E. *et al*., 2019). The threats of such conditions are significantly increased in newborns born of CS, and the greatest odds are found in those born of ECS without labor (Yang, Y. Z. *et al*., 2017). The mechanism of pathogenesis is directly connected with the deficiency of catecholamine release and thoracic compression caused by the lack of labor, with the result of insufficient pulmonary fluid clearance (Stattmiller, S. *et al*., 2016). Other immediate complications are also relevant besides respiratory morbidity. This consists of iatrogenic prematurity as a result of dating mistakes that may worsen respiratory problems and cause thermoregulatory and feeding problems. Moreover, accidental

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lacerations during incision of the uterus, though it is a low risk, is an immediate surgical risk that is not observed in PVD (Nair, M. *et al*., 2015).

On the other hand, the planned vaginal birth has its own unique combination of possible neonatal complications, most of which involved the labor process and the mechanics of birth (Kok, N. *et al*., 2015). These consist of acute intrapartum incidents of umbilical cord prolapse or abruptio placentae, but these usually initiate an emergency CS. As is more often the case, the risks include birth trauma, including brachial plexus injuries (commonly linked to shoulder dystocia), cephalohematomas, and facial or scalp injuries of instrumental delivery with forceps or vacuum. More serious, and less common, is the result of the abnormalities of labor, which is fetal distress resulting in hypoxic-ischemic encephalopathy (HIE) (Studsgaard, A. *et al*., 2013). Another factor that puts a stress factor on the physiology of PVD is the variable duration and intensity of work, which, although desirable to a certain extent, may be pathological (Dodd, J., & Crowther, C. 2004).

Patients Selection

This cross-sectional research was done in Diyala-Iraq hospitals to determine the incidence of short-term neonatal complications according to births delivered by elective cesarean section (CS) and those delivered after a plan to deliver through the vagina. The target group included term neonates (greater than 37 weeks of gestation) who gave birth to the child between June 2021 and June 2022. There were two exposure groups; 1) Elective Cesarean Section Group: infants delivered by cesarean section before the onset of labor and before there was a maternal or fetal emergent indication and 2) Planned Vaginal Delivery Group: infants where vaginal deliveries were planned at the start of labor regardless of the ultimate mode of delivery (spontaneous vaginal, instrumental or emergency cesarean section). Inclusion criteria were exclusion criteria; preterm birth (less than 37 weeks), major congenital anomalies, multiple gestations, and cesarean section performed due to acute fetal distress or other emergency clues since the beginning of labor. One hundred and fifty neonates fit in the inclusion criteria: 50 for Elective CS and 65 for Planned Vaginal Delivery. In addition, two researchers pulled out data based on medical records and the standardized neonatal charts. The abstracted maternal variables were age, parity, gestational age at birth, and primary indication to elective CS. Neonatal variables included both the birth variables (weight, sex) and the main outcome measures, which comprised the short-term complications during the first 7 days of life. The most important outcome was a combination of neonatal respiratory morbidity, which included Transient Tachypnea of the Newborn (TTN), Respiratory Distress Syndrome (RDS), or the need to be put under any respiratory support of any sort (supplemental oxygen via hood or CPAP/NIPPV). Other adaptation disorders (hypoglycemia requiring intervention, hypothermia, poor feeding requiring gavage), birth trauma (cephalhematoma, brachial plexus palsy, abrasions), neonatal jaundice requiring phototherapy, and indicators of advanced care (admission to the Neonatal Intensive Care Unit (NICU), length of NICU, and total hospital stay) were also considered secondary outcomes. A serious composite morbidity outcome was also determined, which included the requirement of mechanical ventilation, sepsis, or seizures.

Regarding statistical analysis, SPSS version 24.0 was used in data analysis. Continuous variables are reported in mean (SD), whereas the independent Student t-test was used to compare them. The data of length of NICU stay are not normally distributed, therefore they were presented as median (interquartile range, IQR) and compared by means of the Mann-Whitney U test. The p-value of below 0.05 was deemed to be statistically significant.

