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RESEARCH ARTICLE

Effects of Delayed Cord Clamping on Neonatal Hematological Status at Maternity Teaching Hospital in Sulaimani City/Iraq

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ABSTRACT

Background: Infants born at full term consistently had better hematologic and iron status in the short- and long-term when the umbilical cord clamping was delayed for at least 2 minutes after birth. **Aim:** In this study, the bilirubin serum, hemoglobin, and hematocrit levels of term newborns who underwent early cord clamping versus delayed cord clamping following a typical vaginal delivery were compared. **Material and Method:** A true experimental study involving (160) pregnant women from the labour ward who were in the second stage of labour. Participants were randomly assigned between the 1st of July 2021 and the 1st of February 2022. Samples were selected by using a simple random sampling technique through the Structured Interviewing Questionnaire and the neonatal outcome, haematological parameters (Hemoglobin and Hematocrit), and total serum bilirubin level at 72 hours after birth, and the participants have 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 the socio-demographic characteristics of pregnant women with early and delayed cord clamping on neonatal outcomes (Hemoglobin, Hematocrit, and Total Serum Bilirubin). **Result:** Among the 160 participants who completed the study, 80 were in the control group (early cord clamping), and 80 were in the study group (delayed cord clamping). Delayed cord clamping was associated with higher haemoglobin and hematocrit among newborns after 72 hours. Neonatal haemoglobin ranged from 16.8 ± 1.99 g/dl, and there was a statistical reduction in early when compared to the late cord clamping group (17.9± 1.33 respectively). Serum bilirubin ranged from 6.28± 2.89, and there was a significant reduction in early when compared to the late-cord clamping group (8.27± 3.52 respectively). **Conclusion:** A delayed cord clamp is helpful because it is a quick, easy, and safe manoeuvre. Delaying cord clamping in term newborns resulted in higher haemoglobin and hematocrit levels without unfavourable impact on neonatal characteristics and significantly higher newborn hematocrit and haemoglobin levels. In addition to a large rise in newborns' blood and red cell volumes, it reduces anaemia.

Keywords: Delayed Cord Clamping, Neonatal Outcomes. Hematocrit, Hemoglobin, Total Serum Bilirubin, and haematological parameters.

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INTRODUCTION

The umbilical cord must connect the uterus and fetus (Mebarki M. *et al*., 2021). A flexible, tube-like structure joins a fetus to the mother's placenta. The placenta connects An organ to the uterine wall, which 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 *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 centimetres in length and 2 cm in diameter. Fetal morbidity and death can increase due to abnormalities in the umbilical cord. Because the newborn can now breathe independently, the umbilical cord is clamped, then cut, and the remaining umbilical cord is delivered with the placenta after birth (Gomersall *et al*., 2021).

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

As part of actively managing the third stage of labour, the World Health Organization (WHO) no longer recommends early cord clamping because the research indicates that it does not prevent postpartum haemorrhage (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).

Delaying cord clamping by three minutes after birth in term newborns increased venous hematocrit levels measured six hours later, within physiological ranges, and lowered the prevalence of neonatal anaemia without having any negative effects on the neonates or their mothers (Korkut S. *et al.,* 2021). Early cord clamping was demonstrated to cause substantial bradycardia, along with a brief increase in carotid artery pressure, marked hypotension, and a decline in cardiac output and cerebral circulation (Korkut S. *et al*., 2021).

Infants' haemoglobin and hematocrit levels are influenced by various circumstances; delayed cord clamping raises haemoglobin levels in newborns (Ashish, K. C. *et al.,* 2016). Haemoglobin levels may fall after birth if the placenta is cut or divided, if a fetal artery is torn or punctured, or if the baby is held much above the level of the placenta for a while before the umbilical cord is clamped. Compared to newborns with early umbilical cord clamping, individuals with delayed cord clamping have a 32% larger blood volume (Nouraie *et al.,* 2019). Children with delayed cord clamping at 6 months also have greater serum ferritin levels. Even in the US, early umbilical cord clamping is still encouraged despite some evidence to the contrary. In premature newborns, delayed cord clamping improves blood circulation, lessens the need for blood transfusions, and lowers the risk of intraventricular haemorrhage (Nouraie *et al*., 2019).

