Effects of Delayed Neonate Cord Clamping on Oxygen Saturation, Apgar Score, and respiratory distress syndrome at Maternity Teaching Hospital in Sulaimani City

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Abstract
Background: The World Health Organization has created a strategy to manage the third stage of labor that exchanged delayed cord clamping for early cord clamping in order to achieve several newborn advantages. Aim: This study was designed to evaluate the effect of delayed neonate umbilical cord clamping on Oxygen Saturation, Apgar score, and respiratory distress syndrome. Method: A true experimental study involving (160) pregnant women from the labor ward who were within the second stage of labor. Participants were randomly assigned between the 1st of July 2021 and the 1st of February 2022, Through the Structured Interviewing Questionnaire, samples were chosen using a simple random sampling procedure and neonatal outcomes checklist (Apgar score, oxygen saturation, and respiratory distress syndrome). was used, and the participants was randomly divided into two groups early cord clamping (< 1 minute) and delayed cord clamping (more than 1 minute). Descriptive and inferential statistics were applied to the data analysis. A structured interviewing questionnaire; includes two parts socio-demographic characteristics of the pregnant women with early and delayed cord clamping on neonatal outcomes (Apgar score, oxygen saturation, and respiratory distress syndrome). Result: among the 160 mothers, delaying cord clamping was linked to less study group participants' need for oxygen therapy. With both groups (DCC and ECC), there was a statistically significant difference in oxygen saturation between the first and tenth minutes. There was also a statistically significant difference in the Apgar score between the first and fifth minutes. Babies who had their cords clamped at 1-3 minutes or longer had their first breath and regular breathing established earlier. Neonatal respiratory distress was five times more common and neonatal intensive care unit admission was obviously greater in the Delayed cord clamping study group.Conclusion: The study concluded that Delaying cord clamping for longer than the first minute was a beneficial intervention to ensure higher oxygen saturation at the first and tenth minutes, and spontaneously breathing term newborn children born by vaginal delivery who received DCC into 1- 3 days old showed a clinical advantage on the neonatal outcome in that it was related with a decreased need for oxygen therapy among newborns as opposed to early cord clamping, which was associated with an increased need for oxygen therapy.
Keywords: Delayed Cord Clamping, Oxygen Saturation, Apgar score, and respiratory distress syndrome.

1. Introduction

The uterus and fetus must be connected by the umbilical cord (Mebarki, M. *et al*, 2021). A flexible, tube-like structure joins a fetus to the placenta of the mother. An organ connected to the uterine wall by the placenta, which in turn connects to the mother's blood supply (Khier, A, & Elghazaly, E. A, 2015).
A little connecting stalk that connects the embryo to its trophoblastic shell is the beginning of the development of the umbilical cord on the 19th or 20th day following fertilization (Gupta, T. *et al*, 2018) (Um, S. *et al*, 2020). The primitive umbilical cord grows out of this shell, and by the fifth week of pregnancy, the intestinal loop has been added to the primitive cord's contents. Around the 12th week of pregnancy, the primitive umbilical cord retracts to the fetus's abdomen, and the mature cord, which has two umbilical arteries and an umbilical vein bathed in Wharyon jelly and all wrapped in an amniotic membrane, continues to develop (Cardoso, R. M. *et al*, 2021).
The umbilical vein transports oxygenated blood with nourishment from the placenta to the fetus, and the umbilical arteries convey oxygen - depleted blood with waste material from the unborn baby to the placenta (Seidler, A. L. *et al*, 2021).
The typical umbilical cord has up to 40 helical turns and measures 50 to 60 centimeters in length and 2 cm in diameter. Fetal morbidity and death can increase as a result of abnormalities in the umbilical cord. Because the newborn can now breathe on its own, the umbilical cord is therefore clamped, then cut, and the remaining umbilical cord is delivered with the placenta after birth (Gomersall, J. *et al*, 2021).
The newborn is separated from the mother by cutting or clamping the umbilical cord. Umbilical

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cord cutting is the process of tying that cord using nippers in order to stop the placenta's supply of blood to the fetus (Katheria, A. C. et al, 2017). There are two ways to get the umbilical cord clamped during spontaneous labor: the first is immediate umbilical cord clamping within 30 minutes after the birth. Umbilical cord clamping is delayed for at least 1 minute following birth in the second modality. Due to diminished cardiac output, cerebral blood flow is lowered once more after one minute (De Bernardo, G. et al, 2020).

