
The Correlation between Duration of Fetal Extraction during Cesarean Section and Development of Transient Tachypnea of Newborn

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Abstract

Background: Pregnancy and delivery are considered as normal in women. Some of the deliveries put the mother and baby's life at risk requiring caesarean section but sometimes it is also performed on request. Negative obstetric and perinatal outcomes are more likely after a cesarean section.

Objectives: Our research was done to demonstrate how operating time affects the immediate neonatal outcome.

Methodology: The study included 200 women having a singleton pregnancy, a full term cesarean delivery, and no underlying medical conditions (uncomplicated pregnancy), fetal distress or neonatal congenital anomalies. The neonates were assessed and evaluated through Apgar score.

Results: : the duration from incision of the skin till clamping the cord was ranged between 3 and 22 minutes, and the duration from incision of the uterus till clamping of the cord was ranged between .5 to 4 minutes. No significant correlation between Apgar score of the neonates, either after 1 minute or 5 minutes, and the U-C interval. 13 neonates developed Transient Tachypnea of Newborn (TTN) and transferred to NICU. Gestational age ranged between 38 and 40 weeks, with mean of 38.740 ± 0.753 weeks. TTN was developed in 7 males and 6 females. no significant relation between BMI and development of TTN. no significant correlation between the S-C interval and the development of TTN. No statically significant correlation between development of TTN and U-C interval.

Conclusion: Gestational Age is a predictor for the development of TTN; CS is preferred to be done at 39 weeks. Increase the duration from the uterine incision till the cord clamp increase the probability of TTN occurrence.

Key words: Caesarean section; uncomplicated pregnancy; Apgar score; Transient Tachypnea of Newborn

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Introduction

The traditional definition of a cesarean birth is the delivery of a fetus via an anterior uterine wall incision made during surgery [1].

Cesarean deliveries are now the most common surgery in obstetrics. The emergence of newborn respiratory diseases, particularly the incidence of Transient Tachypnea of the Newborn, have been mirrored by this circumstance. A cesarean section is often carried out when a vaginal delivery might endanger the life or health of the mother or the infant, however in more recent years it has also been requested for deliveries that would have otherwise been natural [2].

CS has more postoperative problems, such as hemorrhage and a lengthier recovery period. Even though they may have been done at full term, CS conducted without antecedent labor is linked to a greater risk of respiratory distress than those performed after the beginning of labor [4, 5].

Understanding the impact of operating duration on perinatal morbidity is crucial given the rising prevalence of cesarean sections worldwide, since operative time may be one of the variables contributing to a poor neonatal outcome during cesarean surgery [6].

Infants born by cesarean section are more likely than infants born vaginally to experience negative respiratory outcomes like respiratory distress syndrome, transient tachypnea of the newborn, higher neonatal morbidity, admission to the NICU, especially if delivery occurs before the start of labor, and maternal pain in the puerperium [7,8].

An increased risk of newborn encephalopathy, future cerebral palsy (cp), and learning challenges is substantially correlated with a critically low Apgar score at 5 minutes [9].

The purpose of this research was to evaluate the relationship between the length of fetal extraction after cesarean delivery and the likelihood that the baby may have brief tachypnea.

Patients and methods

The present study was carried out in Beni-Suef University Hospital and Nasser central Hospital during the period from May 2020 to December 2020, Two Hundred (200) pregnant women were included in the study fulfilling the inclusion and exclusion criteria.

Inclusion criteria included: Elective cesarean section, Primary and repeat Cesarean section, No history of medical disorders, Gestational age between 38 weeks to 40 weeks

Exclusion criteria included: Cesarean section due to fetal distress, Fetal congenital anomalies, Multiple pregnancies, Gestational age below 38 weeks and above 40 weeks, IUGR, General anesthesia, Maternal drug intake before C.S which may affect the neonatal wellbeing e.g. “narcotics”, Antepartum hemorrhage, Maternal medical disorders e.g. DM, hypertension, anti-phospholipid syndrome, Premature rupture of membrane.