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

After several hours, if the cord clamping is postponed and the placenta transfusion is complete, the plasma volume decreases, leaving a significant amount of Red Blood Cells (RBC) (Mneimneh S. *et al*., 2019). When such RBCs are destroyed, bilirubin and a significant amount of iron are left behind. The iron produced by delaying cord clamping is 20–30 mg/kg, sufficient for the fetus's needs for at least three months. However, the resultant bilirubin will increase the risk of jaundice, necessitating phototherapy (Mneimneh S. *et al*., 2019).

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

This research aimed to assess the impact of delayed umbilical cord clamping on neonatal outcomes and 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.

METHOD

Design of the study: The true- experimental study was conducted 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 37^{th} to 42^{nd} of gestation and fall into many age categories. The study was done between the 1^{st} of July 2021 and the 1^{st} of February 2022. The inclusion criteria for choosing pregnant women were between weeks 37 and 42 or full-term mothers, prime mothers, or mothers with many pregnancies. Mothers were older than 18, and birth weights ranged from 2.500 to 4000 gm. A woman with a negative Rhesus factor status was excluded from some labourers. Mothers who do not cooperate have problems with the newborn (such as intrauterine growth retardation and congenital malformation).

A panel of 10 experts determined the content validity, and the correlation coefficient, r 0.87, determined the reliability. (Statistically adequate).

Data collection: Direct interviews with study participants were used to obtain data. The sociodemographic features, prior obstetric history, reproductive history, and neonatal haematological parameters (including haemoglobin, hematocrit, and total serum bilirubin level at the 72-hour postpartum fetus) were all assessed as part of a questionnaire created for this purpose.

Data Collection Procedure: The survey's entire sample was chosen using a straightforward random sampling procedure. The Maternity Teaching Hospital divided these into two groups of 80 each as the study groups (delayed cord clamping) and 80 as the control groups (early cord clamping). The result for newborns is. Haematological indicators (haemoglobin and hematocrit), total serum bilirubin level at 72 hours after birth, and the need for admission to the neonatal intensive care unit are examples of late neonatal outcomes (NICU).

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. Fisher's exact test was applied when the projected count of > 20% of the combined Excel cells scored below 5. The mean differences between the early and late cord clamping groupings were compared using an independent (t) test. The p-value measures significance. At a p-value of 0.05, a statistically significant difference was regarded; at a p-value of 0.001, a statistically significant difference was examined. Moreover, at a p-value > 0.05, non-significant results were shown.

RESULT

Table (1) shows that both groups had high percentages of Multipara participants, with 71.3% in the control groups and 70% in the study groups and that most 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, this table shows a relationship between the control and the study groups regarding age and parity. This table also shows no statistically significant difference in gestational age between the two groups, even though the p-value was equal to the common alpha of (p. value = 0.000). Table (2) compares neonatal studies conducted after 72 hours for the DCC and ECC groups. On the third day of life, there were extremely statistically significant variations (p 0.001) in newborn Hb and HCT. On the third day of life, total bilirubin considerably changes between the DCC and ECC groups.

In contrast to 85.0% of the DCC group at 3 days old, most ECC group (93.7%) had normal bilirubin levels. Only 3.7% of people in the DCC group had high intermediate-risk bilirubin levels, as opposed to 2.5% in the ECC group. The total bilirubin had a mean of (6.28±2.89) mg/dl and a standard deviation of (8.27±3.52) mg/dl in the DCC group, where the mean was significantly higher than in the ECC group. Additionally, it was shown that there was a statistically significant difference in anaemia between the two groups (p=0.023) but not in polycythemia (p=0.912).

Table (3) 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 per cent of the control group samples, who were crying and breathing before cutting the cord. For both groups, most participants (75.6%) delivered placentas with normal weights, and most women (90.6%) had umbilical cords with normal cord lengths. According to the placenta item, all factors in the relationship between the study and the control groups were statistically significant (p-value 0.05).

Table (7) shows 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). Table (4) 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 significant (p 0.01); the majority (70.0%) of a woman within control group (immediate cord clamping less than thirty seconds just after the 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) Age, parity, and time of delayed cord clamping were statistically different (less than 0.05); however, there was no significant statistical difference between gestational age and time of late cord clamping (P > 0.05), based on this table.

Table (6) shows how delayed cord clamping timing and newborn outcomes are related. It demonstrates that while there was no statistically significant difference between total bilirubin count and the time of delayed cord clamping (P > 0.05), there was a statistically significant difference between the mean and standard deviation of neonatal (haemoglobin and hematocrit) with the time of delayed cord clamping.

