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Complications: Short-Term Neonatal Elective Cesarean Section vs. Planned Vaginal Delivery

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Abstract: Elective cesarean section (CS) and planned vaginal delivery (VD) are typical births that are linked to different outcomes of infants. This information is necessary to understand their short-term neonatal complications to ensure that there is maximization of delivery practices and neonatal care. The purpose of the study is to demonstrate a comparison of elective CS versus planned VD concerning the outcome of neonatal care in the short term, that is, respiratory complications. The study design was a cross-sectional study including 127 neonates (n=63 and n=64) born during 12 months of follow-up (June 2024-June 2025) using both elective CS (n=63) and planned VD to be born in different hospitals in Iraq. This work gathered and summarized clinical outcomes in the neonate after delivery, respiratory conditions, and NICU hospitalization. Also, the children who were born out of elective CS had a greater number of respiratory complications (28.6% vs. 7.8%), such as respiratory distress syndrome and transient tachypnea. Their Apgar scores also showed lower results at 1 minute (7.2 vs. 7.8) and indicated a higher degree of hypoglycemia (14.3% vs. 4.7%). In summary, infants born through elective cesarean delivery face higher risks of respiratory complications, hypoglycemia, and having to be admitted to the NICU more than those who were born due to normal birth. These results reveal the sensitivity of perinatal care and counseling on the mode of delivery in order to reduce neonatal morbidity.

Keywords: Planned Vaginal Delivery, Elective Cesarean Section, Post-Delivery Complications, And Neonatal Sepsis.

INTRODUCTION

Choosing the modality of delivery is a pivotal point in obstetrics and neonatal practice with some drastic implications on the outcome of maternal and infant health [Brownlee, S. *et al*., 2017]. A decision on an adequate mode of birth during parturition is a subsequent choice which may affect various maternal and neonatal outcomes [Glasziou, P. *et al*., 2017]. Elective caesarean section and planned vaginal delivery are the main and respective choices, which have their specific advantages and possible threats. [Saini, V. *et al*., 2017]

The past few decades have seen a trend in an increase in the popularity of caesarean section in various parts of the world, especially in what can be rarely described as the elective ones performed before the phenomenon of spontaneous labor happening [Kleinert, S., & Horton, R. 2017; Miller, S. *et al*., 2016]. Elective caesarean is such that surgery is performed before labor sets in; generally, at the time of the 39th gestation week, but can be carried out earlier in case of medical necessity. The reasons other than the maternal preference for the elective caesarean delivery is sought is due to various reasons, and this includes certain obstetric pathologies. [Boerma, T. *et al*., 2018]

Planned vaginal birth assumes spontaneous development of labor and aims at spontaneous vaginal delivery. Short-term neonatal outcomes simply mean the physiologic condition and the general well-being of the neonate within the early days and weeks of life [Betran, A. P. *et al*., 2018]. There are myriad conditions that affect neonatal health, such as delivery mode, maternal physiologic condition, and gestational maturity. [Gibbons, L. *et al*., 2010]

Newborns delivered through elective cesarean are at a greater risk of respiratory problems, especially Transient Tachypnea of the Newborn (TTN) [Vadnais, M., & Sachs, B. 2006]. TTN is generally associated with pulmonary fluid retention, which can be attributed to the lack of hormonal changes not caused by labour that promote the clearance of the fluid. Additionally [Nelson, R. L. *et al*., 2010], babies born by the use of elective cesarean sections show greater hospitalization rates to the neonatal intensive care unit (NICU) relative to the vaginally born counterparts, presumably associated with respiratory distress amongst other acute perinatal issues. [Dodd, J. M. *et al*., 2013]

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Planned vaginal delivery births by parturients can be associated with faster lactation onset. Conversely, the postoperative period that follows a cesarean section can put off the commencement of breastfeeding and therefore can negatively affect neonatal nutrition. [Alfirevic, Z. *et al*., 2013; Rørtveit, G., & Hannestad, Y. S. 2014]

