Original Article

doi:10.31674/mjn.2023.v15i02.006

MJN

Effect of Delayed Cord Clamp on Maternal and Neonatal Outcomes

Reda M. Nabil Aboushady[1], Amel Dawod Kamel Gouda[1]*, Nesren S.M. Bahnsawy[2], Hend Wageh Abozed[3], Sahar Mansour Ibrahim[1]

1Department of Maternal and Newborn Health Nursing, Faculty of Nursing, Cairo University, Giza Governorate 12613, Egypt

2Department of Pediatric Nursing, Faculty of Nursing, Cairo University, Giza Governorate 12613, Egypt

3Department of Pediatric Nursing, Faculty of Nursing, Mansoura University, Dakahlia Governorate 35516, Egypt

**Corresponding Author's Email: dawod@cu.edu.eg*

ABSTRACT

Background: Third-stage labor with a Delayed Cord Clamp (DCC), is still being discussed and there are currently no definite regulations or instructions for doctors to abide by, and little knowledge exists on the possible consequences for both the mother and the baby. **Aim:** Evaluate the effect of delayed cord clamp on maternal and neonatal outcomes. **Methods:** The posttest-only quasi-experimental research design was carried out. This study was conducted at the labor and delivery unit at Mansoura University Hospital (MUH). A convenient sample of 200 laboring mothers. The first 100 mothers were the study group. The second 100 mothers were the control group. Four tools were utilized to gather data. structured interview questionnaire the maternal assessment, the maternal satisfaction questionnaire and the neonatal assessment tool. **Results:** More than three-quarters of the study group compared to less than two-thirds of the control group had a duration third stage of labor within 5-10 minutes with a highly statistically significant difference at (p=0.001). Three cases of postpartum hemorrhage occur in the DCC group as compared to 5% in the control group. There was a noticeable contrast in the health of newborn babies between the two groups after 24 hours, particularly in regard to hemoglobin, hematocrit, ferritin, and total bilirubin levels. **Conclusion:** Delayed cord clamp is a safe and simple procedure during the third stage of labour and is associated with better maternal and neonatal outcomes with no adverse effects. **Recommendations:** DCC should be performed routinely on all laboring mothers throughout the third stage of labor in all delivery units.

Keywords: Delayed Cord Clamp; Maternal Outcomes; Neonatal Outcomes

INTRODUCTION

The umbilical cord, a unique connection, keeps a newborn infant attached to its mother after birth. The baby is delivered, and the placenta is evacuated when labour reaches its third stage. The placenta contains this cord. It is customary to cut the umbilical cord to separate the newborn from the placenta (De Angelis *et al.*, 2021). Delayed umbilical cord clamping (DCC), which occurs 1-3 minutes after birth or after the umbilical cord stops beating, results in more placental transfers than immediate umbilical cord clipping (Rabe *et al.* 2019).

The timing of cord clamping is still an unknown and contentious issue. DCC duration varied from 30 seconds to over 5 minutes after the cable ceased pulsating (Mohammad *et al.*, 2021). ECC refers to the umbilical cord's clamping quickly upon delivery. Reduces the number of red blood cells (RBCs) transferred to babies significantly. This method sprang from advances in neonatology and obstetrics, and its potential effects on neonates are just now receiving the scholarly attention they merit. A long umbilical cord clamp is required to carry fetal blood from the placenta to the newborn child during delivery (Welsh *et al.*, 2020; Lu *et al.*, 2022).

Numerous systematic reviews and meta-analyses have supported the current recommendations for DCC in newborn infants, finding that DCC improves hemodynamic outcomes and reduces hospital mortality (Qian *et al*., 2019). Maternal health specialists have debated when the ideal time is to cut the umbilical cord for many years. Immediate clamping of the umbilical cord is a common practice in nations where birth centers have a strategy of actively managing the last stage of labor (Elgzar *et al.*, 2017). Although it is commonly suggested,

Received: August 24, 2023; Received in revised form: September 22, 2023; Accepted: September 25, 2023

full-term infants seldom undergo delayed cord clamping. The optimal timing of cord clamping remains uncertain (Hooper *et al.*, 2016). DCC is not widely acknowledged, as around two-thirds of birthing units in both developed and developing countries regularly use ECC (Madhavanprabhakaran *et al.*, 2018). More studies are needed to understand how DCC and ECC (early cord clamping) affect the health of both mothers and newborns. The study shows that over 90% of postpartum hemorrhage cases within 24 hours after childbirth result from uterine atony, often due to issues in the active management of the third stage, including timing of oxytocin, inadequate uterine fundus contraction, and poor control of the umbilical cord (Abiyoga & Meihartati, 2020). These studies will provide information to help improve the abilities and techniques used by doctors who specialize in pediatric and obstetric healthcare.

