

# A Quasi-Experimental Study to Assess Consequences of Early Versus Delay Umbilical Cord Clamping on Maternal and Neonatal Outcomes in Beni-Suef city

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## Abstract

**Background:** Timing of an umbilical cord clamping is considering as a challenging undertaking for improving maternal & neonatal quality outcomes.

**Aim:** To compare the effects of early versus late umbilical cord clamping on maternal & neonatal outcomes in Beni-Suef city.

**Design:** A quasi-experimental study conducted with a purposive of 150 predominantly Upper Egyptian laboring women were eligible collected from labor ward in Beni-Suef General hospital.

**Tools:** A Structured Interviewing Questionnaire Sheet and Maternal & Fetal Outcome Sheet were used.

**Results:** No significant difference between DCC & ECC groups in relation to estimated maternal postpartum blood loss, maternal hemoglobin, hematocrit levels and needs for blood transfusion, moreover, the effects of late cord clamping on neonate reported that rise in hematocrit & hemoglobin level at birth, especially among late cord clamping group. The late cord clamping was negatively correlated with treatment with phototherapy, admission to the NICU, respiratory distress, jaundice requiring phototherapy, with need for resuscitation, polycythemia and prevent incidence of anemia.

**Conclusion:** Deferred times for umbilical cord clamping didn't increase the risk of maternal post-partum hemorrhage, duration of the 3<sup>rd</sup> stage of labor or the need for manual removal of the placenta, however, it significantly increased neonatal hemoglobin, hematocrit, and bilirubin, polycythaemia, and transient tachypnoea in the newborn.

**Recommendations:** Institutionalization of DCC in all governmental hospitals & medical educational settings and do not extend time of DCC to decrease risk of DCC such as (hyperbilirubinaemia, polycythaemia, & transient tachypnea).

**Keywords:** Early, delay, umbilical cord clamping, maternal' outcomes, neonatal outcomes.

## INTRODUCTION

Nowadays, the timing of umbilical cord is considering a growing area of research. The researchers looking for optimize maternal & neonate outcomes. The early umbilical clamping is determined as the umbilical cord being clamped around one minute after birth, while late clamping usually reserved for more than one minute minutes, however studies reported that in most deliveries, clamping the cord is performed immediately after

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birth within 10 to 15 seconds with baby maintained at or below the level of the placenta. <sup>[1, 2]</sup> World health organization (WHO) recommended that delay cord clamping in the low & middle-income countries may be beneficial. <sup>[3,4]</sup> The reduction of neonatal risk for administration blood transfusion and consequences such fluid overload, necrotizing enterocolitis & blood-borne pathogens can be achieved by implementation of delayed cord clamping. <sup>[5]</sup>

In early cord clamping (ECC) the cord is usually clamped just following the birth of the infant; this is mostly carried out in the first 30 seconds after birth; nevertheless of whether the cord pulsation has ended. <sup>[6]</sup> Delayed or late cord clamping (DCC) is a physiological method, involves clamping the cord after one minute or more (1-3 minutes), after birth or when cord pulsation has stopped. However, meanings of what establishes early and late cord clamping vary if the umbilical cord isn't clamped. The umbilical circulation usually stops when the umbilical arteries close, so the cord will stop its pulsating. <sup>[7]</sup> There are studies displayed altered points in the time of cord clamping worldwide and there is slight agreement among doctors and midwives about the best time to clamp the cord after birth. Maternal & infant safety is considered the most important point of difference. Worldwide, a lot healthcare providers are likely to clamp the umbilical cord after delivery of the baby as quickly as possible. <sup>[8,9]</sup>

The WHO had combined this intervention as active management of the 3<sup>rd</sup> stage of labor (AMTSL). <sup>[1]</sup> Later on, numerous researches had been done to evaluate the effectiveness of each component of AMTSL. <sup>[10,11]</sup> The administration of uterotonic drugs had been recognized as the most vital element of the intervention, while the profits of ECC and controlled cord traction is still contentious. <sup>[12]</sup> The WHO had shown many trials and demonstrated that ECC didn't increase any welfare to the prevention of post-partum hemorrhage (PPH). It may disturb the duration of the 3<sup>rd</sup> stage of labor, which is a significant issue for busy staff in the delivery room. <sup>[11]</sup> Consequently, the WHO changed the AMTSL to contain: first, administration of uterotonic drugs immediately after delivery of the fetus; the favored uterotonic drug is oxytocin. Second, delayed cord clamping (DCC) for at least 1-3 minutes to decrease infant anemia and organized cord traction conducted only if required. <sup>[12]</sup>

The quality improvement initiative for DCC in low-birth-weight (LBW) infants and the recommendation reported by Bolstridge et al (2016) <sup>[13]</sup>, that DCC is used for the newborn before thirty-seven weeks gestational age, it improves overall clinical neonatal outcomes. <sup>[14]</sup> Furthermore, the transference period from fetal to newborn life is considering one of the major physiological challenges in all human may face, however, once the umbilical cord is clamped, infants must clear their airway for allowing gas exchange, as well as the cardiovascular system, must undergo a major structural and organ functional rearrangement. <sup>[15-17]</sup>

In fact, the timing of cord clamping and following strategies and policies carried out for active management in the 3<sup>rd</sup> stage of labor to reduce postpartum hemorrhage, consequently, considered the DCC may increase the risk of maternal hemorrhage. Conversely, in a review of five trials that consisted more than 2200 women, late umbilical cord clamping was not associated with an increased risk of PPH or increased blood loss at delivery and reported nor was a relationship with a difference in PPH level or need for blood transfusion. <sup>[18]</sup>