Elective caesarean section is a serious surgical operation that is accompanied by adverse effects like infection, bleeding, and anesthesia-related comorbidities. These complications may prolong the period of recovery and determine a negative impact on the maternal well-being during the postpartum period [Litorp, H. *et al*., 2013]. On the other side, women giving birth in the planned way tend to have their hospitalization shortened and their recovery time is quicker as compared to those having the caesarean section, which are beneficial in alleviating surgical pain, faster recovery, and less restrictive activities. [Vallely, L. M., & Mola, G. D. 2017]

Psychologically, the mode of delivery selected might trigger different emotions among the mothers. Other women have claimed that they feel more empowered and satisfied due to a planned vaginal birth, and that women who choose to deliver by caesarian section might have to experience feelings of being unfulfilled, especially where they had anticipations of vaginal birth. [Guise, J. M. *et al*., 2010; Fahmy, W. M. *et al*., 2018; Hou, L. *et al*., 2017]

PATIENTS & METHOD

The study involved a cross-sectional design to compare ovulatory neonatal issues in elective CS and planned vaginal delivery. The population that the study was conducted on included the neonates of mothers that experienced either an elective CS or planned VD in different hospitals in Iraq between June 2024 and June 2025. The selection criteria included the inclusion criterion of singleton gestations to term (gestational age of 37-40 weeks), and exclusion criteria were preterm birth, fetal defects, or possible maternal comorbidities that would affect the neonatal outcomes.

Data were collected by a review of medical records and the extraction of the appropriate demographic, obstetric, and neonatal data. Demographic variables like maternal age and parity, obstetric factors, including gestational age at delivery, were recorded so that the groups can be compared. Neonatal outcome measures comprised birth weight, Apgar score after 1 minute of birth, the occurrence of respiratory problems, hypoglycemia, hospitalization in the NICU, and sepsis.

The evaluated outcomes were the neonatal respiratory distress syndrome (RDS) and transient tachypnea of the newborn (TTN) because it is also usually a respiratory complications in the short term based on the mode of birth. Secondary outcomes included the Apgar scores, blood glucose in neonatal units, occurrence of hypoglycemia (blood glucose of less than 45mg/dL), admission into the NICUs, and neonatal sepsis. One-minute Apgar was documented as an indicator of the immediate well-being of the neonatal situation. Blood glucose analysis was done during the initial hours of postpartum, and hypoglycemia was established as below 45mg/dl of blood glucose level. Clinical monitoring of neonatal respiratory conditions was done with confirmation through radiological results that were done when required, and helped to diagnose RDS and TTN. Neonatal sepsis diagnosis has been made on the basis of clinical manifestation and validated with the help of laboratory tests, including those of the blood cultures.

The two groups were compared by using statistical analysis (SPSS, version 24.0). Student t -test or Mann- Whitney U test was used to conduct continuous tests on variables like maternal age, gestational age, birth weight, Apgar scores, and blood glucose levels, based on the distribution of the data. Chi-square or Fisher's exact test was used to compare categorical variables with each other, such as the occurrence of respiratory complications, hypoglycemia, NICU admission, and sepsis. A p-value of below 0.05 was said to be statistically significant.

RESULTS

Demographic Characteristics of Study Group

The analyzed comparisons of maternal age, gestational age to parity between elective cesarean section (CS) and planned vaginal delivery (VD) groups did not show any statistically significant differences. The average age of the mothers in the elective CS group was 30.5 years, and the average age in the planned VD group was 29.8 years (p=0.45). The percentage of nulliparous women was also similar, with 63.5 and 65.6 percent in the elective CS and the planned VD groups, respectively (p=0.78). These results indicate that both groups were very similar concerning the baseline maternal demographic factors.

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Table 1. Baseline the demographic features of patients.