According to Madhavanprabhakaran *et al.* (2018), DCC benefits mothers by reducing the frequency of RBCs and all vaccines without having any negative effects like postpartum hemorrhage (PPH), placental removal, or an extended third stage of labor. The disadvantages of DCC include a higher risk of neonatal polycythemia, jaundice, and temporary tachypnea (Kresch, 2017). Despite the possible advantages of DCC, it is still unknown how DCC affects the health of mothers and newborns. Therefore, the method can be used safely for caesarean and surgical births, which makes mothers more satisfied and comfortable, as well as benefiting the medical team in today's delivery settings (Welsh *et al.*, 2020). So, this study compared the impact of three different delayed cord clamping timings (30, 60, and 120 seconds) on venous hematocrit and serum ferritin levels in late preterm and term newborns who didn't need resuscitation, highlighting the lack of uniform guidelines for delayed cord clamping (Chaudhary *et al.*, 2023).

Significance of the Study

The World Health Organization (WHO) revised its recommendations in 2023 and now suggests DCC for the first minute of life to enhance mother and baby nourishment. In addition, according to WHO guidelines, "the optimal timing for cord clamping the umbilical cord for all infants, regardless of gestational age or fetal weight, is when cord circulation has stopped and the cord is flat and pulseless (approximately 3 minutes or more after birth), and the American Academy of Pediatrics and the American Heart Association unanimously supported DCC for reducing postpartum pain in both full-term and preterm babies (McAdams *et al.*, 2020).

A recent study conducted in Egypt found a positive relationship between delaying cord cutting and greater hemoglobin levels in newborns at 6 weeks after delivery, at the time of physiological anemia in the fetus (Alzaree, Elbohoty, and Abdellatif 2018). As well, according to a different study done at Al-Azhar University in Egypt, there was a strong relationship between delayed cord clamping (more than 30 seconds) and greater hemoglobin and hemocrit levels and fewer blood transfusions in preterm babies as opposed to quick cord clamping (Abbas, Elboghdady, & Mohammed, 2019).

There is increasing evidence that DCC has potential benefits, including the improvement of baby health and a decreased risk of placental retention. More studies are necessary to find out how much time is needed to get the most benefit from placental transfusion and to understand the pros and cons of delayed cord clamping by looking at the outcomes for both the mother and the newborn baby.

Operational Definitions:

Delayed Cord Clamp (DCC)

In the current research, DDC is defined as clamping anywhere after the complete cessation of cord pulsations.

Maternal Outcomes

This research includes the length of time for the third part of childbirth, the incidence of postpartum hemorrhage, mothers' preferences for the same care in the future, and the level of mothers' satisfaction, which is measured by the Maternal Assessment Tool and Maternal Satisfaction Questionnaire.

Neonatal Outcomes

This research includes neonatal hematological outcomes such as hemoglobin, hematocrit, ferritin, and total

bilirubin levels after 24 hours, which are measured by the Neonatal Assessment Tool.

The Study's Aim

To evaluate the effect of delayed cord clamps on maternal and newborn outcomes.

Research Hypotheses

1. Laboring mothers who will perform delayed cord clamps for their newborns will report a decreased duration of the third stage of labor and a lower occurrence of postpartum hemorrhage, with a higher level of satisfaction than the control group.

2. Newborns who will receive delayed cord clamps have better hematological outcomes (hemoglobin, ferritin, hematocrit, and total bilirubin levels) after 24 hours than the control group.

METHODOLOGY

Research Design

A posttest-only quasi-experimental research design approach was carried out. This approach is extremely close to the actual experimental design, except that control or randomization is lost (Thomas, 2022).

Setting

The Mansoura University Hospital's (MUH) labor and delivery unit served as the study's site. It sits on the first level of the main hospital building and has 21 beds. The four areas are the admission, examination, delivery, and post-delivery room. It assists moms in Dakahlia and surrounding governorates. It provides three days a week of emergency obstetric medical care. There were 610 admissions for vaginal deliveries overall (Statistical Department, 2022).

Study Sample

A convenient sample of 200 labouring mothers was chosen. In the study group the initial 100 women were urged to conduct DCC on their babies. The second 100 women served as the control group and underwent standard hospital treatments using ECC. Based on the inclusion and exclusion criteria, the labouring women were enrolled. Based on the methodology employed by Sim *et al.* (2018), the sample size was determined. The selected women were randomly assigned into two groups: the "study group and the control group (100 labouring mothers in each group). The first group was the "control group" that received standard care. The second group was the 'study group' that practiced delayed cord clamping. Labouring mothers who were primipara, singleton term pregnancy, vaginal delivery (vertex presentation), free from any medical diseases Apgar's first-minute score was more than 8 when he was recruited. And Labouring mothers with twins, history of postpartum hemorrhage, instrumental delivery, prolonged labour, cesarean section, preterm, congenital anomalies, and cord around the neck necessitating early cutting and in need of early resuscitation were excluded.