Table 1: Sociodemographic variables on the mothers in the two groups:

Variables	**N=80**		**N=80**		**N=160**		**P. value**
	Control group Early cord clamping		**Study group Delayed cord clamping**		**Total**		
	F	**%**	**F**	**%**	**F**	**%**	
Age							
≤ 20 years	7	8.8	6	7.5	13	8.1	
21-25 years	23	28.7	24	30.0	47	29.4	**<0.001***
26-30 years	24	30.0	21	26.3	45	28.1	**H. Sig**
>30 years	26	32.5	29	36.2	55	34.4	
Mean ± SD	27.2±5.10		28.5±5.76		**<0.001†**	**H. Sig**	
Parity							
Primiparous	23	28.7	24	30.0	47	29.4	**<0.001***
Multiparous	57	71.3	56	70.0	113	70.6	**H. Sig**
Mean ± SD	2.42± 1.15		2.41±1.14		**< 0.001 H. Sig**		
Gestational age at birth							
37 weeks							
38-40 weeks	6	7.5	9	11.2	15	9.4	
41-42 weeks	63	78.8	60	75.0	123	76.9	**0.482** N. Sig**
	11	13.7	11	13.8	22	13.7	
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

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Table 2: Distribution of the study samples according to neonatal characteristics' outcomes.

Variables	N=80 Control group Early Cord Clamping		N=80 Study group Delayed Cord Clamping		N=160 Total		P. value
	F	%	F	%	F	%	
Neonatal Hemoglobin level							
<14 g/dl	12	15.0	2	2.5	14	8.8	**<0.001** N. Sig**
14-18 g/dl	58	72.5	37	46.3	95	59.4	
>18 g/dl	10	12.5	41	51.2	51	31.8	
Mean± SD	16.8±1.99		17.9±1.33				**<0.001† H. Sig**
Neonatal hematocrit level							
<43	5	6.3	2	2.5	7	4.4	**<0.001* N. Sig**
43-56	52	65.0	51	63.7	103	64.3	
>56	23	28.7	27	33.8	50	31.3	
(Mean ± SD) After 72 hrs.	52.7±5.42		54.0±4.52				**<0.001† H. Sig**
Total Bilirubin count							**0.016** Sig**
-Normal Low risk (≤13 mg/dl)	75	93.7	63	78.8	138	86.3	
- Low intermediate risk (13.1-15.2 mg/dl)	3	3.8	10	12.5	13	8.1	
- High intermediate risk (15.3- 17.2 mg/dl)	2	2.5	3	3.8	5	3.1	
- High risk (17.3and more mg/dl)	0	0	4	5.0	4	2.5	
(Mean ± SD) After 72 hrs.	6.28±2.89		8.27±3.52				**0.038* Sig**
Polycythaemia HCT > 65% After 72 hrs.	2	2.6	4	5.0	6	7.6	**0.912** N. Sig**
Anemia HCT <45 after 72hrs.	5	6.3	2	2.6	6	7.5	**0.023* Sig**

*By Fisher's-exact test. **By Chi-square test. †By t-test for two independent samples

Table 3: Distribution of the study samples according to the placenta and umbilical cord.

Variables	N= 80		N= 80		N=160		P. value
	Control group Early cord clamping		Study group Delayed cord clamping		Total		
	F	%	F	%	F	%	
Weight of the baby							
2.5-3.4 kg	32	40.0	27	33.8	59	36.9	**0.633*** **N. Sig**
≥ 3.5 kg	48	60.0	53	66.2	101	63.1	
Mean ± SD	3.54 ± 0.44		3.59±0.40				
Neonatal crying and breathing before cord clamping							
Yes	66	82.5	80	100	146	91.3	**<0.001*** **H. Sig**
No	14	17.5	0	0	14	8.7	
Placental Weight							
Normal weight	67	83.8	54	67.5	121	75.6	**0.016**** **Sig**
More than normal	13	16.2	26	32.5	39	24.4	
Mean ±SD	632.7±97.2		654.5±118.5				
Length of Umbilical cord							
Normal cord (50-60 cm)	72	90.0	73	91.3	145	90.6	**0.692*** **N. Sig**
Long cord > 80 cm	8	10.0	7	8.7	15	9.4	
Mean ± SD	65.0±11.7		65.1±12.8				

**By Chi-square test. *By Fisher's exact test.

Table 4: Distribution of the study samples according to the umbilical cord clamping time.