As part of the active management of the third stage of labor, the World Health Organization (WHO) no longer recommends early cord clamping because the research indicates that it has no effect on preventing postpartum hemorrhage (WHO, 2012). The WHO advised delaying cord clamping for all deliveries in 2014 while beginning newborn care, with early clamping advised if the baby needs immediate and advanced resuscitation (WHO, 2014). By keeping the left ventricular preload and oxygen supply constant until the lungs are aerated, delayed cord clamping aids in the fetal-to-neonatal transition. Most healthy term infants will successfully begin this cardiopulmonary adaptation during the first 60 seconds of life (Hooper, S. B. *et al*, 2016). However, some go on to experience respiratory difficulty. According to (Manley, B. J. et al. (2017), the chances of neonatal unit admission following delayed cord clamping range from 3% to 5% and between 7% and 11%, respectively, in low-risk births (Blank, D. A. et al, 2018).

In both term and preterm infants, delayed umbilical cord clamping has been associated with increased hemoglobin levels and iron status, improved baby and child neurodevelopment, less anemia, higher blood pressure, fewer transfusions, and decreased incidence of intraventricular hemorrhage, chronic lung disease, necrotizing enterocolitis, and late-onset sepsis, according to growing body of research. Polycythemia, jaundice, a greater need for phototherapy, maternal postpartum hemorrhage, or the demand for maternal blood transfusions are among potential drawbacks of delaying cord clamping (Fogarty, M. et al, 2018).

On the other hand, a delayed cord clamping technique where the cord is clamped 3 minutes after birth can raise the mean neonatal hemoglobin concentration and hematocrit. Additionally, it is linked to improved cardiac acclimatization, the prevention of infant anemia, and a shorter third stage of labor, which lowers the risk of neonatal distress. Late cord clamping may have an impact on the neonatal Apgar score because the newborn needs enough blood volume for oxygen transport and tissue perfusion. (Qian, Y. et al, 2019).

The purpose of this research was to assess the impact of delayed umbilical cord clamping on neonatal outcomes and to compare the effects of early and delayed umbilical cord clamping on neonatal outcomes. According to the World Health Organization, the study also examined the outcomes for neonates following delayed cord clamping.

2. Material and Method

Design of the study: The true- experimental study was carried out at the sole and important governmental Maternity Teaching Hospital in Sulaimani City.

Study Population: a simple random sampling technique of 160 pregnant women who are beyond their 37th to 42nd of gestation and fall into many age categories. The study was done between the 1st of July 2021 and the 1st of February 2022. The criteria of inclusion for choosing pregnant women were to be between weeks 37 and 42 or to be full-term mothers, prime mothers, or mothers who had many pregnancies. Mothers were older than 18 years old, and birth weights ranged from 2.500 to 4000 gm. If a woman has a negative Rhesus factor status, she was excluded from some labors. Mothers who don't cooperate, problems with the newborn (such as, intrauterine growth retardation, and congenital malformation).

Ethical Approval: The University of Sulaimani's College of Nursing's ethical review committee as well as the Maternity Teaching Hospital's ethical review committee both gave their approval to the study. The study's data was gathered through interviews. Each pregnant woman gave her consent verbally. A panel of 10 experts determined the content validity, and the reliability was determined by the correlation coefficient, which was r 0.87. (Statistically adequate).

Data collection: Direct interviews with the study participants served as the method for gathering data. A questionnaire was used for this created to collect information on socio-demographic traits, any prior obstetric history, reproductive history, hematological parameters, oxygen saturation, and Apgar score for newborns.

Data Collection Procedure: Using a simple random sample procedure, all survey participants were selected. The Maternity Teaching Hospital divided these into two groups of 80 each as the study groups (delayed cord clamping) and 80 each as the control groups (early cord clamping). The result for newborns is. Early neonatal outcomes include the fetus's ability to cry and breathe before the cord is clamped, as well as the fetus's Apgar scores at one and five minutes after delivery. First, fifth-, and tenth-minutes oxygen saturation, newborn weight immediately following birth, and need for oxygen therapy after fetus delivery.