Data Collection Tools

The Tools were Divided into Four Categories:

1: Structured Interview Questionnaire

This tool was developed by the researchers after reviewing literature and included data related to labouring mothers' demographic characteristics such as age, level of education, and residence. Written consent was obtained from labouring mothers. The anonymity and confidentiality of the participants were considered.

2: Maternal Assessment Tool

After a thorough study of the literature, the researchers created this tool, which contained information on the length of the final stage of labor and the prevalence of maternal postpartum hemorrhage.

3: Maternal Satisfaction Questionnaire

This tool was developed by researchers after reviewing the literature. It was a Likert-type scale and divided into two parts: The first part included questions about laboring mothers' preferences for the same care in the

future and consisted of 4 items scored on a 4-point scale, ranging from 1 to 4 (4 = most certain, 3 = certain, 2 = quite certain, and 1 = not certain). The second part included questions about mothers' satisfaction regarding the delayed cord clamp practice and consisted of 4 items scored on a 4-point scale, ranging from 1 to 4 (4 = very satisfied, 3 = satisfied, 2 = fairly satisfied, and 1 = unsatisfied).

4: Neonatal Assessment Tool:

This tool has three sections: The first section: newborns' sex, gestational age, and weight at delivery. The second one was created based on Virginia Apgar (1953) and provided information regarding the Apgar score for newborns. The Apgar score is made up of five objective markers: heart rate, breathing rate, muscle tone, reflex irritability, and colour. These indications are awarded a total score between 0 and 10, with each sign earning a value of 0, 1, or 2 during the first- and fifth-minutes following delivery. The final portion was prepared by the researchers, and it contained information concerning neonatal hematological results .

Validity and Reliability

To evaluate the content validity of the data collection instruments, five specialists in the domains of pediatric nursing and maternity and newborn health nursing were given access. The tools were modified to enhance language clarity, topic appropriateness, and item sequencing in accordance with the suggestions of experts. Utilizing Cronbach's alpha test, the tools' reliability (II, III, and the third component of tool IV) was assessed. The findings (0.84, 0.74, and 0.86, respectively) demonstrated high reliability. A pilot study was conducted on 20 laboring mothers who participated to determine the study's clarity, viability, objectivity, and application, a pilot study of 20 labouring mothers took part in the study to evaluate the clarity, feasibility, and applicability of the study.

Interviewing, Assessment, Implementation, and Evaluation were Used to Collect Data.

Interviewing and Assessment: The laboring mothers' demographic characteristics and obstetric history were recorded on the sheet using the tool (1). This phase was achieved in the waiting room at the labor and delivery unit and consumed about 15-20 minutes for each mother. The researchers collected data four days a week: on Sunday and Monday for the study group and Tuesday and Wednesday for the control group.

Implementation: The first 100 mothers in the study group were encouraged to perform DCC for their newborns. During the labor before cutting the cord, the newborn was held at 20 cm below the vulva. Ligation of the umbilical cord took place after pulsation stopped. For the control group, 100 mothers were left with routine hospital procedures that used ECC during labor before cutting the cord. Ligation of the umbilical cord of newborn infants was done within 30–60 seconds after birth.

Evaluation: All labouring mothers recruited in both groups and their newborns were evaluated. Labouring mothers were evaluated for the duration of the third stage, the incidence of postpartum hemorrhage, preference for the same care in the future, and satisfaction regarding the practice using tools (2 and 3). In addition, withdraw blood samples from the neonates before hospital discharge. Hemoglobin, hematocrit, ferritin, and total bilirubin levels were determined in a newborn blood sample. The researchers obtained a blood sample in an EDTA tube for the Complete Blood Count (CBC) for hemoglobin and hematocrit and in serum separator tubes for serum ferritin and total bilirubin and sent it to the laboratory, and results were recorded in the sheets using the tool (4).

Statistical Analysis

The data was gathered, tabulated, and statistically analyzed using the Statistical Package for Social Science version 22. Analytical statistics were employed to investigate the relationship between two qualitative variables, such as the chi-square test. In descriptive statistics, such as quantitative data reported as mean (X), standard deviation (SD), and T independent sample *t*-test, the significance threshold for the analysis was set at 5%; a p 0.05 result will be considered statistically significant.

Ethical Considerations

The study was approved by the Faculty of Nursing's Research Ethics Committee of Mansoura University, Egypt with reference number 0384 on January 23, 2023.

