

Literature Review: Delayed Umbilical Cord Clamping on Hemoglobin Levels in Newborns

Resna Litasari¹, Neli Sunarni¹, Dini Ariani¹
¹STIKes Muhammadiyah Ciamis, Indonesia

Article Info

Keywords :

BBL, Hemoglobin, Delayed Cord Cutting

Corresponding Author :

Resna Litasari
E-mail : litasari76@gmail.com

ABSTRACT

Introduction & Objective: Neonatal anemia is a common health problem, particularly in developing countries, and contributes to increased morbidity and mortality in infants. One effective intervention that can be implemented immediately after birth is delayed cord clamping, which involves delaying the clamping of the umbilical cord for 1–3 minutes to allow for blood transfusion from the placenta to the infant. This practice is associated with increased hemoglobin levels in newborns. **Method:** This study is a literature review analyzing seven selected research articles published between 2019 and 2024, from both national and international journals. Inclusion criteria included experimental or quasi-experimental studies evaluating the effects of delayed cord clamping on hemoglobin levels and newborns. Data were analyzed narratively and comparatively. **Result:** All analyzed studies showed that delayed umbilical cord clamping has a positive impact on increasing hemoglobin levels and the hematological status of newborns. Newborns who underwent delayed umbilical cord clamping had higher hemoglobin, hematocrit, and iron stores compared to those who had their umbilical cord clamped earlier. Some studies also noted improved blood pressure stability and organ perfusion, particularly in preterm infants. **Conclusion:** Delayed cord clamping is a simple, safe, and effective intervention that can increase hemoglobin levels and improve the hematological status of newborn infants. The routine implementation of delayed cord clamping should be considered in delivery protocols as a preventive measure against neonatal anemia.

DOI: <https://doi.org/10.56359/igj.v4i2.733>



This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

Introduction

Anemia in newborns is a significant global health issue, contributing to neonatal morbidity and mortality (Berihun et al., 2024). This condition, characterized by low hemoglobin levels in the blood, can lead to various complications, including neurological developmental disorders, increased risk of infection, and growth disorders (Asfarina et al., 2020). The prevalence of anemia in newborns varies widely worldwide, with significantly higher rates in developing countries compared to developed countries, often due to limited access to adequate nutrition and prenatal care (Haider et al., 2013). Data from the World Health Organization (WHO) highlights that anemia remains a substantial public health issue, particularly among pregnant women and children, which further impacts the hemoglobin status of newborn infants (WHO, 2012).

In Indonesia, data from the Ministry of Health indicate a significant burden of anemia among women of reproductive age, including pregnant women, which indirectly contributes to an increased risk of anemia in their babies (Kemenkes RI, 2023). Anemia in pregnant women can have adverse effects on the fetus, leading to low birth weight, preterm birth, birth defects, and even infant mortality, exacerbated by factors such as maternal non-compliance in taking iron tablets during pregnancy (Ramadhan et al., 2023; Sutni & Nulhakim, 2023)

One promising intervention to increase hemoglobin levels in newborns is delayed cord clamping (DCC). DCC has been shown to significantly improve neonatal health by increasing blood volume and iron stores in infants. By delaying clamping for at least 30 seconds to several minutes, infants can receive up to 30% more blood volume and 60% more red blood cells, which are crucial for iron supply (Andersson et al., 2011). This practice not only improves iron status, potentially preventing deficiency during the first year, but also facilitates the transfer of stem cells from the placenta (Zanardo et al., 2023).

Aware of these benefits, the World Health Organization (WHO) has recommended DCC as part of active management of the third stage of labor since 2012, particularly in Southeast Asian countries. WHO suggests delaying clamping for 1 to 3 minutes after birth for all babies, regardless of gestational age or birth weight, and does not recommend immediate clamping (<1 minute) unless in cases of asphyxia requiring emergency resuscitation (WHO, 2014). This recommendation is based on the understanding that delaying clamping allows for continued blood flow from the placenta, which has been shown to increase iron stores in young infants by over 50% at 6 months of age (WHO, 2014).

