

Evaluation of Neonatal Hemoglobin after Delayed versus Immediate Cord Clamping

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Abstract: The timing of cord clamping after birth is an important factor affecting neonatal outcomes. Delayed cord clamping (DCC) (1–3 minutes) is used when urgent resuscitation is required, or to permit placental transfusion which raises the blood volume, hemoglobin and iron stores of the infant. The aim of the present study was to compare the hemoglobin levels of neonates post-delayed cord clamping versus immediate cord clamping. The study included a convenient sample of 100 full-term infants 24-hour post C-section (50 immediate cord clamping and 50 delayed cord clamping). Hematological analysis was performed for all infants including hemoglobin concentration, hematocrit values, white blood cells and platelets count. The DCC group infants obtained significantly higher concentration of hemoglobin than the ICC group infants. Moreover, the infants who belong to DCC group showed a significantly higher value of hematocrit than infants in ICC group. No significant difference was found between the two groups in terms of WBCs count or platelets count. DCC resulted in higher hemoglobin concentration and hematocrit values compared to ICC.

Keywords: Neonatal Hemoglobin, Umbilical Cord Clamping, Placental Transfusion

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Introduction

The placenta is the principal organ for gas exchange during fetal life and there is a unique and special system of circulation to carry oxygen and other nourishing material from the mother to the fetus. The umbilical cord is formed by the two umbilical arteries and one umbilical vein which are surrounded by Wharton's jelly, which helps to protect the umbilical vessels from being compressed. The umbilical vein carries oxygenated and nutritive blood to the fetus, while the arteries carry deoxygenated blood and metabolic wastes to the placenta. The change from fetal to neonatal circulation is a huge adjustment at birth, and the timing of umbilical cord clamping could affect the blood volume and haematological status of the neonate [1, 2].

The umbilical cord is a routine procedure in obstetrics that is performed to stop the flow of blood from the newborn to the placenta. There are two main methods that have been identified: immediate or early cord clamping (ICC/ECC) which typically occurs within 15–30 seconds after birth, and delayed cord clamping (DCC) which is carried out after about 30–60 seconds after birth, or when pulsations stop. The timing of clamping affects the amount of placental transfusion, and therefore affects neonatal circulating

blood volume, haemoglobin concentration and iron stores [3,4].

Immediate cord clamping was the standard practice in order to allow quick assessment and resuscitation of the newborn. Early interruption of placental circulation, however, causes a reduced transfer of further blood and red blood cells to the newborn and thus lower iron reserves and hemoglobin concentrations in early infancy. Conversely, delayed cord clamping will increase the volume of blood transfused from the placenta and neonatal blood volume by 20-30%, which will help to achieve higher levels of hemoglobin and hematocrit in the early postnatal period [5].

Delayed cord clamping for term and preterm babies has been shown to have significant hematological benefits. This practice has been shown to be correlated with higher hemoglobin concentrations during the first 24–48 hours of life, better ferritin levels, and greater iron stores during the first 3–6 months of life. These benefits can help to lower the risk of iron-deficiency anemia and help infants grow and develop properly. Preterm infants may also benefit from delayed clamping by having better cardiovascular stability, decreased need for blood transfusion, and better physiologic adjustment to extrauterine life [6,7].

Nevertheless, delayed cord clamping might be linked to a greater prevalence of neonatal jaundice, and therefore there is a need to consider the potential benefits and risks of delayed cord clamping when deciding on the timing of clamping. However, professional international groups such as the World Health Organization (WHO) and the American College of Obstetricians and Gynecologists (ACOG) recommend delayed cord clamping (DCC) when clinically appropriate [8,9].

Given the need for appropriate hemoglobin concentration for oxygen conveyance, iron storage, and early postnatal adjustments, the assessment of the haematological effects of various cord clamping practices is still clinically relevant. Hence, the current study was conducted to assess the level of hemoglobin in neonates after delayed and immediate umbilical cord clamping.

Methodology

This study is a case-control study that was carried out at Al-Mwani Teaching Hospital in Basra Governorate during six months (December 2025 to June 2026).

The study was conducted on 100 full-term neonates who were cesarean section deliveries. The subjects were classified into 2 groups: 50 neonates with immediate cord clamping and 50 neonates with delayed cord clamping. 24 hours after delivery, all neonates were evaluated.

Only full-term singletons delivered by cesarean section with no congenital anomalies and live and viable were included. The study excluded preterm neonates, twins, neonates with congenital anomalies and vaginally delivered neonates.

All neonates enrolled had venous blood samples taken 24 hours after birth under strict conditions of asepsis. A full blood count (CBC) was ordered to check on haematological parameters including finding the concentration of haemoglobin in the baby.

Formal ethical and administrative approvals were given by the Department of Obstetrics and Gynecology, Faculty of Medicine, University of Basra. All mothers involved in the study were informed of the purpose, procedure and potential risks of the study and informed consent was obtained.