RESULTS

According to Table 1, the mean age of the studied laboring mothers was 29.40±5.58 years in the control group compared to 30.55±4.71 years in the study group. Regarding the studied laboring mothers' educational level, 23% had secondary education in the control group. While 27% of them had secondary education in the study group, Moreover, 52% were from an urban area within the control group, compared to 47% within the study group.

Table 1: Demographic Distribution of Laboring Mothers (n=200)

Items	Control Group (N=100)		Study Group (N=100)		Test	*p* value
	No.	%	No.	%		
Age						
20-	59	59	46	46		
30-	40	40	53	53	*t*=-1.57	0.11
≥40	1	1	1	1		
Mean ± SD	29.40±5.58		30.55±4.71			
Degree of Education						
Can`t read and write	23	23	21	21		
Read and write.	21	21	23	23	(χ2)=0.94	0.91
Primary	20	20	16	16		
Secondary	23	23	27	27		
University	13	13	13	13		
Residence						
Urban	48	48	53	53	(χ2)=0.50	0.47
Rural	52	52	47	47		

According to Table 2, about 77% of the study group had a third stage of labor that lasted between five and ten minutes, compared to 64% in the control group. At p=0.001, this difference was extremely statistically significant. The majority of study mothers who did not suffer postpartum hemorrhage (95% in the control group and 97% in the study group) did not vary statistically substantially from those who did. About (98%) of the study group and only (25%) of the control group needed the same level of care in the future, with a highly statistically significant difference at $p = 0.001$. A statistically significant difference between 47% of study group mothers and the control group's study mothers in terms of their satisfaction with the practice was found at $p = 0.001$ (Table 2).

Table 2: Distribution of Laboring Mothers Regarding to Maternal Outcomes (n=200)

Variables	Control Group (n=100)		Study Group (n=100)		Chi Square Test(χ2)	*p* Value
	No.	%	No.	%		
Time of the Third Stage of Labor (in minutes**)**						
< 5	3	3	14	14	22.03	0.001
5-10	64	64	77	77		
> 10	33	33	9	9		
Incidence of Postpartum Hemorrhage					0.52	0.47
Yes	5	5	3	3		
No	95	95	97	97		

Preference for the Similar Care Afterwards						
Most certain	25	25	98	98		
Certain	15	15	2	2	113.26	0.001
Quite certain	60	60	0	0		
Not certain	0	0	0	0		
Mothers' Satisfaction						
Very satisfied	0	0	47	47		
Satisfied	57	57	40	40	75.10	0.001
Fairly satisfied.	19	19	13	13		
Unsatisfied	24	24	0	0		

Table 3 documented that the control group's mean birth weight was 3188.61 kg, whereas the study group's was 3077.10 kg. Furthermore, the control group's mean gestational age for the neonates studied was 38.68 weeks, compared to 38.71 weeks for the study group. The mean time of the cord pulsation stop (sec.) was 26.70± 2.06 in the control group as compared to 49.98±6.10 in the study group. The mean Apgar score of newborns in the study group at 5 minutes was 9.05 ±0.51, whereas infants in the control group had 8.41 ± 1.02. With a p-value of 0.001, this difference was extremely statistically significant.

Table 3: Distribution of Laboring Mothers According to Neonatal Assessment (n=200)

Variables	Control Group (n=100)		Study Group (n=100)		Test	*p* value
	No.	%	No.	%		
Gender						
Boys	53	53%	49	49%	(χ2)=0.32	0.57
Girls	47	47%	51	51%		
Birth Weight(kg) Mean ± SD	3188.61 ±661		3077.10 ± 645		*t*=1.20	0.22
Gestational Age (in weeks) Mean ± SD	38.68± 1.32		38.71± 1.43		*t*=-0.15	0.87
Mean Time of Stop Cord Pulsation (Seconds)	26.70± 2.06		49.98 ±6.10		*t*=-36.14	0.0001
Apgar Score at 5 Minutes Mean ± S	8.41± 1.02		9.05 ±0.51		*t*=-5.5	0.001

Table 4 describes the hematological results of the research on neonates 24 hours after birth. Only 65% of neonates in the control group had hemoglobin levels between 14.5-22.5 g/dl after 24 hours after delivery, but all of the infants in the study group had the same level with a strong statistically significant difference at $p = 0.001$. Only slightly more than half of the kids in the study group (50.6%) had hematocrit levels between 45 and 65% after 24 hours after delivery, compared to 87% of the babies evaluated in the control group. Extremely statistically significant (p=0.001) was the difference between the two groups. Additionally, only 48% of neonates in the control group had ferritin levels between 15 and 150 ng/mL 24 hours after delivery, which was significantly lower than the 77% of the study group and highly statistically significant at $p = 0.001$. The same table also showed that, compared to 72% of the infants in the control group, 84% of neonates in the study group had total bilirubin levels between 1.2 and 5 mg/dl after 24 hours of delivery, with a mean of 3.88 ± 154 mg/dL vs. 15.16 ± 227 g/dL. The statistical significance of this difference was quite strong (p 0.001).