In Indonesia, the Ministry of Health has promoted a similar practice, namely clamping the umbilical cord after 2 minutes of birth (with the baby placed on the mother's abdomen) followed by the administration of 10 units of oxytocin within the first minute after birth (APN, 2017). DCC has been proven to provide various important benefits for newborns. Studies show that delaying umbilical cord clamping for more than 120 seconds can significantly increase hemoglobin and hematocrit levels,

as reported by (Gonnade et al., 2018; Malik et al., 2024). Additionally, DCC contributes to increased iron stores in infants, effectively preventing anemia up to four months of age (Busarira et al., 2019). Therefore, DCC is a simple yet highly impactful intervention in supporting the hematological and physiological health of neonates.

Objective

The purpose of this literature review is to review and analyze scientific evidence regarding the effect of delayed cord clamping (DCC) on hemoglobin levels in newborns.

Method

This study was conducted using a literature review method, which is an approach to collect, analyze, and synthesize various literature relevant to the topic of delayed cord clamping on hemoglobin levels in newborns. Data sources were obtained from various databases such as PubMed, Google Scholar, ProQuest, ScienceDirect, and Garuda (Garba Rujukan Digital). The inclusion criteria applied were literature in the form of journal articles, books, or research reports discussing the role of husbands in pregnancy care, published in the last 6 years (2019–2024), accessible as free full text in PDF format, written in Indonesian or English, original research, and articles with quantitative and qualitative studies. Meanwhile, exclusion criteria include literature that lacks empirical data or is irrelevant to the research focus.

The literature selection process was conducted in two stages. The first stage involved screening titles and abstracts to assess relevance to the topic. The second stage is an assessment of the full text based on inclusion and exclusion criteria. The results of the analysis are presented in a structured narrative, describing the main findings from the various studies reviewed. These findings are expected to provide in-depth insights into the effects of delayed umbilical cord clamping on hemoglobin levels in newborns.

Results

The seven studies analyzed in this literature review examined the effect of delayed cord clamping on hemoglobin levels in newborns. The results of the analysis are summarized in Table 1.

TABEL 1. Research analysis results

No	Researcher/Year/Journal Source	Title	Objective	Method	Sample	Data Collection/Measuring Instruments	Research Results
1.	(Ilmiyani et al., 2023) <i>Babali Nursing Research</i>	The Effect of Delayed Cord Clamping (DCC) on Haemoglobin	To analyze the effect of DCC on hemoglobin and oxygen saturation	Experimental research with Post-test Only Control	30 newborns (15 newborns in the interventi	Hemoglobin levels, oxygen saturation levels	DCC significantly increased hemoglobin levels and oxygen

No	Researcher/ Year/Journal Source	Title	Objective	Method	Sample	Data Collection/ Measuring Instruments	Research Results
		bin Levels and Oxygen Saturation Levels in Newborns	levels in newborns.	Group design.	on group and 15 newborns in the control Group)		saturation in newborns.
2.	(Mena & Mohammed, 2023) <i>Mosul Journal of Nursing</i>	Effects of Delayed Cord Clamping on Neonatal Hematological Status at Maternity Teaching Hospital in Sulaimani City/Iraq	To assess the effect of DCC on neonatal hematological status.	Quasi-experimental	80 newborns (40 early cord clamping , 40 delayed cord clamping)	Blood samples for hematological parameters (e.g., hemoglobin, hematocrit, red blood cell count)	DCC group had significantly higher hemoglobin, hematocrit, and red blood cell count compared to the early clamping group.
3.	(Restya et al., 2024) <i>Health Gate</i>	The Effect Of Delaying Umbilical Cord Cutting On Hemoglobin Levels In Newborn Babies	To determine the effect of delaying umbilical cord cutting on hemoglobin levels in newborn babies.	Quantitative (quasi-experimental)	60 newborns	Hemoglobin levels	Delayed cord clamping had a significant positive effect on newborn hemoglobin levels.
4.	(Jafra et al., 2023) <i>International Journal of Reproduction , Contraception, Obstetrics and Gynecology</i>	Effect of timing of cord clamping (early vs delayed) on hemoglobin level among newborns: an Indian study	To compare the effect of early versus delayed cord clamping on hemoglobin levels among newborns	Comparative study	200 newborns (100 early cord clamping , 100 delayed cord clamping)	Hemoglobin levels (at 24-48 hours of life)	Delayed cord clamping group had significantly higher hemoglobin levels compared to the early cord clamping group.

