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Deferred Cord Clamping versus Milking of the Cord in Full Term Vaginal Delivery: A Randomized Controlled Trial

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ABSTRACT
Background: Insufficient evidence exists on the benefits of delayed cord clamping (DCC) for term infants in resource-rich settings. While a delay of up to 60 seconds may enhance iron stores and blood volume, it raises the risk of neonatal phototherapy.

Objective: To evaluate deferred cord clamping as compared to umbilical cord milking in enhancement of placenta-fetal blood transfusion among full term vaginally delivered new born.

Patients and methods: We performed a randomized controlled trial in Ain Shams University Maternity Hospital during the period from March 2015 to March 2017 where 1000 vaginally delivered full term pregnant women were included, 500 underwent deferred cord clamping (DCC) and the other 500 underwent cord milking.

Results: This randomized controlled trial compared DCC and umbilical cord milking (UCM) in 1,000 term neonates delivered vaginally. DCC (2-minute delay with 30° positioning) resulted in significantly greater neonatal weight gain (74.16 ±9.66 g vs. 52.36 ±7.68 g; $p<0.001$) and placental transfusion volume (77.87 ±10.14 mL vs. 54.98 ±8.06 mL; $p<0.001$) compared to UCM (20 cm cord milked thrice). Weak but significant correlations were found between maternal age and DCC outcomes (weight: $r=0.124$; volume: $r=0.130$; $p=0.006$), suggesting older mothers benefit more from DCC. In contrast, UCM efficacy correlated positively with gestational age ($r=0.123$–0.129; $p=0.006$), indicating advanced gestation enhances milking benefits. No significant sex-based differences were observed in the neonatal weight of either group (DCC: males 73.31±9.48 g vs. females 72.92±9.72 g, $p=0.206$; UCM: $p=0.365$). Apgar scores (5-minute: 9±0) showed no correlation with outcomes, confirming the safety of both methods. Maternal BMI and gestational age (DCC group) had no significant impact.

Conclusion: The findings highlight DCC as superior for optimizing placental transfusion in term neonates, particularly among older mothers, while UCM remains a viable option in time-sensitive scenarios or advanced gestational ages. Future research should explore long-term hematologic and neurodevelopmental outcomes.

Keywords: Deferred cord clamping, Cord milking, Vaginal delivery, Full term.

INTRODUCTION
After clamping, the cord is cut which is painless because there are no nerves involved. Because of its extraordinary toughness, cutting the cord requires a tool that is appropriately sharp. A higher risk of polycythemia is one of the negative consequences of postponing cord clamping. However, investigations suggested that this syndrome was benign [(1)].

"Deferred cord clamping" is the term used when clamping is postponed for more than one minute. In preterm newborns, deferred cord clamping (DCC) reduces neonatal morbidity, but it has little effect on long-term results [(2)].

DCC improved the hemoglobin level at delivery, reduced the requirement for postnatal exchange transfusions, and extended the time between birth and the first transfusion without causing severe hyperbilirubinemia [(3)]. Additionally, it permits time for the placenta to transfer the fetal blood to the newborn. The baby may receive up to 60% more red blood cells and an extra 30% more blood volume from this placental transfer [(4)]. The American College of Obstetricians and Gynecologists recommended a 30- to 60-second DCC for all preterm births[(5)].

Umbilical cord milking (UCM), which involves milking the unclamped umbilical cord before clamping it, may improve perfusion in the superior vena cava soon after delivery. The newborn's blood volume increases by 12 mL/kg within the first 30 seconds after birth [(6)]; however, if the cord is clamped quickly, this early placental transfusion is prevented[(7)].

There is currently not enough evidence to confirm or deny the advantages of DCC for term babies born in resource-rich environments. The potential benefits of delaying umbilical cord clamping for up to 60 seconds must be balanced against the increased risk of neonatal phototherapy, even though this delay may increase blood volume and total body iron stores, which may be especially helpful in populations where iron deficiency is common [(7)].

This work aims to evaluate DCC compared to umbilical cord milking in enhancing placenta-fetal blood transfusion among full-term vaginally delivered newborns.

PATIENTS AND METHODS
This research was a randomized controlled trial conducted at Ain Shams Maternity Hospital from 2015 to 2017. A total of 1,000 term newborns, aged gestationally 38 weeks or more, who were delivered vaginally, were included in the study at Ain Shams University Maternity Hospital.