### **SIGNIFICANT OF THE STUDY**

The timing of a cord clamping has a growing area of research and reporting many clinical benefits. However, the implementation of new evidence is considering as a challenging undertaking for improves neonates' quality outcomes. <sup>[14]</sup> As the nursing care is the main critical component in labor unit, Nurses' poor manipulation of the third stage of labor surely will interfere with their ability to achieve positive pregnancy outcomes. <sup>[19]</sup> Recent studies have now begun to investigate the factors associated with the timing of umbilical cord clamping and how it can improve infant and maternal outcomes. <sup>[20]</sup> So the current study aimed to compare the effectiveness of ECC versus DCC on the maternal & newborn outcome. While WHO, as well as the International Federation of Obstetrics & Gynecology no longer support the ECC as apart of the Active management of the 3<sup>rd</sup> stage of labor

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(AMTSL). Furthermore, DCC may play a vital role in the decline of anemia during infancy. In Egypt, according to the results of a recent study conducted by Elgzaret al (2017) [21], 57.1% of infants in Menoufiagovernorate, Egypt have iron deficiency anemia, but DCC may well increase rates of hyperbilirubinaemia, polycythaemia, and transient tachypnea in the newborn. [22] Complications of polycythemia in the newborn are bleeding, thrombotic, & vascular complications are the major causes of morbidity and mortality. [23]

### AIM OF THE STUDY

The present study was conducted to evaluate the consequences of ECC versus DCC on maternal & neonatal outcomes in Beni-Suef city.

### HYPOTHESES OF THE STUDY

The DCC will have clinical benefits on both maternal & neonatal outcome than ECC.

### SUBJECTS AND METHODS

**Research Design:** A quasi-experimental research design was selected for the current study.

**Research Setting:** The study was conducted at labor & delivery units at Beni-Suef General hospital.

**Sample Size and Technique:** The sample size was detected based on the last year census report of the obstetrics and gynecology department at Beni-Suef General Hospital. The total number of multipara pregnant women was 1490. [24] The sample size was calculated by taking 10% of the total annual rate. Randomized controlled trial used for comparing DCC with ECC. The sample size was detected based on the last numbers of previous setting students was 298. The sample size was calculated utilizing the following formula. [25]

$$n = \frac{N}{1 + N(e)^2}$$

Where n= sample size, N= population(1490), e= margin error (0.05). A total of sample size was 315 mothers

**SAMPLING:** While a total calculated sample size was 315, subsequently a purposive sample of 150 women meets the required criteria and agreed to participate in the study. They divided into two groups 75 women with early cord clamping ( $\leq 1$  min after delivery) and 75 for delayed umbilical cord clamping ( $\geq 3$  min after delivery) during the period from September 2015 to September 2016. The participants were selected according to the following criteria

### Inclusions Criteria

1. Women aged 18-35 years.
2. Gestational age 37- 42 weeks.
3. Multipara having second to fourth delivery, singleton birth.
4. Free from medical disorders associated with pregnancy.
5. Expected to give birth vaginally (cephalic vaginal birth).
6. No obstetric complication during the 1<sup>st</sup> stage of labor.
7. The birth weight ranged from 2500 to 4000 gm.

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### Exclusions Criteria

1. Women who have negative Rhesus factor status (Rh -).
2. Women have been given preterm birth (less than 37 weeks gestation).
3. Women have been given a breech or any abnormal presentation.
4. Women who give birth by cesarean section (CS).
5. Women with evidence of intrauterine growth restriction (IUGR) or congenital malformation.

### TOOLS OF DATA COLLECTION

The tools of data collection were developed and used by the researchers after reviewing the related literature. Two tools were used for the collection of the necessary data.

**Tool I:** Structured Interviewing Questionnaire Sheet which compromises from 3 parts:

**Part 1:** Women's general characteristics data such as weight, age, educational level, occupational status, and residence.

**Part 2:** Women's obstetrical history as menstrual history (duration of menstruation, menstrual regularity, amount of menstrual blood flow, menstrual disorder) and history of PPH.

**Part 3:** Prenatal data: The following information was collected from maternal health care records from the time of admission to antenatal care, weight, blood group, hemoglobin (Hb) value, gestational age and antenatal visit.

**Tool II:** Maternal and Fetal Outcome Sheet which compromise from 2 parts:

**Part 1:** Maternal outcomes sheet: duration of the 3<sup>rd</sup> stage of labor, hemoglobin and hematocrit level (assess the need for blood transfusion, postpartum hemorrhage, etc.) and placental separation (spontaneous or manual removal of the placenta).

**Part 2:** Neonatal outcomes sheet: umbilical cord hemoglobin (immediately after birth & 24hrs after delivery hematocrit level), RBCs count, bilirubin level, and the need for admission to Neonate Intensive Care Unit (NICU), and need for restitution.

### TOOLS VALIDITY

All tools were tested for content validity by a jury of five experts in the obstetrics and gynecological nursing, pediatric nursing professor and one from biostatistics field.

### Tools Reliability

Reliability of tools was tested by using Cronbach's Alpha coefficient test, which revealed that the tool II (Maternal & Neonatal outcomes assessment sheet). Consisted of relatively homogenous items as indicated by high reliability= 0.85 & 0.87, respectively.