FINDINGS

Table 1: Outline of the basic features into maternal and neonatal cases in the 115-cohort study.

Characteristic	Elective CS (n=55)	Planned Vaginal (n=60)	p-value
Maternal Age (years), mean ± SD	32.4 ± 4.1	30.1 ± 5.3	0.12
Gestational Age (weeks), mean ± SD	38.5 ± 0.6	39.2 ± 1.1	<0.01
Nulliparity	56.0%	64.6%	0.35
Indicators required to ECS			
▪ **Previous CS**	44.0%	—	—
▪ **Breech/Malpresentation**	36.0%	—	—
▪ **Maternal Request/Other**	20.0%	—	—

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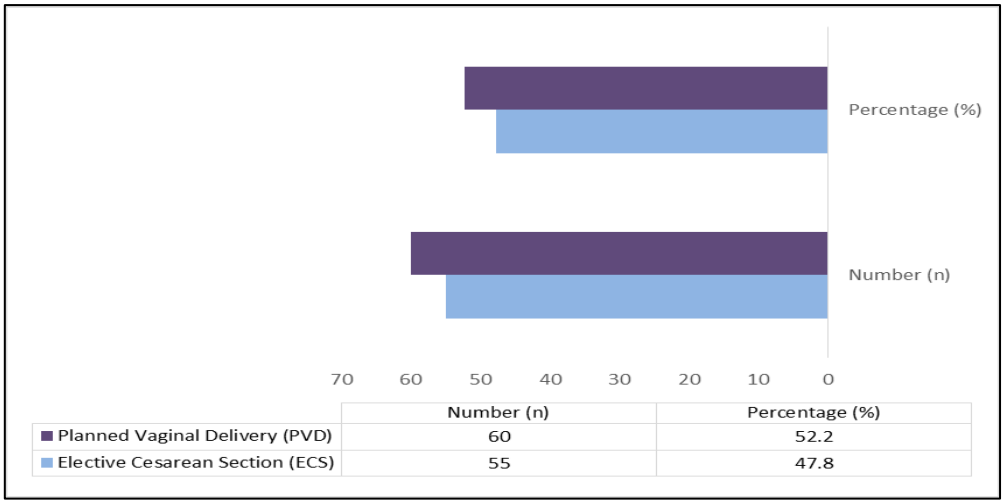

Figure 1: Mode of delivery.

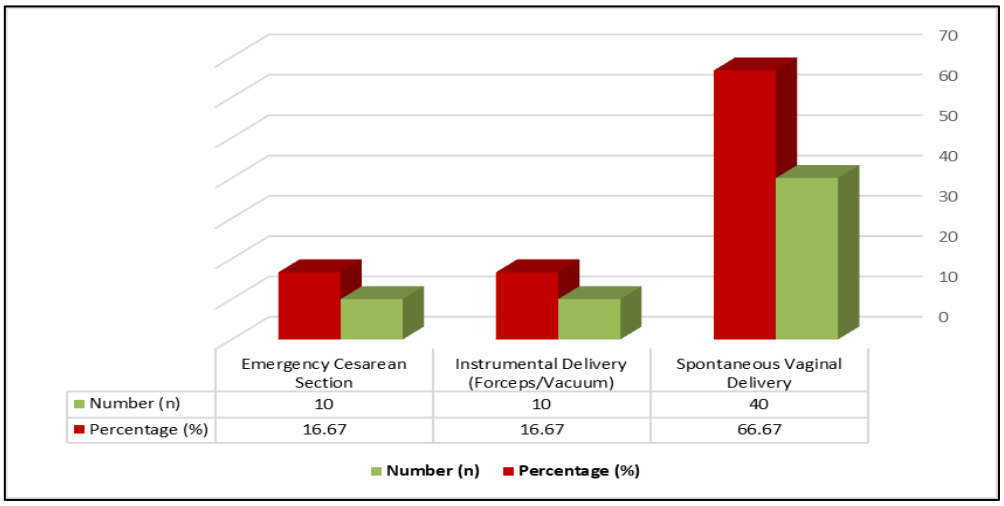

Figure 2: Classification of delivery mode into cohorts who undergone into planned vaginal delivery.