Variables	N= 80		N=80		N=160		P. value
	Control group Early cord clamping		Study group Delayed cord clamping		Total		
	F	%	F	%	F	%	
Time of Umbilical Cord **Clamping**							
Early cord clamping							
< 30 seconds	56	70.0	0	0	56	70.0	**0.025*** **Sig**
30-60 seconds	24	30.0	0	0	24	30.0	
Delayed cord clamping							
1-3 minutes	0	0	45	56.2	45	56.2	
> 3 minutes	0	0	35	43.8	35	43.8	
Mean ± SD	**29.4±13.8**		**3.65±0.35**				

*By Fisher's exact test.

The 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 haematological 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). The 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 haematological 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).

Table 5: Association between the time of delayed cord clamping and sociodemographic data.

Variables	N= 45		N=35		N=80		P. value
	Delayed Cord Clamping (1-3 minutes)		Delayed Cord Clamping (>3 minutes)		Total		
	F	%	F	%	F	%	
Age							
≤ 20 years	3	6.7	3	8.6	6	7.4	**0.039** Sig**
21-25 years	10	22.2	14	40.0	24	30.0	
26-30 years	9	20.0	12	34.3	21	26.3	
>30 years	23	51.1	6	17.1	29	36.3	
Mean± SD	29.9±5.99		27.0±5.01				
Parity							
Primiparous	7	15.6	17	48.6	24	30.0	**0.003** Sig**
Multiparous	38	84.4	18	51.4	56	70.0	
Mean± SD	2.95±1.38		2.28±1.72				
Gestational age at birth							**0.087** N. Sig**
37 weeks	3	6.7	6	17.1	9	11.3	
38-40 weeks	38	84.4	22	62.9	60	75.0	
41-42 weeks	4	8.9	7	20.0	11	13.7	
Mean ± SD	39.5±0.99		39.1±1.40				

**By Chi-square test. *By Fisher's exact test

Table 6: Association between the time of delayed cord clamping and neonatal outcomes

Variables	N=45		N=35		N=80		P. value
	Delayed Cord Clamping (1-3 minutes)		Delayed Cord Clamping (>3 minutes)		Total		
	F	%	F	%	F	%	
Neonatal Hemoglobin level							
<14 g/dl	1	2.2	1	2.9	2	2.5	**0.034* Sig**
14-18 g/dl	17	37.8	15	42.9	37	46.3	
>18 g/dl	27	60.0	19	54.2	41	51.2	
Mean± SD after 72 hrs.	18.0±1.26		17.8±1.41			**0.032† Sig**	
Neonatal Hematocrit level							
<43	2	4.4	0	0	2	2.5	**0.016* Sig**
43-56	25	55.6	26	74.3	51	63.7	
>56	18	40.0	9	25.7	27	33.8	
(Mean ± SD) After 72 hrs.	53.8±4.06		54.2±5.10		**0.044† Sig**		
Total Bilirubin count							
-Normal Low risk (≤13 mg/dl)	38	84.4	25	71.4	63	78.7	**0.104* N. Sig**
- Low intermediate risk (13.1-15.2 mg/dl)	5	11.2	5	14.3	10	12.5	
- High intermediate risk (15.3- 17.2 mg/dl)	1	2.2	2	5.7	3	3.8	
- High risk (17.3and more mg/dl)	1	2.2	3	8.6	4	5.0	

(Mean ± SD) After 72 hrs.	8.06±3.07	8.55±4.04	**0.514† N. Sig**

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

Variables	N=45 Delayed Cord Clamping (1-3 minutes)		N=35 Delayed Cord Clamping (> 3 minutes)		N=80 Total		P. value
	F	%	F	%	F	%	
Weight of the baby							
2.5-3.4 kg	10	22.2	17	48.6	27	33.8	**0.032** Sig**
≥ 3.5 kg	35	77.8	18	51.4	53	66.2	
Mean ± SD	3.71±0.32		3.45±0.44				**0.021 Sig†**
Placental Weight							
Normal weight	25	55.6	29	82.9	54	67.5	**0.015** Sig**
More than normal	20	44.4	6	17.1	26	32.5	
Mean ±SD	672.1±118.7		628.8±116.8				**0.018 N. Sig†**
Length of Umbilical cord							
Normal cord (50-60 cm)	39	86.7	34	97.1	73	91.3	**0.129** N. Sig**
Long cord > 80 cm	6	13.3	1	2.9	7	8.7	
Mean ± SD	63.7±15.0		66.8±9.43				**0.234 N. Sig†**

**By Chi-square test by t-test for two independent samples

DISCUSSION

In total, 160 women were participating in the study. These women were either selected for 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 labour. Additionally, it is thought that early cord clamping as part of active treatment of the third stage of labour considerably lowers the risk of postpartum haemorrhage. Many active management guidelines require early cord clamping, encouraging some to suggest that postpartum haemorrhage risk could arise with delayed cord clamping. On the other hand, a recent World Health Organization protocol for managing the third stage of labour 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 concluded 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 20 and 30 years old in their study.