Inclusion criteria: The study included women with full-term (≥38 weeks) new-born vaginal deliveries.

The criteria for exclusion include situations where there was insufficient time to gain consent or refusal from patients, the presence of recognized congenital

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abnormalities in the fetus, issues related to Rhesus sensitization, the occurrence of hydrops fetalis, and instances of multiple pregnancies.

Sample size calculation:

Sample size was calculated using PASS® version PASS 11 (NCSS, LLC. Kaysville, Utah, USA) program, setting the type-1 error (α) at 0.05 and the power (1-β) at 0.8. Results from a previous study by **Vain *et al.*** [(8)] showed that the mean weight change in the deferred group was 59±48, assuming that the weight change in the milking group 50±45. Calculation according to these values produced a minimal sample size of 420 cases in each group, which was rounded to 500 cases per group.

Randomization, Allocation, and Blinding: Randomization was computer-generated. A randomization table was used for the allocation process, which involved sealed opaque envelopes without the application of masking. Participants were divided into two groups: Group 1 (500 participants) underwent delayed cord clamping (after two minutes), while Group 2 (500 participants) had their cords milked before clamping and cutting. The investigators who analyzed the outcomes were blinded to the clamping method, making this a single-blind study.

METHODS

All women included in the study underwent the following procedures: written consent was obtained from each patient, a detailed medical history was taken, and general physical examinations were conducted. The cases were divided into two groups: Group 1 (500) had deferred cord clamping after two minutes, while Group 2 (500) experienced milking of the cord followed by clamping and cutting. Deferred cord clamping was performed two minutes post-delivery, with the timing measured from when the newborn's shoulder was delivered until the cord was clamped, while the newborn was positioned at an angle of 30 degrees below the mother's abdomen. Cord milking involved moving approximately 20 cm of the umbilical cord over a two-second duration, repeated two additional times [(9)].

The newborn was weighed right after birth using a scale positioned at the level of the mother's introitus. Both groups of infants experienced the same initial procedure of weight measurement immediately post-delivery. For group 1, the second weight was recorded 120 seconds after birth, calculated from the time the newborn's shoulder was delivered until the umbilical cord was clamped. In group 2, the umbilical cord was milked approximately 20 cm over a span of 2 seconds, with two additional repetitions, before the second weight measurement was taken.

Placental transfusion was determined using the weight difference between the first and second measures. The weight was converted to volume, and 1 mL of blood weighed 1.05 g.

All newborns were evaluated for their birth weight, sex, gestational age, and Apgar scores at one and five minutes. Factors assessed included intubation and whether the infant required admission to the neonatal ICU. The Apgar score was determined based on five criteria: skin color, respiratory effort, muscle tone, heart rate, and reflexes. Each of these criteria could receive a score ranging from zero to two, and the total score was calculated accordingly.

Ethical approval:

The study received ethical approval from the Faculty of Medicine of Ain Shams University (FMASU MS118/2015). Additionally, it was registered in the Pan African Clinical Trials Registry with the identifier PACTR202501716148165. Before being recruited for the study, every participant mother gave her informed written consent. All procedures adhered to the Declaration of Helsinki.

Statistical analysis:

Data were collected, revised, coded, and entered into SPSS for analysis. Descriptive statistics provided the mean, ± SD, and range for parametric data, along with frequency and percentage for non-numerical data. For analytical statistics, the independent Student T test assessed significance of difference between two group means, while a Chi-square test examined relationships between qualitative variables. The paired t-test determined significance of differences in repeated measures for the same group. Correlation analysis using Pearson's method evaluated the strength of associations between quantitative variables, denoted by the correlation coefficient "r". Significance levels were defined as follows: $P > 0.05$ (non-significant), $P < 0.05$ (significant), and $P < 0.01$ (highly significant).

RESULTS

Table 1 showed that the comparison of personal and obstetric data between the deferred cord clamping group and the cord milking group revealed no significant differences in age, weight, height, BMI, gestational age, or Apgar scores at both 1 and 5 minutes. Additionally, the distribution of sex of the newborns showed a higher percentage of males in the deferred cord clamping group compared to the cord milking group. However, this difference was also not statistically significant. Overall, these findings indicate that the two groups were comparable regarding the examined personal and obstetric characteristics (Table 1). In the DCC group, four cases experienced primary post-partum hemorrhage (PPH), while none had retained placenta. There were seven cases of PPH in the cord milking group, with no instances of retained placenta. There were no cases requiring intubation or NICU admission. Additionally, there was no statistically significant difference in the occurrence of primary post-partum hemorrhage between the deferred cord clamping and cord milking groups (P=0.544).