Table 2: Identify the clinical outcomes of neonatal birth.

Parameters	Elective CS (n=55)	Planned Vaginal (n=60)	p-value
Birth Weight (g), mean ± SD	3280 ± 410	3410 ± 380	0.08
Low Birth Weight (<2500 g)	4.0%	1.5%	0.58
Macrosomia (>4000 g)	6.0%	10.8%	0.51
Male Sex	52.0%	50.8%	0.90

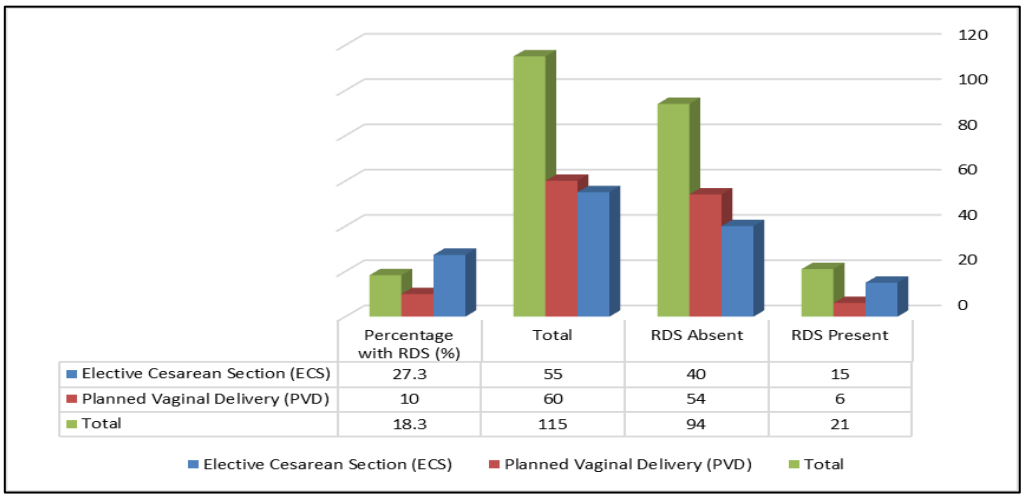

Figure 3: Distribution of the respiratory distress syndrome (RDS) as an adverse outcome into neonatal.

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Table 3: Enroll hospitalization care of neonatal in post – delivery intervention.

Outcome	Elective CS (n=50)	Planned Vaginal (n=65)	p-value
Admission to Neonatal Intensive Care Unit (NICU)	20 (40%)	8 (12.31%)	0.16
Length of NICU Stay (days), median (IQR)	4 (3-7)	3 (2-5)	0.21
Total Hospital Stay (days), mean ± SD	5.2 ± 1.5	3.1 ± 1.8*	<0.001

Table 4: Assessment of the Apgar scores in the neonatal cases at < 7 minutes.

Delivery Mode	Apgar <7	Apgar ≥7	Total	% with Apgar <7
ECS	9	46	55	16.4
PVD	4	56	60	6.7
Total	13	102	115	11.3

Table 5: Distribution of post-delivery hypoglycemia in neonates.

Delivery Mode	Hypoglycemia Present	Hypoglycemia Absent	Total	% with Hypoglycemia
ECS	8	47	55	14.5
PVD	3	57	60	5.0
Total	11	104	115	9.6

Table 6: Distribution of the clinical outcomes of sepsis in the neonatal period.