3. Statistical Analysis

The statistical package for social sciences (SPSS) version 22 was used to computerize and analyze the data, Statistics (both descriptive and inferential) were used to analyze the data. To describe the characteristics of the study participants, frequency, percentage, mean, and standard deviation were

used. The nominal distribution of the data was assessed using the association using the Chi-square test.When the projected count of > 20% of the combined excel cells scored below 5, Fisher's exact test was applied. The mean differences between the groupings for early cord clamping and late cord clamping were compared using an independent (t) test. Significant is measured by the p-value. At p-value 0.05, a statistically significant difference was regarded, at p-value 0.001, a highly statistically significant difference was examined, and at p-value > 0.05, non-significant results were shown.

4. Results

Table 1: Socio-demographic variables on the mothers in the two groups:							
Variables	N=80 Control group Early cord clamping		N=80 Study group Delayed cord clamping		N=160 Total		P. value
	F	%	F	%	F	%	
Age ≤ 20 years 21-25 years 26-30 years >30 years	7 23 24 26	8.8 28.7 30.0 32.5	6 24 21 29	7.5 30.0 26.3 36.2	13 47 45 55	8.1 29.4 28.1 34.4	<0.001* H. Sig
Mean ± SD	27.2±5.10		28.5±5.76		<0.001† H. Sig		
Parity Primiparous Multiparous	23 57	28.7 71.3	24 56	30.0 70.0	47 113	29.4 70.6	<0.001* H. Sig
Mean ± SD	2.42± 1.15		2.41±1.14		< 0.001 H. Sig		
Gestational age at the birth 37 weeks 38-40 weeks 41-42 weeks	6 63 11	7.5 78.8 13.7	9 60 11	11.2 75.0 13.8	15 123 22	9.4 76.9 13.7	0.482** N. Sig
Mean ± SD	39.4±1.31		39.3±1.20		0.491 N. Sig		
**By Chi-square test. *By Fisher's exact test. †By t-test for two independent samples							

Table 1: It shows that both groups had high percentages of Multipara participants, with 71.3 percent in the control groups and 70% in the study groups, and that the majority of the samples (34.4%) in both groups were over 30. Also, both groups delivered their infants between 38 and 40 weeks of gestation. Additionally, the information in this table shows a relationship between both the control and the study groups in terms of age and parity. This table also shows that there was no statistically significant difference in gestational age between both the two groups, even though the p-value was equal to the common alpha of (p. value = 0.000).

Table 2: Distribution of the study samples according to neonatal characteristics' outcomes.							
Variables	(80) Control group Early cord clamping		(80) Study group Delayed cord clamping		(160) Total		P. value
	F	%	F	%	F	%	
ABGAR Score first minute Mild distress 4-6 Normal 7-10	24 56	30.0 70.0	6 74	7.5 92.5	30 130	18.8 81.2	**0.034* Sig**
Mean ± SD	6.43 ± 2.30		8.57± 1.07				
ABGAR Score fifth minutes Mild distress 4-6 Normal 7-10	19 61	23.8 76.2	2 78	2.5 97.5	21 139	13.1 86.9	**0.021* Sig**
Mean ± SD	7.66 ± 2.48		9.22± 0.69				
Oxygen saturation at the first minute Oxygen saturation at fifth minutes Oxygen saturation at tenth minutes	62.8±5.3 78.2±6.1 85.3±3.1		65.3±3.9 85.1±3.5 91.6±1.03		**0.016 Sig† 0.576 N. Sig † <0.001 H. Sig†**		
NICU admission Yes No	39 41	48.8 51.2	2 78	2.5 97.5	41 119	25.6 74.4	**0.029* Sig**
Neonatal respiratory distress Yes No	5 75	6.2 93.8	1 79	1.2 98.8	6 154	3.8 96.2	**0.039* Sig**
Need for resuscitation Yes No	13 67	16.3 83.7	3 77	3.7 96.3	16 144	10.0 90.0	**0.437* N. Sig**
Early neonatal mortality Yes No	2 78	2.4 97.6	1 79	1.2 98.8	3 157	1.9 98.1	**0.56* N. Sig**
†By t-test for two independent samples *By Fisher's-exact test.							

Table 2: With most variables at the 0.05 level of significance, the estimated chi-square value was shown to be statistically significant in the comparing of newborn features between both the control and the study groups. Significant differences were between the two groups for oxygen saturation in the first and tenth minutes (p values 0.05), NICU admission (p values 0.05), and infant respiratory distress (p values 0.05). No statistically significant relationship between oxygen saturation at the fifth minute and the requirement for resuscitation items was found in this table due to the p-value being greater than 0.05. Additionally, the rate of early newborn mortality was 1.9%. (Only three neonates died, for both groups).