### Pilot Study

The pilot study was conducted on 10.0% of the total sample to test the feasibility & the applicability of the tool, find out the possible obstacles or problems that might face the researchers and interfere with data collection, detect any problems peculiar to the statements as sequence of questions, clarity and estimate the time needed for data collection. The samples of the women included in the pilot study were excluded from the main study sample

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### **FELID OF WORK**

The data were compiled by the researcher during the period of 13 months from the 1<sup>st</sup> of September 2015 up to the end of September 2016. The present study was carried out through the following phases:

#### **Interviewing or Assessment Phase**

- The mothers were selected at their 1<sup>st</sup> stage of labor by fitting eligibility criteria. The researchers explained the aim and approach of the study to every woman and then informed oral consents were obtained from all the eligible ones to participate in the study.
- The researchers started to collect baseline data using the tool (I) through interviewing technique to fill the tools. Each woman was questioned individually and they assured that confidentiality by the researchers. The mean time needed for each woman was about 25-35 min to fill a questionnaire. The antenatal data as medication, parity, gravidity, weight, and gestational age were collected from maternal records.

#### **Planning Phase**

- Women were randomized to two homogeneous groups, early or late cord clamping groups. Each group was randomly assigned to cord clamping at less than one minute for early clamping group, while the timing of late cord clamping and cutting was (1 to 3 min.) and maintain the baby level in a low level of the placenta, random assignment was done by computer-generated tables.
- Closed impervious sequentially numbered covers that contained the assigned intervention used to cover the distribution, if at the time of delivery the woman was still considered qualified for the experimental, acceptance took place, and a wrapper was drawn and opened accordingly in the delivery room after deciding to include those who have uneventful pregnancies according to the previously mentioned criteria.
- Labor and delivery were performed following the obstetrics' standard practice of care at the hospital. In line with hospital routine, oxytocin (10 IU, corresponding to 16.7 µg) was administered intravenously to the mother immediately after cord clamping. After delivery, the women and their babies were cared for the according to clinical routines and early breastfeeding was recommended and encouraged.
- The researchers assessed all women among both groups for the duration of the 3<sup>rd</sup> stage of labor. All women among both groups received uterotonic agents after cord clamping.
- After completion of these procedures, The obstetrician held the infant in a sterile towel or blanket approximately 10 to 15 inches below the mother's introitus at vaginal delivery, the assistant nurse who attended the delivery room and previously informed about the nature of research used a stopwatch to check the time at which clamping was effectively accomplished. Care was taken that no tension or traction was placed on the cord.

#### **Implementation Phase**

- Physician was responsible for performing neonatal examinations, maternity & newborn and pediatric nursing researchers were responsible for the data collection; blood samples collected from women and their newborn and send to laboratory analyses. They were blinded to the infant's allocation group.

#### **Maternal Implementation**

1. The maternal outcome: assess the maternal outcomes through the length of the 3<sup>rd</sup> stage of labor, mean blood loss, manual removal of the placenta, blood transfusion and use of therapeutic uterotonic.

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2. For the measurement of maternal blood loss, all vaginal blood was collected immediately after the infant's delivery by placing a pan and pad under the woman's buttocks until she was transferred to the postpartum ward. The collected blood was poured in a graded jar, and blood volume was determined.
3. After delivery and getting birth, the estimated maternal postpartum blood loss was recorded by the researchers within two hrs after childbirth by weighing pads, sheets, and other textiles, and by measuring the volume of blood collected in a pan. The time between the fetal and placental delivery was noted.

### **Neonatal Implementation**

1. The infant was warmly wrapped & held below the level of the mother's abdomen to prevent heat loss while waiting cord clamping.
2. Before discharge from the labor unit to the postnatal ward, the researchers measured the time from complete delivery of the baby to the first clamp on the umbilical cord with a stopwatch.
3. Venous and arterial cord blood samples for assessment of hemoglobin from the double clamped segment of the umbilical cord in the both group with keep infant in a low level of the placental level.
4. Admission to the NICU within 24 hrs after birth was followed for assessing neonatal outcomes.

### **Evaluation Phase**

Measuring maternal and newborn outcomes:

- Assessment of postpartum hemorrhage was determined if blood loss exceeds 500 ml, furthermore, women were assessed for the need for blood transfusion and placental separation is a spontaneous or manual removal of it.
- Assess neonates' weight, treatment with phototherapy, admission to the NICU, neonatal HB level, distress jaundice requiring phototherapy and the need for resuscitation.
- In plain tubes, 4 ml of maternal venous blood was collected for HB & hematocrit estimation. Similarly, 4 ml of the infants' venous blood extracted, twice, from the newborn: (1) umbilical veins blood sample immediately after clamping the umbilical cord; (2) antecubital vein blood sample after 24 hours in 2 tubes sealed at one end with modeling clay, to measure hematocrit, hemoglobin level, RBCs count and Bilirubin level by the cyanmethemoglobin method.<sup>[9]</sup> The sample was sent immediately to the laboratory and all laboratory results were recorded and compared with normal levels to assess maternal and neonatal blood analysis, fetal anemia and outcomes used tool II (part 2) by the researchers.

### **ADMINISTRATIVE AND ETHICAL CONSIDERATION**

The study was conducted after getting permission from the director of the hospital and head of the department of obstetrics & gynecology of the general hospital in Beni-Suef city. Moreover, the aim of the study was explained to the women who participated in the research and oral consent was taken from all women who were agreeing to participate after reassuring them about the confidentiality & privacy of all information and that information will be used only for the purposeful research. The researchers interviewed women at labor departments in Beni-Suef general hospital.

### **STATISTICAL DATA ANALYSIS**

- The data were computerized and analyzed using the statistical package for social science (SPSS) version 22.0.