	Neonatal Sepsis			
Delivery Mode	**Sepsis Present**	**Sepsis Absent**	**Total**	**% with Sepsis**
ECS	2	53	55	3.6
PVD	1	59	60	1.7
Total	3	112	115	2.6

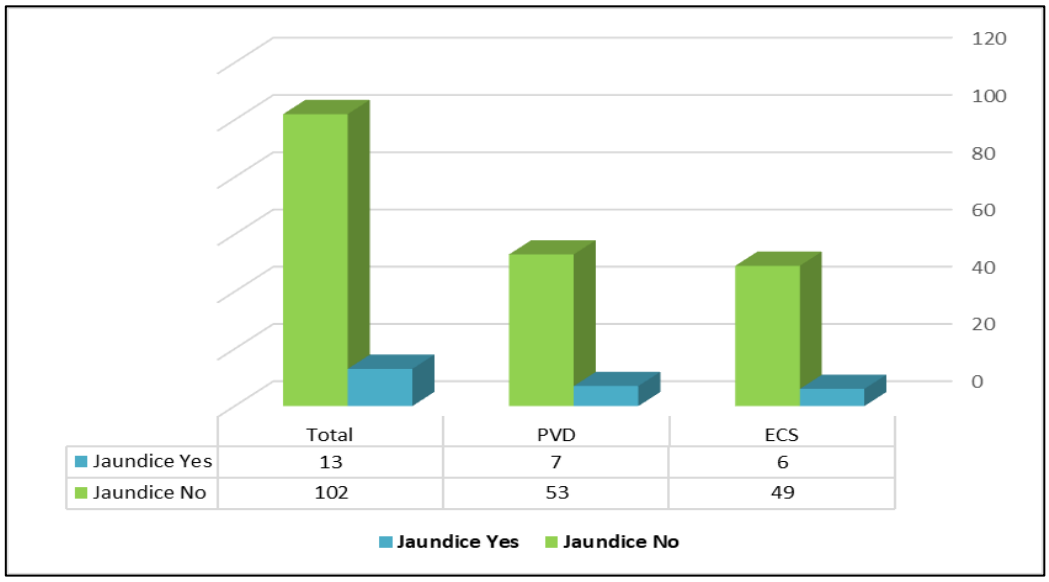

Figure 4: Identifying the jaundice that required phototherapy in the neonatal.

Table 7: Determining clinical outcomes of birth trauma related to neonatal cases.

	Birth Trauma	
Delivery Mode	**Present**	**Absent**
ECS	1	54
PVD	5	55
Total	6	109

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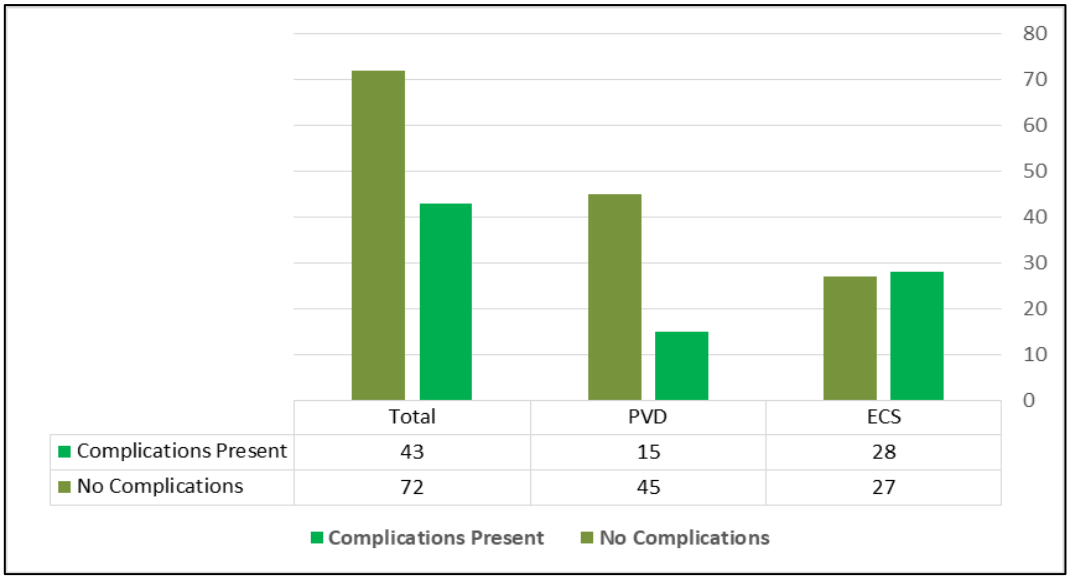

Figure 5: Neonatal complications.