Patients included in the study were subjected to the following:

Full History Including: Maternal age, Gestational Age, Obstetric history, Mode of delivery in the previous pregnancy/ pregnancies if present, Exclusion of any medical disorder, or any drug intake which may affect neonatal wellbeing. Clinical Examination Including: Vital signs, systematic and obstetric Examination. Laboratory Investigations Including: Fasting and 2h PP Blood Sugar, Albumin in Urine, CBC, coagulation profile, liver & kidney function tests.

Ultrasound: To assess Biophysical Profile (BPP), which include: Amniotic Fluid Index (AFI), Fetal Movement, Fetal tone, Fetal Breathing, and Non stress test using CTG, to assess fetal wellbeing and to confirm the Gestational Age.

Operative assessment including: Time from initiation of anesthesia till clamping of the

cord and time from incision of the uterus till clamping of the cord were recorded.

Neonatal assessment Including: Follow up the neonate for Apgar score at 5 min then follow up after 6-24 hours by trained pediatrician and neonatal weight. Apgar score at 1 minute and 5 minutes, respiratory rate and weight of neonate were reported by the pediatric team, and then occurrence of Transient Tachypnea of Newborn (TTN) among the studied neonates (which was followed up for 6-24 hours) was observed.

Ethical statement:

In accordance with its guidelines, the ethical research council of the faculty of medicine at Beni-Suef University accepted this study. All of the pregnant participants gave their written permission after receiving full disclosure.

Statistical analysis

SPSS version 25 was used for data analysis. Description of variables was presented as mean, standard deviation (SD), median, range, numbers (No.) and percent's (%); Using kolomogrove, ANOVA, T-test test, Pearson and spearman. The significant results were when P-value ≤ 0.05

Results

The mean age of the studied women was 27.3 ± 5.5 years. The mean gestational age was 38.7 ± 0.75 weeks. The mean BMI of the studied women was 29.2 ± 3.5 . Most of fetal presentations were cephalic 92.5% and least of them were breach 7% and only one case 0.5% had transverse presentation. 39.5% of the studied cases were the third time to pass section, 36.5% were the second time and 24% were the 1st time. The mean time from initiation to cord clamping was 17.5 ± 4.6 minutes while the Time from uterine incision till cord clamping was 2.4 ± 1.1 minutes. The mean weight of the studied neonates was 3298 ± 346 grams. The Apgar score after 1

minute and after 5 minutes was 5.6 ± 1.5 and 8.2 ± 1.3 and the respiratory rate was 51 ± 7 /minute. The sex distribution of the neonates was almost equal as males were 45.5% and females were 54.5% (Table 1).

There were 6.5% of the studied neonates had transient tachypnea of neonates (Table 2).

Babies who had TTN had statistically significant lower gestational age 38.1 ± 0.3 weeks versus 38.8 ± 0.8 weeks of who passed without TTN and also had statistically significant longer duration from uterine incision till cord clamping 3.4 ± 0.9 minutes versus 2.3 ± 1.1 minutes of who passed without TTN (P-value=0.001) (Table 3).

There was a statistically significant weak negative correlation between the respiratory rate and gestational age, maternal BMI and neonatal weight. Also, there was a statistically significant weak positive correlation between the Apgar score at 5 minutes and the gestational age (Table 4).

Babies with transverse position had a significant higher respiratory rate and lower Apgar score at 1 and five minutes (Table 5).

There was no significant difference between male and female babies regarding their respiratory rate and Apgar score at 1 and five minutes (Table 6).

There was no significant difference between mothers who were passing 1st, 2nd or 3rd section regarding their babies' respiratory rate and Apgar score at 1 and five minutes (Table 7).

The cut off was 2.9 (minutes) of the duration from the uterine incision till the cord clamp, it is predicted the occurrence of TTN by sensitivity 84.6% and exclude its absence with specificity 55%. Increase the duration from the uterine incision till the cord clamp increase the probability of TTN occurrence and decreases the probability of its exclusion or absence (Figure 1).

Discussion

TTN, being the most common cause of neonatal respiratory distress, is closely related to Cesarean section. This association is more pronounced when the cesarean delivery is scheduled before initiation of labor [10].