Table 4: Distribution of Neonatal Hematological Outcomes After 24 Hours After Birth for Both Groups (n=200).

Variables	Control group (n=100)		Study group (n=100)		Chi square test(χ2)	*p* value
	No.	%	No.	%		
Hemoglobin Level						
-<14.5g/dl	14	14	0	0.0	42.42	0.001**
-From 14.5-22.5g/dl	65	65	100	100		
->22.5g/dl	21	21	0	0.0		
Hematocrit Level						
-<45%	13	13	6	0	34.38	0.001**
-From 45-65%	87	87	79	45.9		
- >65%	0	0	21	50.6		
Ferritin Level						
-<15ng/ml	20	20	5	5	19.64	0.001**
-From 15-150ng/ml	48	48	77	77		
->150ng/ml	32	32	18	18		
Total Bilirubin Level						
-(0.3-1.2) mg/dl	16	16	0	0	17.49	0.001**
-(1.2-5) mg/dl	72	72	84	84		
-(6-12) mg/dl	12	12	16	16		

DISCUSSION

Findings of the present study are discussed within the following frame of reference. To answer research hypothesis.

H1: Laboring mothers who will perform delayed cord clamp for their newborns will report decreased duration of the third stage of labor and lower occurrence of postpartum hemorrhage with a higher level of satisfaction than the control group.

The third stage of labour lasted between 5 and 10 minutes for less than two-thirds of the labouring mothers in the control group, compared to more than three-quarters of them in the study group. This difference was highly statistically significant (Table 2). In contrast to these results, a study by De Paco *et al.* (2016) found no statistical differences and that the third stage of labour did not vary significantly as a result of delayed cord clamping ($p = 0.35$). The third stage shortens the stage and lowers the risk of PPH; thus, all women should be urged to actively manage it. The third stage recommendations' active therapies include regular use of uterotonic (oxytocic) drugs, controlled cord traction (CCT) when the placenta displays signs of separation, and delayed clamping and cord cutting (NICE, 2017).

Additionally, as shown in Table 2, there were no statistically significant differences in the postpartum hemorrhage rates between the study and control group's laboring mothers as well. In a study conducted in Benha, Egypt, Heba *et al.* (2018) found that DCC lowers the incidence of PPH, with highly statistically significant differences between participants at both early and late cord clamping. Another article There was no association between DCC and the rise of PPH, according to Mohammad *et al.* (2021), who disagreed with this

finding. Risk factors for PPH include fast uterine massage, cord pressure on a hyperactive placenta, and worn-out uterine muscles. It doesn't appear to increase the risk of PPH by delaying cord clamping for an extra 2–3 minutes during the third stage. The placenta has less blood, however, and the uterine muscles are strong enough to preserve all the newborns if the cord clamping is delayed for 90 seconds (Ricci, 2017).

According to the study, the prolonged third stage of labour and following problems like PPH connected to ECC have negative effects that ultimately influence the positive experience of giving birth. The previous study's findings, which show that DCC is linked to shorter third-stage durations, absence of PPH, and improved maternal and newborn outcomes, boost mothers' preferences for the same treatment in the future and raise their satisfaction levels. In contrast to the findings of the present study, Orenga-Orenga *et al.* (2022) conducted a study to ascertain how the timing of cord clamping affects women's happiness with their delivery experience in the context of our healthcare system. They discovered that there was no correlation between clamping time and the degree of pleasure.

H2: Newborns who will receive delayed cord clamp have better hematological outcomes (hemoglobin, ferritin, hematocrit, and total bilirubin levels) after 24 hours than the control group.

According to the current investigation, there were no significant variations in the birth weight and gestational age of newborn children between the control and study groups (Table 3). The findings matched those of similar Egyptian research done at Shatby Maternity University Hospital. "Results showed no discernible variations in gestational age or birth weight between the two groups. This finding contradicts the findings of McDonald *et al.* (2014), who discovered in their study that there was a significant birth weight increase seen with late, compared to early, cord clamping. The inclusion of term pregnant women in the study and the exclusion of preterm neonates may have prevented variations in birth weight and gestational age across groups.

As shown in Table 3, there were substantial differences between the two groups' mean Apgar scores for the newborns who were the subject of the study. When the results of this study were compared to those of Winkler et al.'s study from 2022, "Cord clamping beyond 3 minutes: short-term outcomes for newborns and postpartum bleeding in mothers, it was found that the group with cord clamping (CC) >3 minutes was still having issues. correlatively increased Apgar scores at 5 minutes, considerably (p= 0.001).