The Statistical Package for the Social Sciences (SPSS) version 27 (IBM corp., Illinois, USA) was used in data analysis. Data were presented in frequencies and percentage for categorical variables and mean and standard deviation for continuous variables. Mean values of normally distributed continuous variables were compared between the immediate and delayed cord-clamping groups using independent-samples t-test. A P-value of < 0.05 was taken as the level for statistical significance.

Results

The study included a convenient sample of 100 full-term infants 24-hour post elective C-section (50 immediate cord clamping and 50 delayed cord clamping).

Infants in delayed cord clamping group had significantly higher hemoglobin concentration compared to infants in immediate delayed cord clamping group (Table 1).

Table 1. Comparison of hemoglobin concentration between the two groups

Variable		Immediate cord clamping group No. 50	Delayed cord clamping group No. 50	P value
Hemoglobin (gm/dl)	Mean $\pm$ SD	18.19 $\pm$ 1.19	19.97 $\pm$ 1.53	0.001

Using Student T test, p value < 0.05 is considered significant

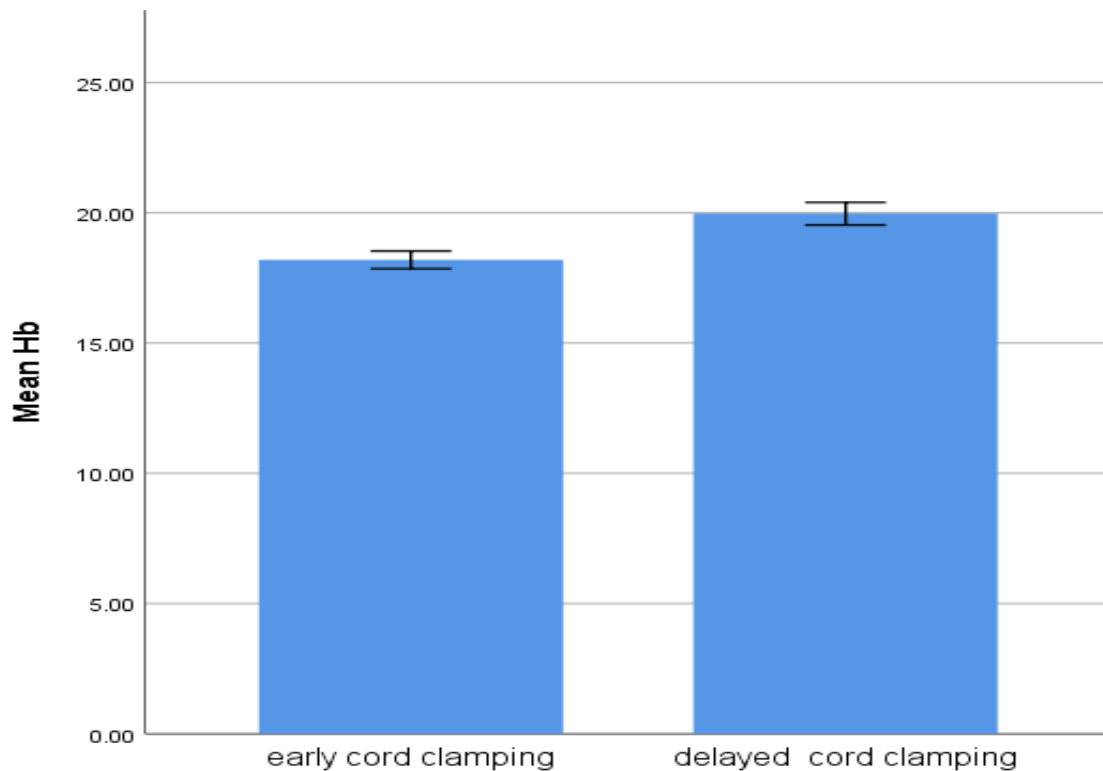


Figure 1. Comparison of hemoglobin concentration between the two groups

Infants in delayed cord clamping group had significantly higher hematocrit values compared to infants in immediate delayed cord clamping group (Table 2).

Table 2. Comparison of hematocrit value between the two groups

Variable		Immediate cord clamping group No. 50	Delayed cord clamping group No. 50	P value
Hematocrit %	Mean $\pm$ SD	54.83 $\pm$ 4.13	64.67 $\pm$ 5.18	0.001