On the other hand, spinal anesthesia has become the default anesthetic procedure offered in everyday obstetric practice, except when general anesthesia is necessary in certain indications. The goal of the current study was to investigate the relationship between the length of the fetal extraction procedure during a cesarean section, measured as the development of TTN and the Apgar score recorded after five minutes (I-C interval) or as the time from the beginning of anesthesia to clamping the cord (U-C interval). According to the study's findings, which included 200 women, there was no statistically significant link between the I-C interval and the Apgar score recorded after five minutes (P-value = 0.95) and between the U-C interval and the Apgar score reported after five minutes (P-value = 0.22).

The current study is supported by a study by Maayan-Metzger and colleagues [11] that found no significant correlations between the majority of the major neonatal short-term clinical outcomes and the length of the three main stages of an elective cesarean delivery at term (from induction of anesthesia to delivery (I-D), from incision of the skin to delivery (S-D), and from incision of the uterus to delivery (U-D)). The findings suggest that obstetricians conducting regional anesthetic-assisted elective cesareans for term pregnancies have a reasonably long timeframe to complete the procedure without compromising infant health.

The study agrees also with a study done by ZAHER and colleagues [12] and demonstrated no correlation between the time between the start of anesthetic and the time the cord was clamped (up to 25.5 minutes for uterine incision and 4.5 minutes for cord

clamping) and the Apgar score at 1 and 5 minutes. However, Doherty and colleagues found in their research A longer operating duration was directly correlated with low five-minute Apgar scores. They divide the cesarean section time intervals into three categories: 30 min, 30–60 min, and > 60 min. Apgar 5 min < 7 was significant with the duration between 30-60 min and >60 min. These findings persisted even after the underlying maternal conditions and the reason for the cesarean had been taken into consideration. This suggests that the surgical technique from incision to delivery is an important consideration in neonatal outcome [13].

The current results showed no significant correlation between multiple cesarean section and Apgar score recorded after 5 minutes (P-value = 0.256). The present study agrees with a study done by Qublan and Tahat [14], in Jordon, and showed no significant correlation between multiple cesarean section and Apgar score recorded after 1 minute and 5 minutes, where Apgar score >7 at one and 5 minutes were similar in the 3 groups; Group 1 = with 1 previous C.S (n=1183); Group 2 = 2 previous C.S (n=781); and Group 3 = >3 previous C.S (n=312). However, it differs with different research conducted by Gedikbasi et al. [15] that shown that having several, consecutive cesarean procedures raise the chances for operating complications and unfavorable neonatal outcomes.

Unexpectedly, in the current study also, there was no significant correlation between the gestational age and Apgar score 5 min (P-value=0.09), this can be explained as all the cases in the study were between 38 to 40 weeks.

However, Li et al. [16] demonstrated that gestational age had an effect on Apgar score. The gestational age was closely correlated with the 1- and 5-minute Apgar scores. The main factors that contributed to a falling Apgar score as gestational age decreased were respiratory efforts, muscular tone, and

reflex.

Another American research revealed that gestational age affected the distribution of Apgar scores, with the lowest gestational ages having larger proportions of low Apgar scores [17].

More analysis for the results in the present study, showed that pregnant women with history of previous cesarean section increased the duration of the I-C interval, with highly significant correlation (P-value = 0.01).

According to research conducted in Mississippi, the length of prior cesarean sections had a substantial impact on the length of the cesarean operating time [13].

It agrees with another study done by Wilson et al. [18] who concluded that in women with previous cesarean deliveries, operative times become longer. It was noticed, in the present study, the absence of significant correlation between the I-C interval and the neonatal respiratory rate (P-value = 0.817), or the occurrence of TTN (P-value = 0.437). A thesis done in 2013, by OYEYEMI [19], on 200 pregnant women, showed that the duration of fetal extraction from initiation of anesthesia until extraction of fetus during cesarean section has no effect on incidence of Transient Tachypnea of The Newborn; While the increase in duration of fetal extraction during cesarean section is associated with increase in neonatal respiratory rate.

The current study show that U-C interval increased in the duration, with the increase of the duration of I-C interval with a significant correlation (P-value = 0.001). It agrees with in a study done by Maayan-Metzger and colleagues [11] where longer I-C interval among women with longer U-C intervals (P-value = 0.04).

History of doing Previous cesarean section before showed no significant correlation with the U-C interval (P-value = 0.829).

It agrees with Maayan-Metzger and colleagues [11] study where no significant

correlation between those with previous cesarean section and U-C interval.