Table 3: Distribution of the study samples according to the placenta and umbilical cord.							
Variables	N= 80 Control group Early cord clamping		N= 80 Study group elayed cord clamping		N=160 Total		P. value
	F	%	F	%	F	%	
Weight of the baby .5-3.4 kg ≥ 3.5 kg	32 48	40.0 60.0	27 53	33.8 66.2	59 101	36.9 63.1	0.633* N. Sig
Mean ± SD	3.54 ± 0.44		3.59±0.40				
Neonatal crying and breathing before cord clamping Yes No	66 14	82.5 17.5	80 0	100 0	146 14	91.3 8.7	<0.001** H. Sig
Placental Weight Less than normal Normal weight More than normal	0 67 13	0 83.8 16.2	0 54 26	0 67.5 32.5	0 121 39	0 75.6 24.4	0.016** Sig
Mean ±SD	632.7±97.2		654.5±118.5				
Length of Umbilical cord Normal cord (50-60 cm) Short cord < 35 cm long cord > 80 cm	72 0 8	90.0 0 10.0	73 0 7	91.3 0 8.7	145 0 15	90.6 0 9.4	0.692* N. Sig
Mean ± SD	65.0±11.7		65.1±12.8				
**By Chi-square test. *By Fisher's exact test.							

Table 3. This table shows that more than half of both groups had infants weighing 3.5 kg or higher. All of the study group samples were crying and breathing before the chord was clamped, compared to 82.5 percent of the control group samples, who were crying and breathing before to the cutting of the cord. For both groups, the majority of participants (75.6%) delivered placentas with normal weights, and the majority of women (90.6%) had umbilical cords with normal cord lengths. According to the placenta item, all factors in the relationship in between study and the control groups were found to be statistically significant (p value 0.05).

Table 4: Distribution of the study samples according to the time of umbilical cord clamping.							
Variables	N= 80		N=80		N=160		P. value
	Control group Early cor clamping		Study group Delayed cord clamping		Total		
	F	%	F	%	F	%	
Time of Umbilical cord Clamping Early cord clamping < 30 seconds 30-60 seconds Delayed cord clamping 1-3 minutes > 3 minutes	56 24 0 0	70.0 30.0 0 0	0 0 45 35	0 0 56.2 43.8	56 24 45 35	70.0 30.0 56.2 43.8	0.025* Sig
Mean ± SD	29.4±13.8		3.65±0.35				
*By Fisher's exact test.							

There was a significant association between both groups regarding early and late cord clamping (p 0.05), and the mean early cord clamping of the women in the control group (29.4 seconds) was significantly (p 0.01); the majority (70.0%) of a women with in control group (immediate cord clamping less than thirty seconds just after birth of the fetus), and (56.2%) of the women in the study group (delayed cord clamping 1-3 minutes after birth) (3.65 minutes).

Table 5: Association between the time of delayed cord clamping and socio-demographic data.							
Variables	N= 45		N=35		N=80		P. value
	DCC (1-3 minutes)		DCC (>3 minutes)		Total		
	F	%	F	%	F	%	
Age ≤ 20 years 21-25 years 26-30 years >30 years	3 10 9 23	6.7 22.2 20.0 51.1	3 13 12 7	8.6 37.1 34.3 20.0	6 23 21 30	7.5 28.7 26.3 37.5	0.039* Sig
Mean± SD	29.9±5.99		27.0±5.01				
Parity Primiparous Multiparous	7 38	15.6 84.4	17 18	48.6 51.4	24 56	30.0 70.0	0.002* Sig
Mean± SD	2.95±1.38		2.28±1.72				
Gestational age at the birth 37 weeks 38-40 weeks 41-42 weeks	3 38 4	6.7 84.4 8.9	6 22 7	17.1 62.9 20.0	9 60 11	11.3 75.0 13.7	0.087** N. Sig
Mean ± SD	39.5±0.99		39.1±1.40				
**By Chi-square test. *By Fisher's exact test							