Using Student T test, p value < 0.05 is considered significant

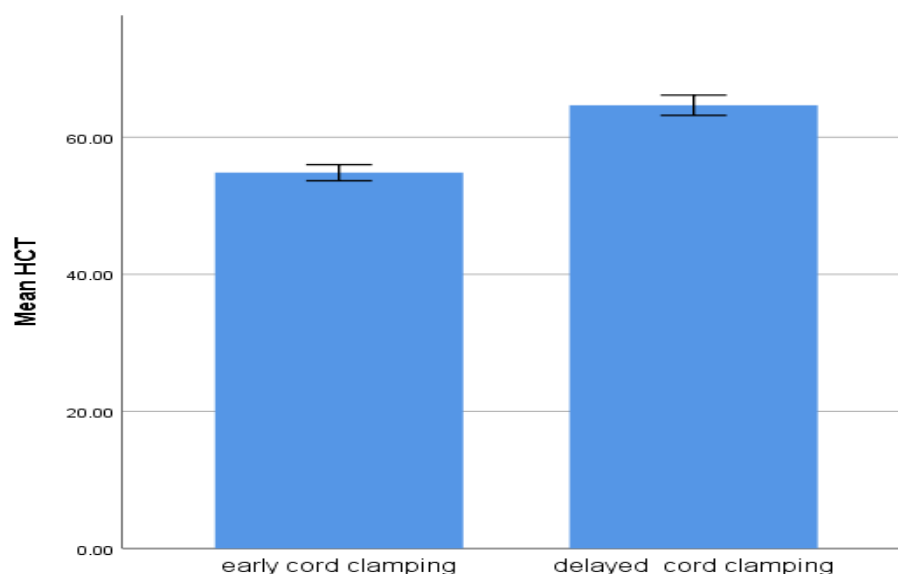


Figure 2. Comparison of hematocrit value between the two groups

There was no statistically significant difference between the two groups as regards white blood cells count (Table 3).

Table 3. Comparison of white blood cells count between the two groups

Variable		Immediate cord clamping group No. 50	Delayed cord clamping group No. 50	P value
White blood cells (cells/ μ L)	Mean $\pm$ SD	19.04 $\pm$ 6.35	17.26 $\pm$ 5.91	0.151

Using Student T test, p value < 0.05 is considered significant

There was no statistically significant difference between the two groups as regards platelets count (Table 4).

Table 4. Comparison of platelets count between the two groups

Variable		Immediate cord clamping group No. 50	Delayed cord clamping group No. 50	P value
Platelets (cells/ μ L)	Mean $\pm$ SD	305.76 $\pm$ 84.88	302.58 $\pm$ 85.85	0.853

Using Student T test, p value < 0.05 is considered significant

Discussion

Cord clamping is an important management intervention in the care of the neonate, done within seconds of birth for immediate clamping and after 1-3 minutes for delayed clamping. Delayed umbilical cord clamping provides placental transfusion which boosts blood volume, hemoglobin and iron stores in the newborn, but is usually selected in cases of immediate resuscitation [10].

The present study was designed to assess the neonatal hemoglobin in the two groups of delayed and

immediate cord clamping. The study included a convenient sample of 100 full-term infants 24-hour post C-section (50 immediate cord clamping and 50 delayed cord clamping).

The hemoglobin concentration was significantly higher in infants in DCC group than infants in ICC group. In addition, the infants in DCC group showed significantly more hematocrit values than the infants in ICC group.

Similar results were obtained by a recent study by Alshlah and colleagues [12] in Iraq who compared ICC within 15 seconds with DCC 60-120 seconds after birth and evaluate their effects on the hematological and clinical parameters of newborns. Hemoglobin and hematocrit levels were significantly higher in the DCC group. Consequently, the authors found that, in the early period, DCC had a significant positive effect on the hematologic status of the newborn, without causing any adverse clinical effects.

In the same context, De Bernardo and colleagues [13] who compared DCC with ICC in term infants born by elective caesarean section. Group A was subjected to ICC while in the Group B, the umbilical cord was clamped 1min after birth. A higher hematocrit was observed in group B than in group A at 72 h.

In agreement with our results, Mercer and colleagues, (2017) [14] measured the effects of a 5-min delay (DCC) versus ICC on neonatal hemoglobin. Infants randomized to DCC compared with ICC had significantly higher hemoglobin levels. Further, Mohammad and colleagues in 2021 (10) have made comparison between the impact of early versus DCC of term births. DCC was correlated with higher hemoglobin level in newborns at 12 hours post partum.

Furthermore, the impact of DCC was said to be not limited to the first days after birth. Andersson and colleagues in 2011 [15] investigated the effects of DCC, compared with ICC, on infant iron status at 4 months of age. The prevalence of neonatal anemia at 2 days of age was lower in the DCC group. Moreover, when measured at 4 months of age, there were no significant differences between the groups in mean hemoglobin concentration, infants in the delayed cord clamping group had a higher mean ferritin concentration, and there was a lower prevalence of iron deficiency anemia.

The physiological benefit of DCC is due to the extra placental transfusion that can be achieved by delaying the clamping of the umbilical cord for 1-3 minutes. At this time, blood flows from placenta to neonate and causes an increase in blood volume and red cell mass. This leads to an increased hemoglobin concentration and hematocrit, and increases oxygen delivery and iron stores in the first months of life [16].

In addition, the higher volume helps maintain cardiovascular stability after birth and this decreases the likelihood of neonatal anemia and general adaptation to extrauterine life [17].

Conclusion

The present study found significantly higher level of hemoglobin concentration in infants in DCC group than infants in ICC group and significantly higher level of hematocrit in infants in DCC group than infants in ICC group with no significant difference between the two groups in regard to white blood cells count or platelets count.

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