In contrast to Chidre and Chirumamilla's (2015) findings, which indicated that there was no difference in the newborns' Apgar scores in the two groups, According to the Royal College of Obstetricians and Gynecologists (2015), this outcome may be explained by the fact that DCC makes it easier for oxygenated blood to be transferred from the placenta to the infant, promoting the seamless transition of cardiopulmonary functioning from intrauterine to extrauterine life. In comparison to CC >3 minutes, CC > 3 minutes was linked to lower Apgar scores at 5 and 10 minutes, per earlier research (Katheria *et al.*, 2017; Ashish *et al*., 2017). CC > 3 minutes was associated with lower Apgar scores at 5 and 10 minutes compared to CC >3 minutes. The transition from fetal to newborn life was also positively impacted by DCC. Compared to babies with ECC, babies with DCC reach a plateau in oxygen saturation much earlier, at 85–90%. According to Lara-Cantón *et al.* (2022), delaying cord clamping may also result in fewer occurrences of bradycardia or tachycardia in the first few minutes following birth.

The outcomes of this research demonstrated that there were highly statistically significant differences between the newborns in the control and study groups regarding neonatal hemoglobin, hematocrit, ferritin, and total bilirubin levels after 24 hours following delivery (Table 4). The current research's results are in agreement with those of Ofojebe *et al.* (2021), who reported in their study that approximately the babies in the delayed clamping group had higher hemoglobin levels (16.51±171 g/dl) than the babies in the immediate clamping group, according to research comparing delayed versus immediate umbilical cord clamping on neonates. However, our study found that neonatal bilirubin levels were significantly different (3.88 ± 154 mg/dL vs. 15.16 ± 227 g/dL; $p < 0.001$) compared to their results. The results of the current study are in line with those of Mercer *et al.* (2017), who found that there were significant differences in groups' levels of hemoglobin and hematocrit but not of total serum bilirubin (TSB) or of symptomatic polycythemia.

Several studies have found that the placenta provides between 25% and 35% of the blood volume for term babies. Delaying cord clamping (DCC) reduces iron insufficiency between three and eight months after birth. According to a recent study by the American College of Obstetricians and Gynecologists (ACOG), in 2020, full-

term newborns who underwent delayed cord clamping (DCC) had a slightly higher prevalence of jaundice. These infants had jaundice that needed to be treated with light therapy. The results of our study are likewise in line with those of prior studies (Chen *et al.*, 2018; Rana *et al.*, 2020; Mohammad *et al.*, 2021) that did not discover a connection between the need for phototherapy and DCC.

CONCLUSION

The current study's findings showed that the study group's laboring women had higher levels of satisfaction, shorter third-stage labors, and no postpartum hemorrhages than the control group. Additionally, compared to the control group, the infants in the study group had better 24-hour postnatal hematological values. DCC is a quick, risk-free procedure that has been shown to produce good results for both the mother and the baby.

Recommendations

The outcomes of the present investigation recommended that:

1-DCC should be performed routinely on all laboring mothers throughout the third stage of labor in all delivery units.

2-All maternity hospitals should run educational programs for pediatric and maternal health professionals to raise their awareness of the significance of DCC.

3-Created a clear, eye-catching Arabic brochure outlining the importance of DCC at maternity hospitals.

4-To track DCC, ECC, and long-term results, longitudinal research is required.

REFERENCES

Abbas, T. R., Elboghdady, A. A., & Mohammed, M. E. A. S. (2019). Early Versus Delayed Umbilical Cord Clamping in Preterm Births. *The Egyptian Journal of Hospital Medicine, 77*(1), 4700-4704.

Abiyoga, A., & Meihartati, T. (2020). Stimulation of Dairy Milk on Active Management Kala III on Time of Placenta Disposal. *Malaysian Journal of Medical Research (MJMR), 4*(4), 43-47. http://doi:10.31674/mjmr.2020.v04i04.010

Alzaree, F., Elbohoty, A., & Abdellatif, M. (2018). Early Versus Delayed Umbilical Cord Clamping on Physiologic Anemia of the Term Newborn Infant. *Open access Macedonian Journal of Medical Sciences, 6*(8), 1399–1404. https://doi.org/10.3889/oamjms.2018.286

American College of Obstetricians and Gynecologists' Committee on Obstetric Practice (2020). Delayed Umbilical Cord Clamping After Birth: ACOG Committee Opinion, Number 814. *Obstetrics and Gynecology, 136*(6), e100–e106. https://doi.org/10.1097/AOG.0000000000004167

Apgar, V. (1953). A proposal for a new method of evaluation of the newborn infant. *Anesthesia & Analgesia, 32*(4), 260-267. https://doi.org/10.1213/ane.0b013e31829bdc5c

Ashish, K. C., Rana, N., Målqvist, M., Ranneberg, L. J., Subedi, K., & Andersson, O. (2017). Effects of delayed umbilical cord clamping vs early clamping on anemia in infants at 8 and 12 months: a randomized clinical trial. *JAMA Pediatrics, 171*(3), 264-270. https://doi.org/10.1001/jamapediatrics.2016.3971.