No	Researcher/ Year/Journal Source	Title	Objective	Method	Sample	Data Collection/ Measuring Instruments	Research Results
5.	(Santi et al., 2021) ARKESMAS	The Effect of Delayed Umbilical Cord Clamping on Hemoglobin Levels in Newborns	Analyzing the effect of delayed cord clamping on hemoglobin levels in newborns.	Quasi Experiment using a Non-Equivalent Control Group design.	31 BBL (17 subjek dilakukan DCC, 14 dilakukan ECC)	Hemoglobin level	DCC shows positive effects on hemoglobin levels in newborns.
6.	(Suryani, 2019) Jurnal Kesehatan Manarang	Effectiveness of delayed cord cutting on hemoglobin levels in newborns at Anutapura Hospital, Palu City	To determine the effect of delayed cord clamping on hemoglobin levels in newborns at Anutapura Hospital, Palu City.	quasi experimental	41 BBL	Hemoglobin level	Delaying cord clamping is effective in increasing hemoglobin levels in newborns.
7.	(Triani et al., 2022) MJ (Midwifery Journal)	Delayed cord cutting on hemoglobin levels in newborns	To examine the effect of delayed cord clamping on hemoglobin levels in newborns.	Penelitian kuantitatif , post test only dengan desain kelompok kontrol	30 BBL	Hemoglobin level	Delaying cord clamping has a positive impact on newborn hemoglobin levels.

Discussion

A review of seven studies shows consistent results: Delayed Cord Clamping (DCC) significantly contributes to increasing hemoglobin levels in newborns. For instance, research conducted by Ilmiyani et al. (2023) showed that babies who underwent DCC had higher hemoglobin levels and oxygen saturation compared to the control group. This suggests that DCC not only affects blood components but also supports respiratory transition after birth. A study by Mena & Mohammed (2023) expanded on these findings by evaluating other hematological parameters, such as hematocrit and red blood cell count. They found that infants in the DCC group had significant improvements in all indicators compared to those who underwent Early Cord Clamping (ECC).

Similar findings were reported by Restya et al. (2024), who found that delayed cord clamping notably increased newborn hemoglobin levels from 15.444 g/dL to 19.800 g/dL after 24 hours. This supports the hypothesis that a longer placental blood

transfusion provides an optimal supply of iron and red blood cells to neonates. In a study involving 200 infants in India, Jafra et al. (2023) demonstrated that babies who received DCC had higher hemoglobin levels 24 to 48 hours after birth compared to those in the ECC group. The large sample size of this study strengthens the validity of its findings.

Research by Santi et al. (2021), Suryani (2019), and Triani et al. (2022) also reported similar outcomes. Although using quasi-experimental designs, their findings support that DCC significantly increases hemoglobin levels, thereby endorsing its implementation in local healthcare facilities. Furthermore, a meta-analysis by Arum Dilafa et al. (2023) indicated that DCC leads to an average hemoglobin increase of 0.81 g/dL compared to ECC. This review compiled data from multiple randomized controlled trials (RCTs) across various countries, reinforcing the scientific evidence of DCC's advantage in improving neonatal hematological status.

The World Health Organization (WHO) also states that delayed cord clamping offers long-term benefits, including increased iron stores and the prevention of anemia during the first few months of a baby's life (WHO, 2012). A similar recommendation is issued by the American College of Obstetricians and Gynecologists (ACOG), which advises DCC for at least 30 to 60 seconds in both full-term and preterm infants, provided there are no emergency conditions requiring immediate intervention (Xodo et al., 2018). Additionally, findings from Busarira et al. (2019) and Gonnade et al. (2018) revealed that DCC not only increases hemoglobin at birth but also improves the body's iron reserves up to four months of age. This is particularly important as iron deficiency anemia is a common health issue among infants, especially in developing countries. DCC serves as an effective preventive intervention to reduce neonatal anemia without incurring additional costs.