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- Data were presented using descriptive statistics in the form of a number, percentage, mean & standard deviation (Mean  $\pm$  SD).
- Quantitative continuous data were
  1. Student t-test was used in case of comparisons between two groups.
  2. Paired t-test was used for pre-post comparisons of the same sample.
  3. Pearson correlation analysis was used for assessment of the inter-relationships among quantitative variables.
  4. Columand Bar chart diagrams were used to express the graphical presentation of the data.
- Statistical significance was considered at P -value <0.05.

### RESULTS

The socio-demographic characteristics of mothers in the study sample are described in **table 1**. It illustrates that more than half of mothers in both groups of the study sample age between 20 to 35 years, around half and most of them were secondary education and housewives. The findings of the present study revealed that both groups were comparable with no significant differences in respect to baseline characteristics as maternal age, occupation, education, and residence.

**Table 1.** Socio-demographic characteristics of mothers in the study sample (n=150)

Women's characteristics	Group1 (N=75)		Group2 (No=75)		P. value
	Early clamping (< 1 min)		Late clamping (1-3mins)		
	No	%	No	%	
<b>Women's age</b>					
<20	9	12.0	15	20.0	0.446
20-35	48	64.0	40	53.3	
>35	18	24.0	20	26.7	
Mean $\pm$ SD	29.55+7.1		29.44+6.4		0.818
<b>Education</b>					
Illiterate	9	12.0	12	16.0	0.622
Primary	12	16.0	10	13.3	
Secondary	32	42.7	35	46.7	
University	22	29.3	18	24.0	
<b>Residence</b>					
Urban	33	44.0	47	62.7	0.472
Rural	37	56.0	28	37.3	
<b>Occupation</b>					
Housewife	50	66.7	60	80.0	0.337
Employer	25	33.3	15	20.0	

**Table (2)** presented that no significant difference regarding regularity of menstruation, and history of menstrual disorders, however, a significant difference was observed regarding the previous history of PPH. Furthermore, both groups were comparable for gestational age, 1<sup>st</sup> antenatal visit weight and amount of menstrual blood flow



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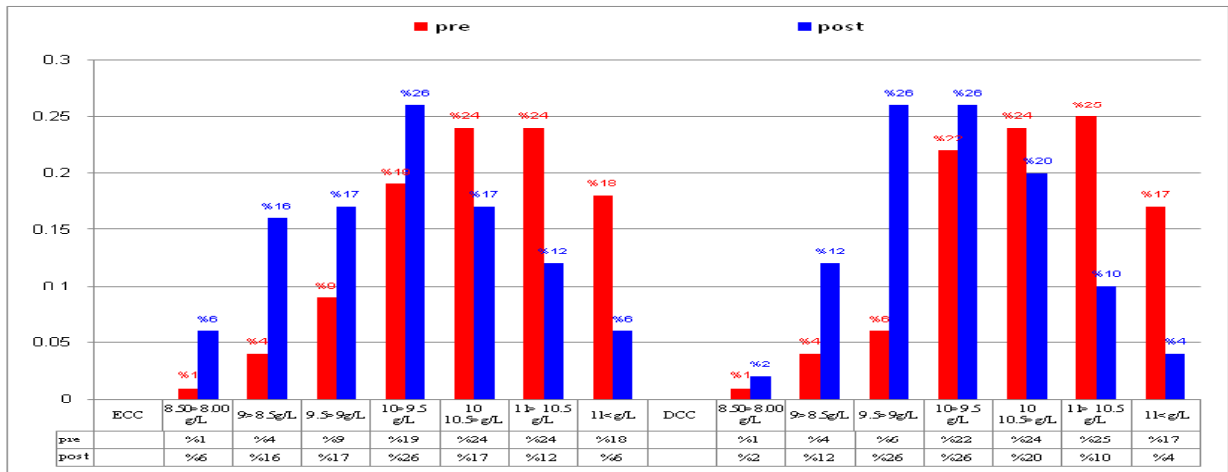
**Table2.** *Obstetrical history of the study sample.(n=150)*

Obstetrical history	Group1 (N=75)		Group2 (No=75)		P. value
	Early clamping(<1min)		Late clamping(1-3mins)		
	No	%	No	%	
<b>Duration of menstruation</b>					0.341
Mean± SD	2.4+0.45		2.1+0.41		
<b>Menstrual regularity</b>					0.311
Regular	50	66.7	45	60.0	
Irregular	25	33.3	30	40.0	
<b>Menstrual disorder</b>					0.509
No	55	73.3	60	80.0	
Yes	20	26.7	15	20.0	
<b>Gestational age</b>					
37 weeks	0	0.0	0	0.0	
38-40 weeks	33	44.0	40	53.3	
40 -42 weeks	47	56.0	35	46.7	
<b>1<sup>st</sup>Antenatal visit Weight</b>					0.545
<60 kg	1	1.3	3	4.0	
61-70 kg	12	16.0	15	20.0	
71-80 kg	22	29.4	20	26.7	
81-90 kg	19	25.3	17	22.6	
91-100kg	21	28.0	20	26.7	
Mean±SD	38.7+5.2		41+5.3		
<b>Amount of menstrual blood flow</b>					0.333
Mean + SD	8.33+2.4		9.32+2.7		
▪ Scanty (changed less than 4 pads during menstruation)	32	42.7	30	40.0	0.532
▪ Moderate (4-9 pads changed)	41	54.7	40	53.3	
▪ Excessive (more than 9 pads changed)	2	2.6	5	6.7	
Past history of PPH					0.043*
▪ No	70	93.3	72	96.0	
▪ Yes	5	6.7	3	4.0	

**Figure (1)** displays the changes in hemoglobin level throughout the period of pre and post labor between early or late cord clamping groups of maternal hemoglobin level. It demonstrates increase the hemoglobin level in pre of both groups and it demonstrates slightly decrease in the post-partum maternal hemoglobin level post-labor of early and delayed cord clamping groups.