Table (1): Description of personal and obstetric data among the deferred cord clamping group.

	Deferred clamping group	Cord milking group		
	Mean±SD **Range**	**Mean±SD** **Range**	**t**	**p-value**
Age (years)	26.27±5.47 16-43	25.93±5.31 16-43	0.991	0.322
Wt. (kg)	85.04±7.10 69-98	85.89±7.05 69-99	-1.899	0.058
Height (cm)	165.5±3.71 158-181	165.39±3.54 158-179	0.497	0.619
BMI [wt/(ht)^2]	31.06±2.57 23.6-37.97	31.4±2.7 23.88-38.76	-2.180	0.090
Gestational age by (wks)	39.2±1.05 38-42	39.18±1.07 38-42	0.240	0.811
Apgar score 1 min.	9.2±1.05 7-8	7.68±0.47 7-8	-0.604	0.546
Apgar score 5 min.	9.00±0 9-9	9.00±0.06 8-9	0.000	1.000
	No.	%	No.	%
Sex of neonates				
Female	240 (48%)	266 (53.2%)	2.704*	0.100
Male	260 (52%	234 (46.8%)		

The comparison of neonatal weight before and after deferred cord clamping in the deferred cord clamping group and the cord milking group demonstrated significant differences in both groups. In the deferred cord clamping group, there was a notable increase in mean weight after the procedure, while the cord milking group also showed a similar increase. Both groups exhibited highly significant results, indicating that the procedures positively influenced neonatal weight. Overall, these findings highlight the effectiveness of both deferred cord clamping and cord milking in enhancing neonatal weight (Table 2).

Table (2): Comparison between neonatal weight before and after deferred clamping in the deferred clamping group and the cord milking group

	Fetal Weight			Mean Diff.		Paired Sample t-test	
		Mean	**±SD**	**Mean**	**±SD**	**t**	**p-value**
DCC	**Before**	3.10	0.29	-0.075	0.049	-34.003	<0.001 HS
	After	3.17	0.30				
UCM	**Before**	3.11	0.30	-0.048	0.064	-16.793	<0.001 HS
	After	3.16	0.31				

Table (3) showed the comparison between the deferred cord clamping group and the cord milking group regarding neonatal weight. Differences in weight, and placental transfusion volume revealed significant disparities. Both groups had similar mean fetal weights before and after the procedures, with no notable differences. However, the deferred cord clamping group exhibited a significantly greater increase in weight differences and higher volumes of blood transfusion compared to the cord milking group. These findings suggest that deferred cord clamping enhances neonatal weight differences and transfusion volume more effectively than cord milking.

Table (3): Comparison between deferred cord clamping and cord milking group as regards neonatal weight, difference in weight, and placental transfusion volume.

	Deferred clamping group	Cord milking group	t-test	p-value
	Mean ± SD Range	Mean ± SD Range		
Fetal wt (Before)	3.1±0.29 (2.51-3.91)	3.11±0.30 (2.51-4.22)	-0.813	0.416
Fetal wt (After)	3.17±0.30 (2.57-3.99)	3.16±0.31 (2.19-4.28)	0.593	0.553
Differences in weight in (gm)	74.16±9.66 60-90	52.36±7.68 (40-60)	39.500	<0.001
Volume of blood transfusion	77.87±10.14 63-94.5	54.98±8.06 (42-63)	39.509	<0.001

In the deferred cord clamping group, maternal age significantly correlated with neonatal weight differences (r = 0.124, p = 0.006) and placental transfusion volume (r = 0.130, p = 0.006). In contrast, no significant correlations were found with maternal BMI or gestational age. The correlation between Apgar scores and placental transfusion volume was insignificant (p = 0.074). Comparisons between male and female neonates revealed no significant differences in neonatal weight (mean for males: 73.31±9.48 grams; females: 72.92±9.72 grams, p = 0.206) or placental perfusion (mean for males: 77.07±9.95; females: 76.56±10.20, p = 0.307). Overall, maternal age was a key factor affecting neonatal weight and transfusion volume, while Apgar scores and neonatal sex did not significantly influence these outcomes.