The current study found a statistically significant difference between the early and delayed groups and respective age groups regarding sociodemographic parameters. This finding contrasted with Elgzar, W. T., Ibrahim, H. A., and Elkhateeb (2017), who found no significant association between sociodemographic data between both groups. Both groups were comparable, with no significant difference regarding the obstetric history (multiparous) and gestational age (early and delayed) clamping).

In comparing neonatal haematological parameters during the third day of life between the DCC and ECC groups, there was a significant increase in neonatal haemoglobin hematocrit and a statistically significant increase in total serum bilirubin count. These results are consistent with those of the study by Elgzar, W. T., Ibrahim, H. A., and Elkhateeb, H. H. (2017), which discovered a highly significant correlation between the two groups' total serum bilirubin, haemoglobin, and hematocrit (early cord clamping and delayed cord clamping).

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 and either group (early cord clamping and delayed cord clamping). The study by Ashish, K.C. et al. (2021), which concluded that there was a statistically significant difference in the weight of newborns and both groups, did not come to the same conclusion as ours.

This study showed that neither early nor late cord clamping groups significantly differed 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).

According to the present study, there was no significant correlation between 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).

Based on the present study, there was a statistically significant difference (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).

CONCLUSION: Delaying cord clamping increases hemoglobin and hematocrit without negatively affecting neonatal outcomes, shortens labor stages, and reduces the requirement for oxygen therapy for neonates. Additionally, the DCC group had a considerably higher mean total bilirubin level. In the first several months of life, delayed umbilical cord clamping increases iron storage. When the umbilical cord is clamped more slowly, there is a little increase in term newborns who need phototherapy for their jaundice. When doing delayed cord clamping on term infants, obstetrician-gynecologists and other obstetric care professionals should ensure that systems are in place to detect and treat neonatal jaundice. Finally, the results of the current study validated the research hypothesis and met the study's objective. A practice guideline can be developed with local data to encourage delayed cord clamping at the Maternity Teaching Hospital in Sulaimani City.

ETHICAL CONSIDERATIONS

The scientific and ethics committees of the nursing and health sciences colleges at the University of Sulaimani authorized the study. Before collecting data, formal authorization was obtained from health and government authorities. Before collecting data, the study sample provided informed permission. The study received ethical approval from the Institutional Ethics Committee.

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 routine care and are emphasizing this practice as one of the overall quality standards to achieve the benefits for mothers and babies under the control of delayed cord clamping time. Create a program to educate expectant mothers about the advantages of delaying cord clamping and apply the same research with a large sample size in various contexts.

LIMITATIONS OF THE STUDY

Some mothers refuse to allow blood from their infants to test their haemoglobin, total serum bilirubin, and hematocrit levels. 72 hours later, the mother was expected to go to the Centers for Registration Bureau of Births and Deaths, but she never showed up. Therefore, the information is gone. Collecting blood from a baby is challenging due to its tiny veins. Low blood draws, which are insufficient for testing, present another challenge.

Ethical Approval Statement

This research study, titled " **Effects of Delayed Cord Clamping on Neonatal Hematological Status at Maternity Teaching Hospital in Sulaimani City/Iraq** " conducted by [***Nazera Salam Mena[1], Dr. Atiya Kareem Mohammed[2]***], has received ethical approval from the Ethics Committee of College of Medicine at University of Sulaimani under approval reference number [**10-7/3/2023**.

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AUTHOR'S CONTRIBUTIONS

All authors contributed equally to the conception and design of the study, data collection, and analysis, and drafted the initial manuscript. All authors critically reviewed and edited the manuscript. All authors approved the final version of the manuscript for submission.

DISCLOSURE STATEMENT:

The authors report no conflict of interest.

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All authors contributed equally to the conception and design of the study, data collection, and analysis, and drafted the initial manuscript. All authors critically reviewed and edited the

manuscript. All authors approved the final version of the manuscript for submission.

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