Chaudhary, P., Priyadarshi, M., Singh, P., Chaurasia, S., Chaturvedi, J., & Basu, S. (2023). Effects of delayed cord clamping at different time intervals in late preterm and term neonates: a randomized controlled trial. *European Journal of Pediatrics,* 1-11. https://doi.org/10.1007/s00431-023-05053-6

Chen, X., Li, X., Chang, Y., Li, W., & Cui, H. (2018). Effect and safety of timing of cord clamping on neonatal hematocrit values and clinical outcomes in term infants: a randomized controlled trial. *Journal of Perinatology, 38*(3), 251-257. https://doi.org/10.1038/s41372017-0001-y

Chidre, Y. V., & Chirumamilla, V. (2015). Impact of early versus delayed umbilical cord clamping on post partum

blood loss: a randomized controlled trial. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology, 4*(4), 1103-1109. http://dx.doi.org/10.18203/2320-1770.ijrcog20150436.

De Angelis, C., Saccone, G., Sorichetti, E., Alagna, M., Zizolfi, B., Gragnano, E., ... & Sardo, A. D. S. (2022). Effect of delayed versus immediate umbilical cord clamping in vaginal delivery at term: A randomized clinical trial. *International Journal of Gynecology & Obstetrics, 159*(3), 898-902. https://doi.org/10.4236/ojog.2021.1111141

De Paco, C., Herrera, J., Garcia, C., Corbalán, S., Arteaga, A., Pertegal, M., ... & Delgado, J. L. (2016). Effects of delayed cord clamping on the third stage of labour, maternal haematological parameters and acid–base status in fetuses at term. *European Journal of Obstetrics & Gynecology and Reproductive Biology, 207*, 153-156. https://doi.org/10.1016/j.ejogrb.2016.10.031.

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. https://doi.org/10.1080/14767058.2019.1602603

Heba, A. I., Galal, A. E. , Amal, A. O., &Aziza I. M. (2018). Effect of Early versus Late Cord Clamping of Term Infants on Maternal and Neonatal Outcomes. *Egyptian Journal of Health Care, 9*(3): 1-13. https://doi.org/10.21608/EJHC.2018.12956.

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*, 1-9. https://doi.org/10.1186/s40748-016-0032-y

Ibrahim, N. O., Sukkarieh, H. H., Bustami, R. T., Alshammari, E. A., Alasmari, L. Y., & Al-Kadri, H. M. (2017). Current umbilical cord clamping practices and attitudes of obstetricians and midwives toward delayed cord clamping in Saudi Arabia. *Annals of Saudi Medicine, 37*(3), 216-224. https://doi.org/10.5144/0256-4947.2017.216

Katheria, A. C., Brown, M. K., Faksh, A., Hassen, K. O., Rich, W., Lazarus, D., ... & Finer, N. N. (2017). Delayed cord clamping in newborns born at term at risk for resuscitation: a feasibility randomized clinical trial. *The Journal of Pediatrics, 187*, 313-317. https://doi.org/10.1016/j.jpeds.2017.04.033

Kresch, M. J. (2017). Management of the third stage of labor: how delayed umbilical cord clamping can affect neonatal outcome. *American Journal of Perinatology, 34*(14), 1375-1381. https://doi.org/10.1055/s-0037-1603733

Lara-Cantón, I., Badurdeen, S., Dekker, J., Davis, P., Roberts, C., Te Pas, A., & Vento, M. (2022). Oxygen saturation and heart rate in healthy term and late preterm infants with delayed cord clamping. *Pediatric Research*, 1-6. https://doi.org/10.1038/s41390-021-01805-y.

Lu, J., Yue, G., Wang, Q., Zhou, X., & Ju, R. (2022). A review on development of placental transfusion in term and preterm infants. *Frontiers in Pediatrics, 10*, 890988. https://doi.org/10.3389/fped.2022.890988.