Variable	Elective CS (n=63)	Planned VD (n=64)	p-value
Maternal Age (years)	30.5 (4.2)	29.8 (4.7)	0.45
Gestational Age (weeks)	38.2 (1.1)	38.5 (1.0)	0.32
Parity (nulliparous)	40 (63.5%)	42 (65.6%)	0.78

Neonatal Birth Weight

No statistically significant difference was found in the neonatal birth weights with the elective CS group, with a mean birth weight of 3300 grams (SD=420), and the planned VD group, 3400 grams (SD=390). The elective CS group had a range of weights (2400-4200 gm), and in the case of the planned VD group, its weight range was between 2500 g and 4100 gms.

Table 2. Clinical outcomes of birth weights in the neonatal period by grams.

Group	Mean (SD)	Range
Elective CS	3300 (420)	2400–4200
Planned VD	3400 (390)	2500–4100

Apgar Scores at 1 Minute

There was a great difference in Apgar scores at 1 minute, whereby the intended VD group scored higher. In the elective CS group, 87.3% of neonates were found to have a score of 7 or above on the Apgar, with an average score of 7.2 (SD=0.8). On the other hand, the 96.9% of the neonates in the planned VD group had 7.8, where the mean is equal to 7.8 (SD=0.4). This is an indication that the neonates born through intentioned VD have moderate improved instant post-birth adjustment, indicated by improved Apgar scores.

Table 3. Assessment of Apgar scores of neonates at 1 minute & at equal or above 7 minutes in both groups.

Group	Number (n)	% with Apgar ≥7	Mean (SD)
Elective CS	63	55 (87.3%)	7.2 (0.8)
Planned VD	64	62 (96.9%)	7.8 (0.4)

Quality of Life: Neonatal Respiratory Complications

The elective CS group had more respiratory complications. All in all, respiratory problems were observed in 28.6% of neonates who had been diagnosed with respiratory distress syndrome (RDS) and respiratory transient tachypnea of the newborn (TTN). Precisely, RDS was found to differ in 12.7% of all neonates, 9.5% in the elective CS, and 3.1% in the planned VD group. TTN occurred 15.9 times in total, 11.1 times in voting CS, and 4.7 times in planned VD. The pooled analysis suggests that there are an increased number of respiratory complications after elective CS as compared to planned VD.

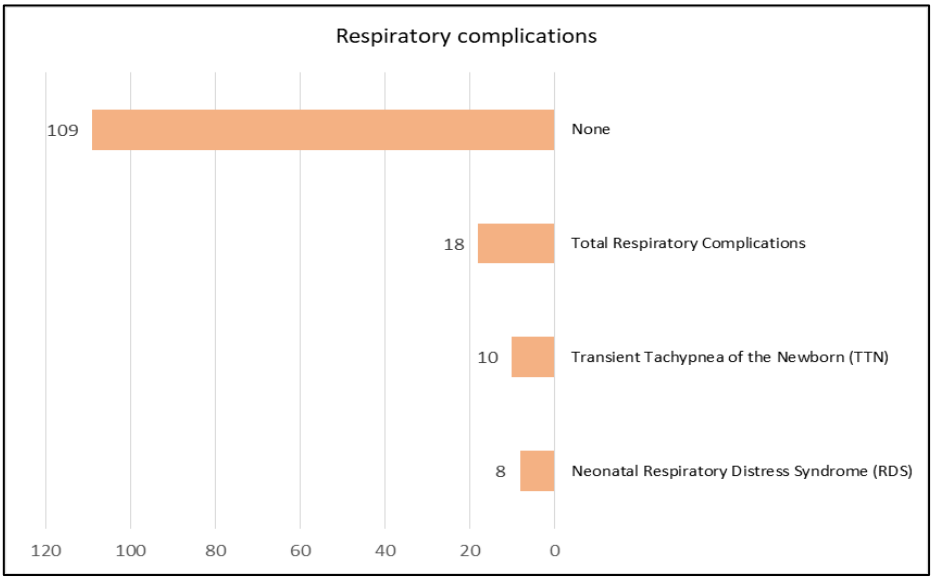

Figure 1. Prevalence of respiratory complications in the neonatal period.