In the cord milking group, correlations between maternal characteristics and neonatal weight differences showed no significant relationships with maternal age (r = 0.008, p = 0.854) or BMI (r = 0.044, p = 0.324). However, a significant positive correlation was found between gestational age and neonatal weight differences (r = 0.123, p = 0.006). Similarly, maternal age (r = 0.009, p = 0.897) and BMI (r = 0.046, p = 0.340) did not correlate significantly with placental transfusion volume, while gestational age did (r = 0.129, p = 0.006). Additionally, correlations between Apgar scores and neonatal weight and placental transfusion were non-significant, with p-values of 0.899 at 1 minute and 0.664 at 5 minutes. Comparisons between male and female neonates revealed no significant associations in neonatal weight (p = 0.365) or placental transfusion (p = 0.383). These findings indicate that gestational age was a crucial factor influencing neonatal outcomes, while Apgar scores and neonatal sex did not significantly impact these measures.

DISCUSSION

Our results and their interpretation

The presented results highlight key differences in factors influencing neonatal outcomes between deferred cord clamping (DCC) and cord milking (UCM) and the efficacy of these interventions. The DCC resulted in significantly greater neonatal weight gain (74.16 ±9.66 g vs. 52.36 ±7.68 g) and placental transfusion volume (77.87 ±10.14 mL vs. 54.98 ±8.06 mL) compared to UCM (p<0.001). This aligns with the existing evidence that DCC facilitates gradual placental transfusion, whereas UCM may deliver a smaller, controlled volume. Both methods increased neonatal weights post-intervention (DCC: 3.11→3.17 kg; UCM: 3.11→3.16 kg), underscoring their clinical value in enhancing neonatal blood volume.

In the DCC group, maternal age is weakly but significantly correlated with neonatal weight gain (r=0.124) and transfusion volume (r=0.130), suggesting older mothers may benefit more from DCC. However, the small effect sizes imply limited clinical relevance.

In the UCM Group, Gestational age positively influenced outcomes (r=0.123–0.129), likely because advanced gestation enhances placental efficiency, making milking more effective. Maternal age and BMI had no impact here, highlighting mechanistic differences between DCC and UCM.

Insignificant factors, such as Apgar scores, showed no correlation with outcomes in either group, possibly due to uniformly high scores (e.g., 5-minute Apgar: 9±0) limiting variability. The Neonatal sex did not affect weight gain or transfusion volume, indicating interventions were equally effective across sexes.

While maternal age (DCC) and gestational age (UCM) reached statistical significance, their weak correlations (r=0.12 and 0.13 respectively) suggest modest biological impact. Contextual factors (e.g., placental health, delivery mode) not analyzed here may play larger roles.

The study reinforces DCC as superior for placental transfusion volume but identifies distinct influencing factors: maternal age in DCC and gestational age in UCM. The lack of sex-based differences supports both methods as universally applicable. While statistically significant correlations are noted, their clinical utility requires further investigation with broader populations and mechanistic studies. These findings underscore the importance of tailoring cord management strategies to maternal and gestational characteristics.

Comparison of Current Findings to Previous Research

Andersson *et al.* [10-12] demonstrated that DCC (3 minutes) improved iron stores (ferritin levels) and reduced iron deficiency at 4 months in term infants, corroborating the current study's emphasis on placental transfusion benefits. While they focused on hematological and neurodevelopmental outcomes, the present study quantifies immediate neonatal weight gain (±74 g) and transfusion volume (±77 mL), reinforcing DCC's role in optimizing early neonatal health.

Raju [13] highlighted DCC's association with higher hemoglobin/hematocrit and reduced anemia risk, particularly in low-resource settings. The current findings support this, as DCC's transfusion volume (77 mL) closely mirrors the ~80 mL placental transfer that **Hill and Fontenot** [14] reported at 1 minute post-delivery.

Our study uniquely links the maternal age to DCC efficacy, a factor not explored in prior trials. Older mothers showed stronger correlations with neonatal weight gain and transfusion volume, suggesting that age-related placental efficiency or vascular dynamics may enhance transfusion.