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**Fig1.** Changes of maternal hemoglobin level (g/L) throughout the follow-up pre and post-delivery

**Table (3)** shows that no significant difference regarding maternal outcomes among both groups in respect to estimated postpartum blood loss, hemoglobin and hematocrit level and need for blood transfusion and 8% of them required manual removal of the placenta. The mean estimated postpartum blood loss, maternal hemoglobin and hematocrit level within 24 hours of labor among early and late cord clamping ( $516 \pm 65$ ,  $562 \pm 112$  &  $14.02 \pm 1.22$ ,  $13.44 \pm 1.88$  &  $40.30 \pm 4.38$ ,  $35.08 \pm 5.66$  respectively) and postpartum blood loss was within the normal average of blood loss for vaginal delivery among early and late cord clamping. However, a significant difference was observed regarding the length of the third stage of labor, the mean duration of the third stage of labor took a shorter time for the early cord clamping group compared to late group ( $22.18 \pm 3.4$  &  $33.6 \pm 4.2$  minutes respectively). Additionally, the majority of the study sample didn't need for blood transfusion and all of the women received uterotonic after cord clamping.

**Table3.** Maternal characteristics' outcomes. (n=150)

Maternal outcomes	Group1 (N=75) Early clamping (< 1 min)		Group2 (No=75) Late clamping (1-3mins)		P. value
	No	%	No	%	
<b>Estimated Maternal a postpartum blood loss (Mean ± SD)</b>	516±65		562±112		0.476
No (blood loss <500)	65	86.7	69	92.0	0.458
Moderate (blood loss 500 <1000)	10	13.3	6	8.0	
Sever (blood loss >1000)	0	0.0	0	0.0	
<b>Maternal hemoglobin level (Mean ± SD)</b>	14.02±1.22		13.44±1.88		0.382
<b>Maternal hematocrit level (Mean±SD)</b>	40.30±4.38		35.08±5.66		0.821
<b>Placental Separation</b>					0.212
Spontaneous	65	86.7	73	97.3	
Manual Removal	10	13.3	2	2.7	
<b>Need for blood transfusion</b>					0.122
No	70	93.3	73	97.3	
Yes	5	6.7	2	2.7	

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<b>Women received uterotonic after cord clamping</b>					
No	0	0.0	0	0.0	
Yes	75	100.0	75	100.0	-
<b>Length of 3rd stage of labor (min) (Mean ± SD)</b>	22.18±3.4		33.6±4.2		
Less than 20 min	50	66.7	12	16.0	0.001**
20 - 30 min	25	33.3	43	57.3	
More than 30 min	0	0.0	20	26.7	

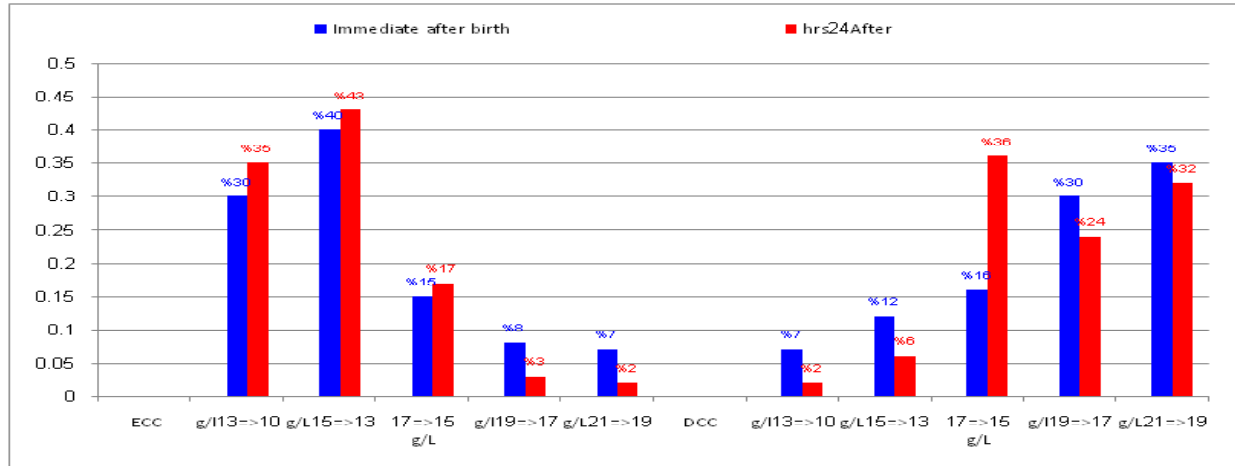
As regards the neonatal outcomes, **Table (4)** revealed that, the neonatal mean of body weight was (4.1 ± 0.7 & 5.7 ± 0.5) and neonatal hematologic parameters were comparable and slightly raised in hematocrit and hemoglobin level at birth especially among late cord clamping group compared to early group with no significant differences however a significant difference was observed regarding these levels after 24 hours, furthermore no significant difference was detected regarding other neonatal variables as total Bilirubin count, polycythemia, anemia and need for admission to NICU. The incidence of newborns with a hematocrit level of <45% and polycythemia or a hematocrit level of > 65% at birth and after 24 hours among the early and late group were lower in ECC but higher among the late cord clamping group compared to early cord clamping, but with no statistically significant differences.