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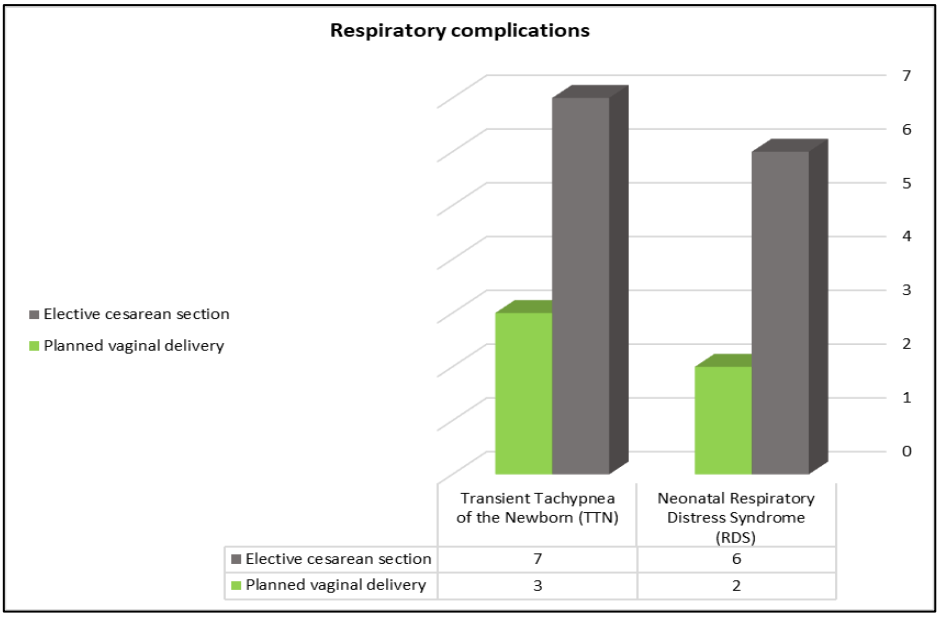

Figure 2. Distribution the respiratory complications in the neonates by mode of delivery.

Table 4. Hospital outcomes of neonatal admission in the Neonatal Intensive Care Unit.

Groups	Number (n)	Percentage (%)
Elective CS	12	19.0%
Planned VD	4	6.3%

Blood glucose level in neonates

The average levels of neonatal blood glucose were marginally less in the elective CS group at 55.2 mg/dL (SD=8.4) compared to the planned VD group, 60.5 mg/dL (SD=7.9). The elective CS group showed a blood glucose level of 40-70 mg/dL, and the planned VD group was 45-75 mg/dL and indicated similar glycemic patterns, including a tendency to have lower blood glucose values of the neonates delivered through elective CS when compared to the planned VD group.

Table 5. Determining levels of blood glucose (mg/dL) in the neonates.

Group	Mean (SD)	Range
Elective CS	55.2 (8.4)	40–70
Planned VD	60.5 (7.9)	45–75

Incidence of Hypoglycemia

A report of hypoglycemia, which is defined as a level of glucose in the blood that is below 45 mg/dl, was noted in 14.3% of the babies that were sampled uniformly. The prevalence was greater in the elective CS group of 9.5% than in the planned VD group of 4.7%. This indicates that there is a tendency of rising cases of hypoglycemic events in the neonates delivered through elective CS.

Table 6. Enroll the hypoglycemia outcomes of blood glucose < 45 mg/dL.

Variable	Number (n)	Percentage (%)
Hypoglycemia Cases	9	14.3%
- Elective CS	6	9.5%
- Planned VD	3	4.7%

Neonatal Sepsis

There was no difference in the incidence of neonatal sepsis in both groups, and a total of 2 cases (3.2%). There was one case per group, which is 1.6 percent of the respective populations. One of these was early-onset sepsis, and the other one was late-onset sepsis.