In the present study also, birth weight of the neonates showed no significant correlation with the I-C interval and U-C interval (P-value = 0.3, P-value = 0.883, respectively).

It agrees with Doherty and co-workers study [13], while in Maayan-Metzger and colleagues study [11], there was a significant correlation between birth weight of the neonates and U-C interval, but no significant correlation with I-C interval.

Further analysis in the results of the present study showed that the gestational age was statistically significant with Transient Tachypnea of Newborn (TTN), as gestational increase the incidence of TTN decrease (P-value= 0.002).

The findings supports a study by Riskin and colleagues that revealed that GA before 38 weeks was linked to a higher risk of TTN in babies delivered through elective CS. Longer hospital stays and substantial morbidities were linked to TTN. Younger GA and CS delivery are risk factors for TTN. Even though TTN is a self-limiting condition, it is still accompanied by serious morbidities. Scheduling elective CS at a gestational age of at least 38 weeks may reduce the incidence of TTN [20].

According to the research done by Tita and colleagues, if an elective cesarean birth is postponed until the fetal gestational age is between 39 and 41 weeks, minimal complications arise. If an elective cesarean birth was carried out in the 37th through 38th week of pregnancy, complications, especially those involving the neonatal respiratory system, were more likely to occur. Before 39 weeks of pregnancy, elective recurrent cesarean birth is prevalent and is linked to poor respiratory and other newborn outcomes [21].

When compared to intended vaginal delivery, Tita and colleagues [21] found that elective cesarean delivery was generally

associated with a worse neonatal outcome. Delivery by elective cesarean before 39 weeks also increased the incidence of serious neonatal respiratory morbidity, which is defined as requiring continuous oxygen supplementation, continuous positive airway pressure, or mechanical ventilation for any length of time. Compared to babies born by elective cesarean at 39 weeks or those delivered vaginally at any gestational age, infants delivered by elective cesarean at 37 weeks were 2- and 4-times more likely to develop significant respiratory morbidity.

According to Robinson et al., [22] there are advantages to delaying an intentional repeat cesarean birth until 39 weeks of gestation. The model showed rising costs via an increase in unfavorable outcomes among elective repeat cesarean births carried out before 39 weeks of pregnancy.

With a P-value of 0.707, the present investigation found no statistically significant relationship between newborn gender and TTN. According to research by Derbent and colleagues [23], lower gestational age, cesarean birth, and male sex are all independent risk factors for TTN.

Conclusion

Babies with transverse position had a significant higher respiratory rate and lower Apgar score at 1 and five minutes. Increase the duration from the uterine incision till the cord clamp increase the probability of TTN occurrence and decreases the probability of its exclusion or absence.

Conflict of interest

None

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Table (1) Basic operative characteristics of the studied cases:

Characteristics	Number
	No=200(%)
<u>Presentation:</u>	
Cephalic	185(92.5%)
Breach	14(7%)
Transverse	1(0.5%)
<u>C/S code:</u>	
1 st	48(24%)
2 nd	73(36.5%)
3 rd	79(39.5%)
Maternal age (years):	27.3±5.5
Gestational age (weeks):	38.7±0.75
Maternal BMI	29.2±3.5
SC Duration	12.8±3.9
Neonatal weight(gm):	3298±346
Neonatal sex:	
Males	91(45.5%)
Females	109(54.5%)
Apgar score after 1 min:	5.6±1.5
Apgar score after 5 mins:	8.2±1.3
Respiratory rate:	51±7

Table (2) Incidence of transient tachypnea of the studied neonates

TTN	no=200 (%)
Yes	13(6.5%)
No	187(93.5%)

Table (3) Relation between TTN and different maternal characteristics

Maternal and fetal	TTN	Mean±SD	P-value
Maternal age	Yes	27.9±3.5	0.664
	No	27.2±5.6	
GA	Yes	38.1±0.3	0.001**
	No	38.8±0.8	
Maternal BMI	Yes	28.4±4	0.384
	No	29.3±3.4	
Neonatal Weight	Yes	3185.4±402.4	0.224
	No	3306.3±341.6	
Duration from initiation to cord clamping	Yes	18±2.9	0.695
	No	17.5±4.7	
Duration from Skin incision to Cord clamping	Yes	13.5±2.8	0.447
	No	12.7±3.9	
Duration from uterine incision till cord clamping	Yes	3.4±0.9	0.001**
	No	2.3±1.1	