**Table4.** *Distribution of neonates according to their hematological parameters and neonatal outcomes*

Neonatal Outcomes	Group1 (N=75)		Group2 (No=75)		P. value
	Early clamping (< 1 min)		Late clamping (1-3mins)		
	No	%	No	%	
<b>Baby weight</b> (Mean ± SD)	4.1±0.7		5.7±0.5		0.268
<b>Neonatal Hematocrit level</b> (Mean ± SD) At birth	65.4±6.6		61.0 ±7.4		0.082
(Mean ± SD) After 24 hours	68.6±7.5		63.8±8.2		0.062
<b>Neonatal hemoglobin level</b> (Mean ± SD) At birth	19.4± 2.4		16.4 ± 2.5		0.274
(Mean ± SD) After 24 hours	18.8± 1.88		19.7±2.3		0.042
<b>Neonatal RBCs counts</b> (Mean ± SD) At birth	6.6± 0.60		7.3±1.2		0.044
(Mean ± SD) After 24 hours	7.3± 0.71		8.42 ±1.8		0.45
<b>Total Billirubin count</b> (Mean ± SD) At birth	4.11±2.1		4.84 ±3.2		0.06
(Mean ± SD) After 24 hours	4.8±2.8		6.4±4.1		0.15
<b>Polycythemia</b> HCT > 65% At birth	1	1.33	4	5.33	0.976
HCT > 65% After 24 hours	1	1.33	8	10.67	
<b>Anemia</b> HCT<45% At birth	2	2.67	1	1.33	0.083
HCT<45% After 24 hours	2	2.67	0	0.0	
<b>Need for resuscitation</b> No	75	100.0	73	97.3	--
Yes	0	0.0	2	2.7	

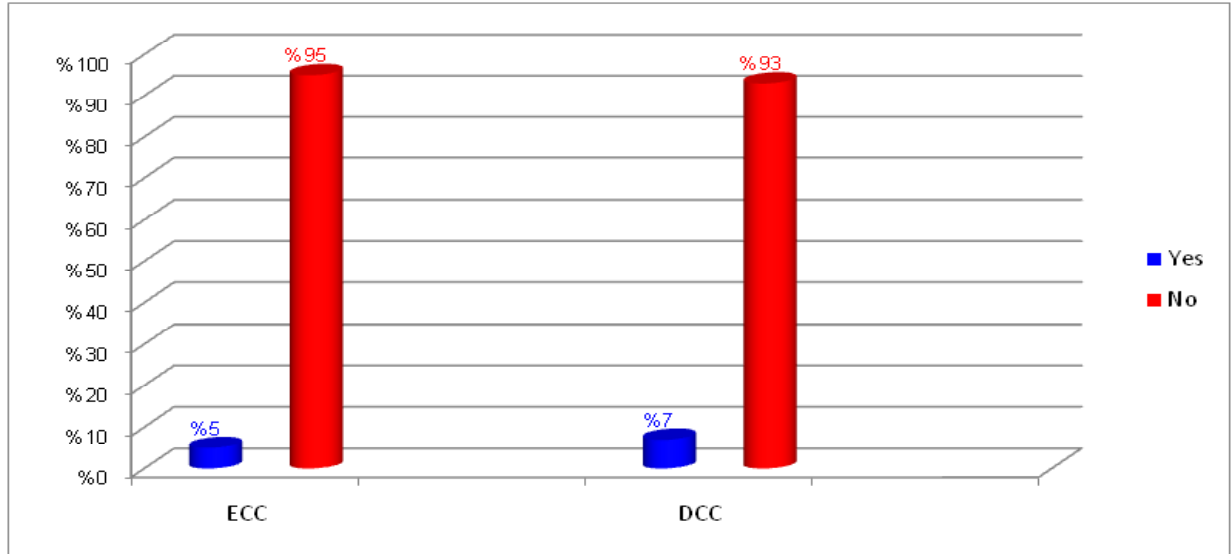
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**Figure (2):** illustrated the hemoglobin level of the neonate among early & late cord clamping. The hemoglobin level of neonates in the ECC study sample was increased than ECC study group. It demonstrates that in the DCC study sample hemoglobin level had ranged between 15 to 17 g/L (36.0%) and about 32.0% had hemoglobin level ranged from 19 to 21 g/L.



**Fig2.** Distribution of hemoglobin level of neonate after birth and after 24hrs of delivery between ECC and DCC (No=150)

The comparison between delayed and ECC groups regarding the neonatal need for admission to NICU is displayed in **Figure (3)**. The figure revealed that the majority of study sample did not need for admission to NICU.