DCC group was
divided into the 30–60 s DCC group (n= 256) and the 61–120 s DCC group (n= 163). Not all neonates had hematological results. The heel blood sample size of 1–
3 days in the ECC group was 61, 25 and 33, and in the DCC group was 53, 46 and 32, respectively (Fig. 1).
There were no significant differences in age, gravidity, parity, gestational age, fetal birth weight, fetal sex and Apgar score at 1 min and 5 min between the ECC group
and DCC group or DCC subgroups (p> 0.05) (Table 1).
DCC group was
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3 days in the ECC group was 61, 25 and 33, and in the DCC group was 53, 46 and 32, respectively (Fig. 1).
There were no significant differences in age, gravidity, parity, gestational age, fetal birth weight, fetal sex and Apgar score at 1 min and 5 min between the ECC group
and DCC group or DCC subgroups (p> 0.05) (Table 1).
Age, parity, and time of delayed cord clamping were statistically different (less than 0.05), however there was no significant statistical difference among gestational age, and time of late cord clamping (P > 0.05), based on this table.

Table 6: Association between the time of delayed cord clamping and neonatal outcomes.							
Variables	N=45		N=35		N=80		P. value
	DCC (1-3 minutes)		DCC (>3 minutes)		Total		
	F	%	F	%	F	%	
APGAR Score first minute Mild distress 4-6 Normal 7-10	6 39	13.3 86.7	0 35	0 100	6 74	7.5 92.5	0.025* Sig
Mean ± SD	8.51±1.29		8.57±0.73		0.044 Sig		
APGAR Score fifth minutes Mild distress 4-6 Normal 7-10	1 44	2.2 97.8	0 35	0 100	1 79	1.3 98.7	0.033* Sig
Mean ± SD	9.28±0.69		9.31±0.47		0.036 N. Sig		
Oxygen saturation at the first minute Oxygen saturation at fifth minutes Oxygen saturation at tenth minutes	75.3±3.2 91.2±3.6 97.2±1.00		74.4± 3.1 89.2±3.0 97.1±1.01		0.006 Sig† 0.012 Sig † <0.001 H. Sig		
NICU admission Yes No	2 43	4.4 95.6	0 35	0 100	2 78	2.5 97.5	0.207** N. Sig
Neonatal respiratory distress Yes No	0 45	0 100	1 34	2.9 97.1	1 79	1.3 98.7	0.438** N. Sig
Need for resuscitation Yes No	3 42	8.6 91.4	0 35	0 100	3 77	3.7 96.3	0.252** N. Sig
†By t-test for two independent samples **By Chi-square test. *By Fisher's exact test.							

DCC group was
divided into the 30–60 s DCC group (n= 256) and the 61–120 s DCC group (n= 163). Not all neonates had hematological results. The heel blood sample size of 1–
3 days in the ECC group was 61, 25 and 33, and in the
DCC group was 53, 46 and 32, respectively (Fig. 1).
There were no significant differences in age, gravidity,
parity, gestational age, fetal birth weight, fetal sex and
Apgar score at 1 min and 5 min between the ECC group
and DCC group or DCC subgroups (p> 0.05) (Table 1).
As illustrated in table 6, there were no significant statistical difference between respiratory distress syndrome, NICU admission, and need for resuscitation with the time of deferred cord clamping, but there was a significantly different between Apgar score in the first and fifth minutes, as well as oxygen saturation during the first, fifth, and 10th minute

Table 7: Association between the time of delayed cord clamping and neonatal outcomes.

Variables	N=45 DCC (1-3 minutes)		N=35 DCC (> 3 minutes)		N=80 Total		P. value
	F	%	F	%	F	%	
Weight of the baby 2.5-3.4 kg ≥ 3.5 kg	10 35	22.2 77.8	16 19	45.7 54.3	26 54	32.5 67.5	0.032* Sig
Mean ± SD	3.71±0.32		3.45±0.44		0.021 Sig†		
Placental Weight Normal weight More than normal	25 20	55.6 44.4	29 6	82.9 17.1	54 26	67.5 32.5	0.015* Sig
Mean ±SD	672.1±118.7		628.8±116.8		0.018 N. Sig†		
Length of Umbilical cord Normal cord (50-60 cm) Long cord > 80 cm	39 6	86.7 13.3	34 1	97.1 2.9	73 7	91.3 8.7	0.129* N. Sig
Mean ± SD	63.7±15.0		66.8±9.43		0.234 N. Sig†		

**By Fisher-exact test †by t-test for two independent samples

These tables show how delayed cord clamping timing and newborn outcomes are related. It demonstrates that there was no statistically significant change in the length of the umbilical cord with the time of late cord clamping (P > 0.05), but there was a difference in the weight of the fetus and placenta with the delay in cord clamping (P < 0.05).