**P-value is highly significant at ≤ 0.001

Table (4) Correlation between fetal Respiratory rate and Apgar score at 1 minute and 5 minutes and different maternal and neonatal characteristics

Maternal and fetal characteristics		RR	Apgar after 1 min	Apgar after 5min
Maternal age	Pearson Correlation (r)	0.052	0.043	-0.092
	P-value	0.467	0.548	0.196
GA	Pearson Correlation (r)	-0.215**	0.125	0.151*
	P-value	0.002	0.078	0.033
Maternal BMI	Pearson Correlation (r)	-0.174*	-0.009	0.004
	P-value	0.014	0.896	0.953
Neonatal Weight	Pearson Correlation (r)	-0.154*	0.091	0.120
	P-value	0.029	0.200	0.092

Duration from initiation to cord clamping	Pearson Correlation (r)	-0.032	0.033	-0.068
	P-value	0.656	0.646	0.340
SC Duration	Pearson Correlation (r)	0.036	0.047	-0.075
	P-value	0.616	0.511	0.291
Duration from the uterine incision till the cord clamp	Pearson Correlation (r)	0.121	-0.021	-0.055
	P-value	0.089	0.772	0.442
Ops Code	Pearson Correlation (r)	0.028	0.043	-0.098
	P-value	0.694	0.543	0.166

Table (5) Comparison between different fetal presentation regarding fetal Respiratory rate and Apgar score at 1 minute and 5 minutes

Dependent factors		Mean±SD	
RR	cephalic	50.79±7.029	
	breach	54.71±10.373	<0.001**
	transverse	77.00±0	
Apgar after 1 min	cephalic	5.70±1.469	
	breach	5.07±1.940	0.019*
	transverse	2.00±0	
Apgar after 5min	cephalic	8.27±1.235	
	breach	8.07±1.492	0.031*
	transverse	5.00±0	

Table (6) Comparison between males and females regarding fetal Respiratory rate and Apgar score at 1 minute and 5 minutes

Dependent factors		Mean±SD	P-value
RR	Male	52.01±8.088	0.163
	female	50.51±7.046	
Apgar after 1 min	Male	5.51±1.649	0.374
	female	5.74±1.417	
Apgar after 5min	Male	8.23±1.359	0.925
	female	8.25±1.195	

Table (7) Comparison between women with different counting of the current section regarding fetal Respiratory rate and Apgar score at 1 minute and 5 minutes

Dependent factors		Mean±SD	P-value
RR	1st	49.90±6.957	0.162
	2nd	52.45±7.984	
	3rd	50.82±7.414	
Apgar after 1 min	1st	5.58±1.471	0.759
	2nd	5.56±1.581	
	3rd	5.73±1.525	
Apgar after 5min	1st	8.44±1.147	0.380
	2nd	8.25±1.382	
	3rd	8.11±1.230	

Figures

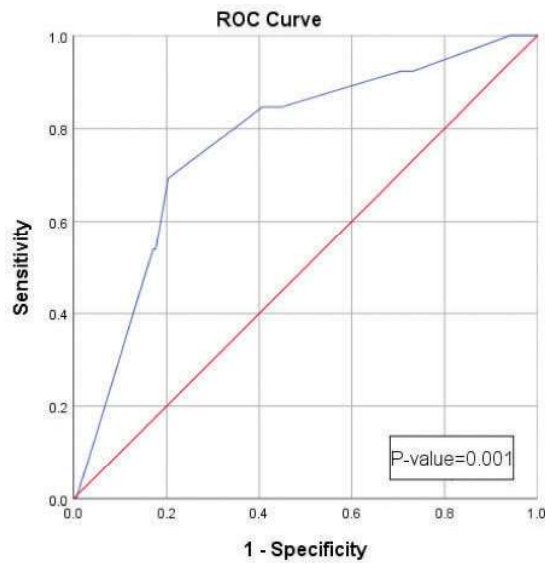


Figure (1) Receiver operating characteristic curve for prediction of the occurrence of TTN from the duration from the uterine incision till the cord clamping