**Fig3.** Comparison Between Delayed and ECC Groups Regarding Neonatal Need for Admission to NICU.

**DISCUSSION**

In the developed world without scientific assessment of its potential effect on a newborn’s health, obstetricians and midwives choose when to clamp and cut the umbilical cord. [26] Nursing personnel plays an important role in the labor area especially in the 3<sup>rd</sup> stage of labor, so nurses should have the basic necessary knowledge and technical skills to offer the care safely, be trained accurately in practical and technical procedures to be able

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to use this knowledge effectively <sup>[27]</sup> Early cord clamping has converted the routine practice as a part of active management of the 3<sup>rd</sup> stage of labor. Furthermore, ECC as a part of the active management of the 3<sup>rd</sup> stage of labor is supposed to significantly reduce the hazard of PPH. Since many active management protocols include ECC, leading some to suggest that DCC may increase the hazard for PPH. On the contrary, recent protocol proposed by WHO to treat the 3<sup>rd</sup> stage of labor switched the ECC by DCC to induce numerous neonatal benefits. However, delayed versus immediate cord clamping is not generally recognized as part of the management of the 3<sup>rd</sup> stage of labor. <sup>[26]</sup> In addition, fear of polycythemia, respiratory distress, and hyperbilirubinemia are concerns that have caught up the practice of DCC as routine care. <sup>[28]</sup>

The umbilical cord clamping time may have a vital impact on a population's health, as revealed by the results of this study and prior data. Even small effects on each individual may have a great impact when multiplied in a large population. Many clinical trials examined the effects of late umbilical cord clamping on both mother and their infant. Therefore many variations were reported in the timing of umbilical cord clamping, this can be immediately after birth within a set time after birth either within 30 seconds to minute, or any time before umbilical cord pulsation ceases. <sup>[29]</sup> The aim of the present study was to evaluate the consequences of early versus delay umbilical cord clamping on both maternal & neonatal outcomes.

As regarding socio-demographic characteristics and maternal outcomes, the present study revealed that there was no statistically significant difference between both early and delayed group. Both groups were comparable with no significant difference regarding menstrual and obstetric history parameters however a significant difference was observed regarding the length of the 3<sup>rd</sup> stage of labor, the mean duration of the 3<sup>rd</sup> stage of labor took a shorter time for the early cord clamping group compared to the late group. This finding was in the same line with Ahmad et al (2012) who found that no statistically significant difference regarding sociodemographic data between both groups was comparable of study subjects except menstrual and obstetric history parameters, however, the only significant difference in her study about effect of early versus late umbilical cord clamping of term infants on maternal and neonatal outcomes at Assiut University. <sup>[30]</sup> This finding was supported by Inch (1985) who underlined that early cord clamping has been related to a reduction in the length of the 3<sup>rd</sup> stage of labor. <sup>[31]</sup> As of the aims of active management is to decrease the length of the 3<sup>rd</sup> stage because of the extended time of placenta remains undelivered. On the contrary, Abalos (2009) stated that, no differences between both groups in respect to the duration of the 3<sup>rd</sup> stage of labor, in his study about the effect of timing of umbilical cord clamping of term infants on maternal & neonatal outcomes. <sup>[32]</sup>

The present study results denoted that, there was no significant difference between DCC & ECC groups in relation to estimated a maternal postpartum blood loss, maternal hemoglobin, hematocrit levels and needs for blood transfusion ( $421 \pm 67$ ,  $435 \pm 125$  &  $14.02 \pm 1.22$ ,  $13.44 \pm 1.88$  &  $40.30 \pm 4.38$ ,  $35.08 \pm 5.66$ ), respectively. Whereas, more than three-quarters of both groups DCC a ECC lost normal amount postpartum blood loss (blood loss was < 500 ml). Severe PPH (blood loss > 1000 ml) was not detected in the both groups. The results of this study supported by Backes et al (2015) who stated that, no benefit of ECC for the prevention of PPH in his study about "the effect of early versus delayed umbilical cord clamping in infants with congenital heart disease. <sup>[33]</sup> Moreover, the study results supported by Ceriani et al (2006) who also recorded cases which suffered from post-partum hemorrhage. Postpartum hemorrhage (blood loss > 500 ml) was decreased among late cord clamping group compared to early group (26.8% in the ECC group, 22.2% in the 1-minute cord clamping group, and 25.4% in the 3-minute cord clamping group). <sup>[34]</sup> Severe postpartum hemorrhage (blood loss > 1000 ml) was 3.6%, 5.6%, & 3.2% in each group, respectively, in his study about the effect of timing of cord clamping on neonatal venous hematocrit values & clinical outcome at term. <sup>[34]</sup> In this Ahmad et al (2012) respect mentioned that, no significant difference was detected in early & late cord clamping groups in maternal hemoglobin & hematocrit

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levels ( $12.01 \pm 0.97$  &  $11.7 \pm 1.35$  and  $33.59 \pm 3.57$  &  $33.52 \pm 4.44$  respectively) in her study about effect of early VS late umbilical cord clamping of term infants on maternal and neonatal outcomes at Assiut University.<sup>[30]</sup> This finding unsupported by Nesheli et al (2014) who stated that, DCC may increase rates of hyperbilirubinaemia, polycythaemia, and transient tachypnoea in the newborn or maternal haemorrhage in his study about effect of late VS early clamping of the umbilical cord (on hemoglobin level) in full-term neonates at Mazandaran University of Medical Sciences, Sari, Iran.<sup>[22]</sup> Regarding the need for blood transfusion, the result of the present study showed that the majority among early group compared to all women among the late group not need blood transfusion with no significant difference. This is agreed with Abalos (2009) who reported that there were no statistically significant differences in need for blood transfusion between the early & late cord clamping groups in his study about the effect of timing of umbilical cord clamping of term infants on maternal & neonatal outcomes at Geneva.<sup>[32]</sup>

As regarding placental separation (spontaneous VS manual removal ) and uterotonic agents administered following birth and previous to cord clamping have been revealed to rise the rate of placental transfusion and are thus likely to increase the effect of delayed clamping and the present study revealed that, there was no statistically significant difference between both early and delayed group in placental separation (spontaneous VS manual removal ) and all women of both groups received uterotonic. Mc Donald et al (2013) found that all women of both groups received uterotonic after cord clamping and showed no significant differences in the need for therapeutic administration of uterotonic between the early VS late cord clamping groups in his study about Effect of timing of umbilical cord clamping of term infants on maternal & neonatal outcomes.<sup>[35]</sup>