5. Discussion

In total, 160 women were participating in the study. These women were either selected to the research group (n=80) who delayed cord clamping or in the control group (n=80) who had early cord clamping. Without a scientific evaluation of its potential effects on the health and development of a newborn, immediate cord clamping has developed a Standard procedure as part of the industrialized world's active management of the third stage of labor. Additionally, it is thought that early cord clamping as part of active treatment of the third stage of labor considerably lowers the risk of postpartum hemorrhage. Many active management guidelines require for early cord clamping, which has encouraged some to suggest that postpartum hemorrhage risk could rise with delayed cord clamping. On the other hand, a recent World Health Organization protocol for managing the third stage of labor substituted delayed cord clamping for early cord clamping to produce significant maternal and newborn advantages.
In this study, the mean age of the study group was (Mean± SD 28.5± 5.76), and 36.2% of the women in the study group were older than 30 years old. This distribution conflicts with the findings of Ahmed, S. S, (2017) in Egypt, who came to the conclusion that 53.3% of the women were in the 30- to 35-year-old age range. However, Elgzar, W. T, Ibrahim, H. A, & Elkhateeb, H. H. (2017) found that participants were typically between the ages of 20 and 30 years in their study.
The current study found a statistically significant difference between the early and delayed groups to respective age group in terms of socio-demographic parameters. This finding contrasted with that of Elgzar, W. T, Ibrahim, H. A, & Elkhateeb, (2017), who found no significant association regarding socio-demographic data between both groups. Both groups were comparable with no significant difference regarding the obstetric history (multiparous), and gestational age (early cord clamping and delayed cord clamping).
According to neonatal outcomes in both groups, the current investigation showed that gains in oxygen saturation at the first and tenth minutes were statistically significant. This finding is consistent with the findings of other studies. In 2015, Fawzy, A. E. et al. did a study in Egypt to "examine the putative benefits and risks of early versus late clamping in term newborns." They discovered a considerable increase in oxygen saturation when the umbilical cord clamping was postponed; however, at 6 days following birth, there were no statistically significant changes between the two groups in terms of oxygen saturation
Our research revealed that breathing at birth indicates earlier establishment of breathing and regular breathing in infants who experienced delayed cord clamping at birth, as well as higher oxygen saturation at 1, 5, and 10 min in infants who experienced delayed cord clamping compared to those who experienced early cord clamping. Up to 10 minutes after delivery, newborns with delayed cord clamping have lower heart rates than neonates with early cord clamping.
In this study, we demonstrate that delaying cord

clamping for 1-3 minutes or longer was a successful intervention to guarantee increased oxygen saturation at 1 and 10 minutes. According to the current study, admission to the NICU and the Apgar score at 1 and 5 minutes were both influenced by delayed clamping. According to other researchers, there were no statistically significant differences between the delayed cord clamping and early cord clamping groups in terms of Apgar scores at the 1st and 5th minute. Elgzar, W. T, Ibrahim, H. A, and Elkhateeb, H. H, conducted a recent study (2017). had carried out "a quasi-experimental study, aimed to evaluate early vs delayed clamping of the umbilical cord in full-term infants," found that there had been no statistically significant difference between the two clamping methods. Also Katheria, A. C. et al. (2017) recently reviewed a large number of prior studies that were connected to this study issue. They came to the conclusion that the investigations of term or preterm neonates with early versus delayed cord clamping did not show any variations in the Apgar score at admission to the newborn unit. This outcome was comparable to that of Mohammad, K. et al. (2021), who discovered no significant difference between the two groups' Apgar scores at the first and fifth minutes.

A statistically significant difference was also noted between the two groups' rates of admission to the NICU and respiratory distress syndrome, according to the current study. Gamal et al. (2015) achieved the opposite outcome from the current study in this regard. They found no discernible difference between the early and late cord clamping groups in the infant need for NICU hospitalization.

According to the current study, only 66.2% of the study group's neonates were heavier than 3.5 kg, and there was no statistically significant correlation between birth weight with either group (early cord clamping and delayed cord clamping). The study by Ashish, K.C, et al. (2021), which came to the conclusion that there was a statistically significant difference in the weight of newborns and both groups, did not come to the same conclusion as ours. The results of this study showed that neither early nor late cord clamping groups showed a significant difference in placental weight or cord length (632.797.2&654.5118.5 and 65.011.7& 65.112.8, respectively).