Erickson-Owens *et al.* [15] reported UCM's hematocrit benefits in cesarean deliveries, aligning with the current study's findings of moderate transfusion (±52 g weight gain; ±55 mL volume). However, UCM underperformed compared to DCC in the present trial, contrasting with **Rabe *et al.*** [16] who equated 30-second DCC to 4x cord milking. This discrepancy may reflect methodological differences (e.g., milking frequency, timing)**.**

March *et al.* [17] advocated UCM's utility in urgent scenarios due to its rapidity (<5 seconds). The current study supports this, as UCM's transfusion efficacy (52 g) remains clinically meaningful, especially in advanced gestational ages (GA), where placental maturity may enhance milking efficiency.

Popat *et al.* [18] found no hemodynamic benefits (e.g., superior vena cava flow) with DCC in preterm infants (<30 weeks), contrasting sharply with the current study's term-focused results. This underscores GA's critical role: DCC's advantages may be gestational age-dependent, with term infants deriving greater benefit.

Ertekin *et al.* [19] observed improved hemoglobin/hematocrit at 2 months with DCC, paralleling the current study's emphasis on immediate transfusion benefits. However, the present trial did not assess long-term outcomes like anemia or neurodevelopment, a gap filled by **Andersson *et al.*** [11,12] who linked DCC to enhanced fine-motor skills at 4 years.

Both the current study and **Ceriani Cernadas *et al.*** [20] reported no adverse effects (e.g., hyperbilirubinemia, ICU admissions) with DCC/UCM. However, **Ertekin *et al.*** [19] noted mild risks (e.g., phototherapy) with DCC, absent in the present cohort, possibly due to stricter exclusion criteria (e.g., congenital anomalies, Rhesus sensitization).

The current study's transfusion volume (77 mL for DCC) aligns with **Hill and Fontenot** [14] who estimated ~100 mL transfer by 3 minutes. However, the weight-to-volume conversion (1.05 g = 1 mL) introduces assumptions not addressed in prior work, potentially underestimating variability from fluid loss or placental retention.

While, **Raju** [13] emphasized DCC's value in low-income settings (iron deficiency prevalence), the current study highlights gestational age as a predictor of UCM efficacy. This complements **Bayer** [21]**,** who linked DCC's neurodevelopmental benefits to term infants' iron reserves.

The findings contradict **Popat *et al.*** [18], where DCC showed no hemodynamic benefits in preterm infants. This reinforces the need for GA-specific protocols: DCC/UCM may benefit term infants but require cautious application in preterm cohorts.

While, **Rabe *et al.*** [16] equated UCM to 30-second DCC, the current study found UCM inferior to 2-minute DCC. This suggests that transfusion efficacy depends on both method and duration, warranting head-to-head comparisons across timings.

Clinical implications of our study

Deferred cord clamping (DCC) should be prioritized in uncomplicated term vaginal deliveries, particularly for older mothers, due to superior neonatal weight gain and placental transfusion volume. Umbilical cord milking (UCM) is recommended in time-sensitive scenarios or advanced gestational ages, offering moderate benefits.

The Strengths and the Limitations of the Study

The strengths include the design of the randomized controlled trial (RCT) effectively minimized selection bias using computer-generated randomization and sealed opaque envelopes. Outcome assessors were blinded to group allocation to reduce detection bias in measurements such as neonatal weight and Apgar scores, ensuring reliable results. Additionally, an adequate sample size strengthened the study's findings.

The study has several limitations that affect its findings. First, its single-center design limits generalizability to other populations, as it only involves uncomplicated term pregnancies. Finally, it overlooks long-term neonatal outcomes, focusing solely on immediate effects like weight changes and Apgar scores without considering potential long-term risks such as neurodevelopment issues or anemia.

Recommendations for Future Studies

Further studies are needed to evaluate multicenter cohorts, incorporating preterm and high-risk pregnancies, while assessing long-term outcomes such as neurodevelopment and anemia.

CONCLUSION

The findings highlight DCC as superior for optimizing placental transfusion in term neonates, particularly among older mothers, while UCM remains a viable option in time-sensitive scenarios or advanced gestational ages. Future research should explore long-term hematologic and neurodevelopmental outcomes.

Conflict of interest: None.
Financial disclosures: None.