Table 7. Post-delivery neonatal sepsis of patients in both groups.

Variable	Number (n)	Percentage (%)
Neonatal Sepsis Cases	2	3.2%

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Early-Onset Sepsis	1	1.6%
Late-Onset Sepsis	1	1.6%
Groups	**Sepsis (n, %)**	
Elective CS	1	(1.6%)
Planned VD	1	(1.6%)

DISCUSSION

Elective CS, which is not usually accompanied by medical reasons, has been linked to various complications in the neonatal unit than PVD. The delivery mode determines the neonatal respiratory conditioning, chances of contracting an infection, and other direct health indices [Gregory, K. D. *et al*., 2012; Harper, M. A. *et al*., 2003]. Short-term neonatal issues of the most investigated issues include respiratory complications. It has been established in many studies that transient tachypnea of the newborn (TTN) and respiratory distress syndrome (RDS) is more often to be found among infants born through elective CS [Deneux-Tharaux, C. *et al*., 2006]. It is mainly due to the lack of thoracic compression caused by labor and hormonal surges contributing to the clearance of lung fluid that this is more likely to cause this risk. Conversely, labor facilitates the release of endogenous catecholamine that facilitates the absorption of lung fluid, hence mitigating respiratory complications during vaginal deliveries [Liu, S. *et al*., 2007]. These reports are consistent with our findings, where the prevalence of TTN and RDS showed a significant statistical difference with the elective CS group. [Zwart, J. J. *et al*., 2008]

Newborns born through CS are at a slightly higher risk of neonatal sepsis, which may be different because of the exposure to the microbes [van Dillen, J. *et al*., 2010]. Nevertheless, a German study [Pallasmaa, N. *et al*., 2008] demonstrated that the probability of infection is not high across the board and that sterile surgical procedures help to decrease the risks of infections. Moreover, the Apgar scores, which is a brief evaluation of newborn vitality, will be observed to be slightly lower in elective CS, especially at 1 minute, because of the absence of stress during labor. The scores, however, normalize by 5 minutes [Mylonas, I., & Friese, K. 2015]. The other factor is the neonatal admission to intensive care units (NICU). Certain studies indicate an increase in NICU admission rates in infants who are born through elective CS, and this is mainly caused by the respiratory problems [D'Souza, R. 2013]. Our results are consistent with this trend, and the NICU admissions in the CS group increase significantly in a statistically significant way.

Also, it is discovered that elective CS is linked to reduced exposure to maternal flora that may have a significant effect on the neonatal microbiome and, possibly [National Institute of Health and Care Excellence, 2012], the immune system development. Although this point mostly refers to the long-term consequences, there is some evidence of preliminary differences with respect to neonatal immune parameters, but it requires further investigation. When we compare our results with the already published articles in Japan, the uniformity is observed in the high rate of respiratory morbidity in relation to elective CS; other complications tend to be similar, such as infection and Apgar scores. Besides, the approach of studies to the difference in methodology, such as sample size, definition of complications, and the time of evaluations, may affect the reported results. [Rothenberg, K. H. 2006]

The French study further highlighted that in cases where it is not done because of obstetric reasons, then the elective cesarean section is associated with a greater risk of adverse neonatal respiratory outcomes in the immediate postpartum period than the planned vaginal delivery [Wax, J. R. 2006]. Although the rates of infections and the Apgar scores are similar, the large number of NICUs demonstrates that due attention should be paid to the nature of the delivery, between the preference of the mother and the state of the baby. [Allen, V. M. 2003]

CONCLUSION

Babies born through elective CS were also found to have a marginally low Apgar score at 1 minute and a high respiratory complications rate, such as respiratory distress syndrome and transient tachypnea. Moreover, the elective CS group had other dominant rates of hypoglycemia and neonatal sepsis than the planned vaginal delivery group. Such results indicate that scheduled vaginal birth is linked to superior temporary neonatal results, even though more studies need to be carried out in order to ascertain these experiences.

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