There was a significant association between both groups regarding early and late cord clamping (p 0.001) between the majority (70.0%) of the women in the control group (early cord clamping less than 30 seconds after the birth of the fetus) and (56.2%) of the women in the study group (delayed cord clamping 1-3 minutes after birth).

DCC group was
divided into the 30–60 s DCC group (n= 256) and the 61–120 s DCC group (n= 163). Not all neonates had hematological results. The heel blood sample size of 1–
3 days in the ECC group was 61, 25 and 33, and in the
DCC group was 53, 46 and 32, respectively (Fig. 1). There were no significant differences in age, gravidity,
parity, gestational age, fetal birth weight, fetal sex and
Apgar score at 1 min and 5 min between the ECC group
and DCC group or DCC subgroups (p> 0.05) (Table 1).

According to the present study, there was no significant correlation among gestational age and two subgroups of delayed cord clamping (P > 0.05), however there was a significant relationship between age, parity, and delayed cord clamping (P 0.05). Our findings did not agree with those of Qian, Y, et al. (2019), who found no statistically significant correlation between demographic factors and either of the two delayed cord clamping subgroups or the overall delayed cord clamping group (P > 0.05).

The results of the present research, there was a significant association between two subgroups of delayed cord clamping and the Apgar score during the first and fifth minutes (P < 0.05). Contrary to the findings of Qian, Y. et alstudy.'s (2019), we found no relationship between the Apgar score in the first and fifth minutes and the delayed cord clamping group or between the two subgroups of delayed cord clamping (P > 0.05).

Based on the present study, there was a statistically significant differences (P < 0.05) between the weight of the newborn and the two categories with delayed cord clamping. In contrast to the research conducted by Qian, Y, et al, (2019), our results indicated that there was no statistically significant difference in newborn weight between the groups receiving delayed cord clamping or among the two subgroups of delayed cord clamping (P > 0.05).

6. Conclusion

The current study found that delayed clamping was associated with decreased need for oxygen therapy. In addition, the delayed cord clamping of the cord for at least 1-3 minutes appears not to increase the risk of postpartum hemorrhage, the delayed cord clamping of the cord for at least 3 minutes after vaginal delivery improved infant outcomes, safety, and should be implemented in a strategy to prevent early neonatal anemia, and the delayed cord clamping has clinical benefits on both maternal and neonatal outcome than early cord clamping. Umbilical cord clamping can be delayed by at least three minutes in order to maximize benefits and reduce the risk of delayed cord clamping. Both the fetal-to-newborn transition and the oxygen saturation values in neonatal babies were positively impacted by delayed cord clamping. Compared to babies who have their cords clamped immediately, babies who have their cords clamped later reach a plateau in oxygen saturation far sooner, at 85–90%.

7. Recommendation

The ministry of health and hospital management should preserve delayed cord clamping as a standard procedure. According to the results of our study, obstetricians and midwives are paying more attention to delayed cord clamping as part of regular care and are emphasizing this practice as being one of the overall standards of excellence to attain the benefits for mothers and babies under the control of delayed cord clamping time.