REFERENCES

1. **Ibrahim N, Sukkarieh H, Bustami R *et al*. (2017):** Current umbilical cord clamping practices and attitudes of obstetricians and midwives toward delayed cord clamping in Saudi Arabia. Ann Saudi Med., 37(3):216-224.
2. **Brocato B, Holliday N, Whitehurst R *et al.* (2016):** Delayed cord clamping in preterm neonates: A review of benefits and risks. Obstet Gynecol Surv., 71(1):39-42.
3. **Garabedian C, Rakza T, Drumez E *et al.* (2016):** Benefits of delayed cord clamping in red blood cell alloimmunization. Pediatrics, 137(3):e20153236. doi: 10.1542/peds.2015-3236.
4. **Airey R, Farrar D, Duley L (2010):** Alternative positions for the baby at birth before clamping the umbilical cord. Cochrane Database Syst Rev., 2010(10):CD007555. doi: 10.1002/14651858.CD007555.
5. **Committee on Obstetric Practice, American College of Obstetricians and Gynecologists (2012):** Committee Opinion No.543: Timing of umbilical cord clamping after birth. Obstet Gynecol., 120(6):1522-26.
6. **Aladangady N, McHugh S, Aitchison T *et al.* (2006):** Infants' blood volume in a controlled trial of placental transfusion at preterm delivery. Pediatrics, 117(1):93-98.
7. **Backes C, Huang H, Iams J *et al.* (2016):** Timing of umbilical cord clamping among infants born at 22 through 27 weeks' gestation. J Perinatol., 36(1):35-40.
8. **Vain N, Satragno D, Gorenstein A *et al.* (2014):** Effect of gravity on volume of placental transfusion: a multicentre, randomised, non-inferiority trial. Lancet, 384(9939):235-40.
9. **Hosono S, Mugishima H, Fujita H *et al.* (2008):** Umbilical cord milking reduces the need for red cell transfusions and improves neonatal adaptation in infants born less than 29 weeks' gestation: a randomized controlled trial. Archives of Disease in Childhood. Fetal and Neonatal Edition, 93:14- 19.
10. **Andersson O, Hellström-Westas L, Andersson D *et al.* (2011):** Effect of delayed versus early umbilical cord clamping on neonatal outcomes and iron status at 4 months: a randomised controlled trial. BMJ., 343:d7157. doi: 10.1136/bmj.d7157.
11. **Andersson O, Domellöf M, Andersson D *et al.* (2014):** Effect of delayed vs early umbilical cord clamping on iron status and neurodevelopment at age 12 months: a randomized clinical trial. JAMA Pediatr., 168(6):547-54.
12. **Andersson O, Lindquist B, Lindgren M *et al.* (2015):** Effect of delayed cord clamping on neurodevelopment at 4 years of age: A randomized clinical trial. JAMA Pediatr., 169(7):631-38.
13. **Raju T (2013):** Timing of umbilical cord clamping after birth for optimizing placental transfusion. Curr Opin Pediatr., 25: 180–187.
14. **Hill A, Fontenot H (2014):** Beliefs and practices of obstetric care providers regarding umbilical cord clamping. Nurs Womens Health, 18(5):413-19.
15. **Erickson-Owens D, Mercer J, Oh W (2012):** Umbilical cord milking in term infants delivered by cesarean section: a randomized controlled trial. J Perinatol., 32(8):580-84.
16. **Rabe H, Jewison A, Fernandez Alvarez R *et al.* (2011):** Milking compared with delayed cord clamping to increase placental transfusion in preterm neonates: a randomized controlled trial. Obstet Gynecol., 117(2 Pt 1):205-211.
17. **March M, Hacker M, Parson A *et al.* (2013):** The effects of umbilical cord milking in extremely preterm infants: a randomized controlled trial. Perinatol., 33(10):763-67.
18. **Popat H, Robledo K, Sebastian L *et al.* (2016):** Effect of delayed cord clamping on systemic blood flow: A randomized controlled trial. J Pediatr., 178:81-86.
19. **Ertekin A, Nihan Ozdemir N, Sahinoglu Z *et al*. (2016):** Term babies with delayed cord clamping: an approach in preventing anemia (.). J Matern Fetal Neonatal Med., 29(17):2813–2816.
20. **Ceriani Cernadas J, Carroli G, Pellegrini L *et al.* (2006):** The effect of timing of cord clamping on neonatal venous hematocrit values and clinical outcome at term: a randomized, controlled trial. Pediatrics, 117(4): 779–786.
21. **Bayer K (2016):** Delayed umbilical cord clamping in the 21st century: Indications for practice. Adv Neonatal Care, 16(1): 68-73.