Madhavanprabhakaran, G. K., Wittmann, A. L., Vaidyanathan, G., Aldughaishi, T., & Thomas, D. S. (2018). Knowledge and Practice of Umbilical Cord Clamping among Maternity Care Providers. *Journal of Midwifery & Reproductive Health, 6*(3). https://doi.org/10.22038/JMRH.2018.23553.1252

McAdams, R. M., Backes, C. H., & Hutchon, D. J. (2015). Steps for implementing delayed cord clamping in a hospital setting. *Maternal Health, Neonatology and Perinatology, 1*, 1-8. https://doi.org/10.1186/s40748-015-0011-8

McDonald, S. J., Middleton, P., Dowswell, T., & Morris, P. S. (2014). Effect of timing of umbilical cord clamping of term infants on maternal and neonatal outcomes. Evidence-Based Child Health: *A Cochrane Review Journal, 9*(2), 303-397. https://doi.org/10.1002/ebch.1971

Mercer, J. S., Erickson-Owens, D. A., Collins, J., Barcelos, M. O., Parker, A. B., & Padbury, J. F. (2017). Effects of

delayed cord clamping on residual placental blood volume, hemoglobin and bilirubin levels in term infants: a randomized controlled trial. *Journal of Perinatology, 37*(3), 260-264. https://doi.org/10.1038/jp.2016.222 .

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. https://doi.org/10.1080/14767058.2019.1602603 .

National Institute for Health and Care Excellence [NICE], (2017). Intrapartum care for healthy women and babies: CG190UK: NICE. 2017. https://www.nice.org.uk/guidance/cg190 . Accessed on 28th November 2022.

Ofojebe, C. J., Eleje, G. U., Ikechebelu, J. I., Okpala, B. C., Ofojebe, B. A., Ugwu, E. O., ... & Ejikeme, T. B. (2021). A randomized controlled clinical trial on peripartum effects of delayed versus immediate umbilical cord clamping on term newborns. *European Journal of Obstetrics & Gynecology and Reproductive Biology, 262*, 99-104. https://doi.org/10.1016/j.ejogrb.2021.04.038.

Orenga-Orenga, B. J., Gregori-Roig, P., Real-Fernández, A., Donat-Colomer, F., & Sánchez-Thevenet, P. (2022). Umbilical cord clamping time and maternal satisfaction. *Midwifery, 115*, 103487. https://doi.org/10.1016/j.midw.2022.103487

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*, 531-543. https://doi.org/10.1007/s00404-019-05215-8.

Rabe, H., Gyte, G. M., Díaz-Rossello, J. L., & Duley, L. (2019). Effect of timing of umbilical cord clamping and other strategies to influence placental transfusion at preterm birth on maternal and infant outcomes. *Cochrane Database of Systematic Reviews*, (9). https://doi.org/10.1002/14651858.

Rana, N., Ranneberg, L. J., Målqvist, M., Kc, A., & Andersson, O. (2020). Delayed cord clamping was not associated with an increased risk of hyperbilirubinaemia on the day of birth or jaundice in the first 4 weeks. *Acta Paediatrica, 109*(1), 71-77. https://doi.org/10.1111/apa.14913

Ricci, S.S. (2017). Essentials of maternity, newborn, and mothers's health nursing. 4th ed. New York (NY): Wolters Kluwer.

Royal College of Obstetricians and Gynecologists, (2015). Clamping of the umbilical cord and placental transfusion. https://www.rcog.org.uk/en/guidelines-research-services/guidelines/sip14/. Access on 15th December, 2022

Sim, J., Saunders, B., Waterfield, J., & Kingstone, T. (2018). Can sample size in qualitative research be determined a priori?. *International Journal of Social Research Methodology, 21*(5), 619-634. https://doi.org/10.1080/13645579.2018.1454643.

Thomas, L. (2022). Quasi-Experimental Design: Definition, Types & Examples. Scribbr. https://www.scribbr.com/methodology/quasi-experimental-design/. Accessed on 16th December, 2022.

Welsh, S., Elwell, J., Manister, N. N., & Gildersleeve, R. K. (2020). Implementing delayed umbilical cord clamping in cesarean birth using a novel method: a pilot study of feasibility and safety. *Journal of Midwifery & Women's Health, 65*(1), 109-118. https://doi.org/10.1111/jmwh.13075 .

Winkler, A., Isacson, M., Gustafsson, A., Svedenkrans, J., & Andersson, O. (2022). Cord clamping beyond 3 minutes: nonatal short-term outcomes and maternal postpartum hemorrhage. *Birth, 49*(4), 783-791. https://doi.org/10.1111/birt.12645 .

World Health Organization (WHO) (2018). Delayed umbilical cord clamping for improved maternal and infant health and nutrition outcomes. Guideline: apps.who.int/iris/bitstream/10665/148793/1/9789241508209_eng.pdf

World Health Organization (WHO) (2023). Optimal timing of cord clamping for the prevention of iron deficiency anaemia in infants. Geneva, Switzerland. https://www.who.int/tools/elena/interventions/cord-clamping. Access on 16th December, 2022.