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References

Mebarki, M, Abadie, C, Larghero, J, & Cras, A. (2021). Human umbilical cord-derived mesenchymal stem/stromal cells: a promising candidate for the development of advanced therapy medicinal products. Stem Cell Research & Therapy, 12(1), 1-1
Khier, A, & Elghazaly, E. A. (2015). Correlation between the Umbilical Cord Morphology and Birth Weight in Full Term Sudanese Neonates (Doctoral dissertation, University of Gezira).
Cardoso, R. M, Rodrigues, S. C, Gomes, C. F, Duarte, F. V, Romao, M, Leal, E. C, & Simões-Correia, J. (2021). Development of an optimized and scalable method for isolation of umbilical cord blood-derived small extracellular vesicles for future clinical use. Stem cells translational medicine, 10(6), 910-921
Gupta, T, Singh, S, Gupta, S, & Gupta, N. (2018). Normal implantation, placentation, and fetal development. In Recurrent Pregnancy Loss (pp. 13-40). Springer, Singapore.
Um, S, Ha, J, Choi, S. J, Oh, W, & Jin, H. J. (2020). Prospects for the therapeutic development of umbilical cord blood-derived mesenchymal stem cells. World Journal of Stem Cells, 12(12), 1511.
Seidler, A. L, Gyte, G. M, Rabe, H, Díaz-Rossello, J. L, Duley, L, Aziz, K, & Soll, R. (2021). Umbilical cord management for newborns< 34 weeks' gestation: a meta-analysis. Pediatrics, 147(3).
Gomersall, J, Berber, S, Middleton, P, McDonald, S. J, Niermeyer, S, El-Naggar, W, & Soll, R. F. (2021). Umbilical cord management at term and late preterm birth: a meta-analysis. Pediatrics, 147(3).
Katheria, A. C, Lakshminrusimha, S, Rabe, H, McAdams, R, & Mercer, J. S. (2017). Placental transfusion: a review. Journal of Perinatology, 37(2), 105-111.
Hooper, S. B, Binder-Heschl, C, Polglase, G. R, Gill, A. W, Kluckow, M, Wallace, E. M, & Te Pas, A. B. (2016). The timing of umbilical cord clamping at birth: physiological considerations. Maternal health, neonatology and perinatology, 2(1), 1-9.
Manley, B. J, Owen, L. S, Hooper, S. B, Jacobs, S. E, Cheong, J. L, Doyle, L. W, & Davis, P. G. (2017). Towards evidence-based resuscitation of the newborn infant. The Lancet, 389(10079), 1639-1648.
Blank, D. A, Gaertner, V. D, Kamlin, C. O. F, Nyland, K, Eckard, N. O, Dawson, J. A, & Davis, P. G. (2018). Respiratory changes in term infants immediately after birth. Resuscitation, 130, 105-110.
Fogarty, M, Osborn, D. A, Askie, L, Seidler, A. L, Hunter, K, Lui, K, & Tarnow-Mordi, W. (2018). Delayed vs early umbilical cord clamping for preterm infants: a systematic review and meta-analysis. American journal of obstetrics and gynecology, 218(1), 1-18.
Qian, Y, Ying, X, Wang, P, Lu, Z, & Hua, Y. (2019). Early versus delayed umbilical cord clamping on maternal and neonatal outcomes. Archives of gynecology and obstetrics, 300(3), 531-543.
14. De Bernardo, G, Giordano, M, De Santis, R, Castelli, P, Sordino, D, Trevisanuto, D, & Perrone, S. (2020). A randomized controlled study of immediate versus delayed umbilical cord clamping in infants born by elective caesarean section. Italian Journal of Pediatrics, 46(1), 1-6.
Ashish, K. C, Budhathoki, S. S, Thapa, J, Niermeyer, S, Gurung, R, Singhal, N, & Network, N. N. (2021). Impact of stimulation among non-crying neonates with intact cord verses clamped cord on birth outcomes: observation study. BMJ paediatrics open, 5(1).
Elgzar, W. T. I, Ibrahim, H. A. F, & Elkhateeb, H. H. (2017). Effects of Deferred Versus Early Umbilical Cord Clamping on Maternal and Neonatal Outcomes. American Journal of Nursing, 5(4), 115-128.
Fawzy, A. E. M. A, Moustafa, A. A, El-Kassar, Y. S, Swelem, M. S, El-Agwany, A. S, & Diab, D. A. (2015). Early versus delayed cord clamping of term births in Shatby Maternity University Hospital. Progresos de Obstetricia y Ginecología, 58(9), 389-392.
Ahmed, S. S, Faheim, S. S, Hassan, H. E, & Meabed, M. A. (2017). Quasi-Experimental Study to Assess Consequences of Early Versus Delay Umbilical Cord Clamping on Maternal and Neonatal Outcomes in Beni-Suef city.
Mohammad, K, Tailakh, S, Fram, K, & Creedy, D. (2021). Effects of early umbilical cord clamping versus delayed clamping on maternal and neonatal outcomes: a Jordanian study. The Journal of Maternal-Fetal & Neonatal Medicine, 34(2), 231-237.
World Health Organization. (2014). Guideline: delayed umbilical cord clamping for improved maternal and infant health and nutrition outcomes. World Health Organization.
World Health Organization. (2012). WHO recommendations for the prevention and treatment of postpartum hemorrhage; [cited 2018 November 19]. Available from: https://www.who.int/reproductivehealth/publications/maternal_perinatal_health/9789241548502/en/