Regarding distribution of neonates according to their hematological parameters & neonatal outcomes about consequences of early versus delay umbilical cord clamping on maternal & neonatal outcomes, the current study stated that there were slightly raised in hematocrit and hemoglobin level at birth especially among late cord clamping group compared to early group with no significant differences however a significant difference was observed regarding these levels after 24 hours. This findings agreed with Nesheli et al (2014) who found that, DCC permitting placental transfusion post-delivery can provide the newborn with a 30% increase the blood volume and up to a 60% increase in red blood cells (RBCs) in his study about effect of late VS early clamping of the umbilical cord (on hemoglobin level) in full-term neonates at Mazandaran University of Medical Sciences, Sari, Iran. <sup>[22]</sup> Moreover, Bolstridge et al (2016) added that DCC reduces the need for blood transfusions by reducing the incidence of iron deficiency anemia. <sup>[36]</sup> Though enhancements in hemoglobin concentrations are more passing, newborns delivery ECC have decreased iron stores and are twice as likely to be iron deficient at three to six months of age in his study about A quality improvement initiative for delayed umbilical cord clamping in very-low-birth-weight infants at Department of Neonatology, Christiana Care Health System USA. In agreement with Ishtiaq & Bano (2013) who found that the prevalence of neonatal anemia at six hrs was more when the cord was clamped early. In group (1), 8% neonates were set up anemic with no incidence of polycythemia. In group 2, the prevalence of anemia was 6%. Only 4 % of the newborns in group 3 were originated to be anemic, while in group 4, no newborn was found to be anemic of compared ECC and DCC groups in his study about effect of timing of cord clamping on neonatal venous hematocrit & clinical outcome at term-hospital-based randomized control trial. Which the study sample was divided into 4 groups of 50 each wherein the umbilical cord was clamped at 15 seconds, 30 seconds, 1 minute and 2 minutes respectively. <sup>[37]</sup>

Polycythemia or a hematocrit level of  $>65\%$  at birth & after 24 hours among early & late group was lower in ECC but higher among the late cord clamping group compared to early cord clamping, this result supported by Ishtiaq & Bano (2013) who stated that, in group 4 polycythemia occurred in 6% of cases and no found anemic

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newborn where as polycythemia presented in 8% of the newborns in prevalence polycythemia at 6 hours. While prevalence polycythemia at 24 hours was one neonate developed polycythemia. In group 4, only 1 neonate was found to be anemic whereas 8% were polycythemic of DCC group in his study about effect of timing of cord clamping on neonatal venous hematocrit and clinical outcome at term-hospital-based randomized control trial.<sup>[37]</sup>Which the study sample was divided into 4 groups of 50 each wherein the umbilical cord was clamped at 15 seconds, 30 seconds, 1 minute and 2 minutes respectively. Additionally, Nesheli et al (2014) stated that, DCC may increase rates of hyperbilirubinaemia, polycythaemia, and transient tachypnoea in the newborn or maternal haemorrhage in his study about effect of late versus early clamping of the umbilical cord (on hemoglobin level) in full-term neonates at Mazandaran University of Medical Sciences, Sari, Iran. But with no statistically significant differences between ECC&DCC in polycythemia or a hematocrit level.<sup>[22]</sup> The results of current study was agreed with Ahmad et al (2012) who mentioned that, no significant difference was detected in early & late cord clamping groups in polycythemia or a hematocrit level in her study about effect of early versus late umbilical cord clamping of term infants on maternal & neonatal outcomes at Assiut University.<sup>[30]</sup>

### **CONCLUSION**

In the bright of the central study results, it was concluded that, the DCC have clinical benefits on both maternal and neonatal outcome than ECC. So the hypothesis of the study is accepted. Moreover, the DCC of the cord for at 1-3 minutes appears not to increase the risk of postpartum hemorrhage. In addition, DCC can be helpful for the infant by increasing hematological values especially the status which may be of clinical value particularly for the newborn in developing nations where access to good nutrition is poor. Thus, this interference appears to be safe, effective and of a certain importance for developing countries in which anemia during infancy & child hood is extremely predominant, it is likely to have a significant effect on all newborns, regardless of birth setting and could be applied without problems. Henceforth, as this study supports, the clamping of the umbilical cord may be late at least up to 2 minutes to get the optimum advantage and decrease of DCC risk

### **RECOMMENDATIONS**

Based on the findings of the present study, it is recommended that

1. Delay cord clamping should be consistent practice and maintained by the ministry of health and hospital administration.
2. Increasing attentiveness of the routine DCC by obstetricians and midwives and reflect this practice as one of the total quality standers to achieve the mothers & babies benefits under control of DCC time.
3. Future study should also be aimed at women's views & newborn effect related to this intervention.
4. Future research should also be carried out on large numbers of parturient and their neonates and do not extend time of DCC to decrease risk of DCC such as (hyperbilirubinaemia, polycythaemia, and transient tachypnea)
5. Additional study may be useful in refining the timing of clamping by determining the minimum time required to provide maximum benefit associated with placental transfusion and neonatal impact

### **LIMITATION OF STUDY**

To collect data on time of delivery it was considering a challenge to fill all variables of the questionnaire to assess maternal and neonate outcomes.

### **CONFLICTS OF INTEREST DISCLOSURE**

The authors declare that there is no conflict of interest.



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