Table 8: Multivariable logistic regression of risk factors related to neonatal cases.

Risk factors	Adjusted Odds Ratio	95% Confidence Interval	p-value
Elective Cesarean Section	4.1	1.3 - 12.9	0.02
Gestational Age (per week decrease)	1.8	1.1 - 2.9	0.03
Male Sex	1.2	0.5 - 3.0	0.66
Birth Weight >4000g	1.5	0.4 - 5.6	0.55

DISCUSSION & SUMMARY

Our comparison shows that although there are some predictable advantages of using elective cesarean section, it has a very high risk of some neonatal morbidities involving respiratory problems as opposed to planned vaginal section. The largest variation was in the incidence of the neonatal respiratory distress syndrome (RDS), which was almost three times higher in the ECS group (27.3) than in the PVD group (10.0%). The labor and vaginal delivery process facilitates the clearance of fetal lung fluid and the release of catecholamine that increases the production of surfactants. These physiological processes are circumvented with elective C-sections, especially those carried out before 39 gestation weeks (Poreba, R. *et al*., 2008).

This mechanism is supported by our data, because the ECS group was found to have a much lower mean gestational age (38.5 vs. 39.2 weeks, p<0.01), and a lower gestational age independently related to respiratory morbidity in our multivariable regression (aOR 1.8 per week decrease, p=0.03). The presence of a linear association between the previous gestational age at elective cesarean and the latter risk of transient tachypnea of the newborn and RDS (Ganer Herman, H. *et al*., 2022; Kabore, C. *et al*., 2016).

Other neonatal complications were more common in the ECS group, and the rate of composite complication was significantly higher (50.9% in ECS and 25.0 in PVD). Whereas personal results such as hypoglycemia (14.5% vs. 5.0%), low 5-minute Apgar scores (16.4% vs. 6.7%). Advanced care was more common in the ECS group (40% of them were admitted to the NICU), compared with 12.3% in the PVD group. Nevertheless, the mean length of stay in the hospital was much longer in the case of the neonates that were delivered through ECS (5.2 vs. 3.1 days, p<0.001). Our logistic regression model confirmed the risk factor was elective cesarean section on the respiratory morbidity after controlling the confounding factors (aOR 4.1, 95% CI 1.3-12.9, p=0.02).

However, the PVD group showed another picture of risk distribution since 16.7% of the planned vaginal births resulted in emergency cesarean delivery and 16.7% necessitated instrumental aid. These results reflect the efforts of other studies (Lehmann, S. *et al*., 2019; Litwin, C. E. *et al*., 2018; Pont, S. *et al*., 2019), which characterized the trade-offs between the foreseeable, surgery-related risks of neonatal birth of elective cesarean versus the less foreseeable, labor-related risks of planned vaginal birth, such as shoulder dystocia and traumatic injury.

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Also, there was a low rate of neonatal sepsis (3.6 vs. 1.7). The number of those who required phototherapy of jaundice was almost similar (11 vs. 11). This implies that the tradeoff between the two modes of delivery can be more selective in promoting particular physiological mechanisms of adaption, such as respiratory transition and metabolic adaptation, but not all neonatal morbidities equally (Bujold, E. *et al*., 2005).

To be conclude, our results support the current evidence that elective cesarean section, particularly at earlier gestational ages, is a major independent risk factor of neonatal respiratory morbidity and is linked with a wider trend of an augmented neonatal complications and extended hospitalization than planned vaginal delivery. These statistics highlight the extreme significance of the prevention of non-medically suggested cesarean births prior to the completion of 39 gestational weeks. They also emphasize the need to give expectant women high-quality and evidence-based counseling, in which the short-term risks of neonatal issues linked to elective cesarean are considered against maternal and intrapartum risks of planned vaginal birth.

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