However, DCC implementation must be tailored to specific clinical situations. In cases where newborns experience respiratory distress or require immediate resuscitation, this procedure should be applied selectively, with careful consideration of the associated risks and benefits.

Conclusion

Based on a review of various studies, Delayed Cord Clamping (DCC) has been proven to positively impact the increase of hemoglobin levels and the overall hematological status of newborns. DCC facilitates blood transfusion from the placenta to the baby, contributing to greater blood volume, enhanced iron stores, and prevention of neonatal anemia. Therefore, DCC is a simple yet effective intervention that should be widely adopted in midwifery practice to support optimal early-life health in newborns.

Acknowledgement

The author would like to thank all parties who contributed to the completion of this research.

References

- Arum Dilafa, R., Rahardjo, S. S., & Murti, B. (2023). Maret Meta-Analysis the Effect of Cord Clamping Time on Hemoglobin Elevation in Newborn Infants. *Journal of Maternal and Child Health*, 03, 347–355. <https://doi.org/10.26911/thejmch.2023.08.03.09>
- Andersson, O., Hellström-Westas, L., Andersson, D., & Domellöf, M. (2011). Effect of delayed versus early umbilical cord clamping on neonatal outcomes and iron status at 4 months: A randomised controlled trial. *BMJ (Online)*, 343(7836), 1244. <https://doi.org/10.1136/bmj.d7157>
- APN. (2017). *Buku Acuan Persalinan Normal*. JNPK-KR.
- Asfarina, I., Wijaya, M., Kadi, F. A., Studi, P., Dokter, P., Ilmu, D., Masyarakat, K., Anak, K., Kedokteran, F., Padjadjaran, U., Rsup, /, & Sadikin, H. (2020). *Prevalensi Anemia pada Bayi Baru Lahir Berdasarkan Berat Lahir dan Usia Kehamilan di RSUP Dr. Hasan Sadikin Bandung Tahun 2018* (Vol. 22, Issue 4).
- Berihun, G. A., Tesfaye, G., Adissu, W., Adamu, K., Kombe, A. T., Gedefaw, L., & Tadasa, E. (2024). Prevalence and Associated Factors of Anemia among Newborns at Jimma Medical Center, South-west Ethiopia. *Journal of Blood Medicine*, 15, 129–140. <https://doi.org/10.2147/JBM.S443312>
- Busarira, M. O., Alasbaly, E., & Mbark, M. S. (2019). Effect of Delayed versus Early Cord Clamping on Neonatal Outcomes and Iron Status at 4 Months. *Open Journal of Obstetrics and Gynecology*, 09(02), 229–241. <https://doi.org/10.4236/ojog.2019.92024>
- Gonnade, N. V., Nikhate, S. D., Bal, H., & Shrivastava, N. (2018). A comparative study of early and delayed cord clamping in term deliveries. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*, 7(12), 4929. <https://doi.org/10.18203/2320-1770.ijrcog20184942>
- WHO. (2012). *Guidelines on basic newborn resuscitation*. World Health Organization.
- Haider, B. A., Olofin, I., Wang, M., Spiegelman, D., Ezzati, M., & Fawzi, W. W. (2013). Anaemia, prenatal iron use, and risk of adverse pregnancy outcomes: Systematic review and meta-analysis. In *BMJ (Online)* (Vol. 347, Issue 7916). BMJ Publishing Group. <https://doi.org/10.1136/bmj.f3443>
- WHO. (2014). *Guideline: Delayed umbilical cord clamping for improved maternal and infant health and nutrition outcomes*.
- Ilmiyani, S. N., Yanti, E. M., & Siswari, B. D. (2023). The Effect of Delayed Cord Clamping (DCC) on Haemoglobin Levels and Oxygen Saturation Levels in Newborns. *Babali Nursing Research*, 4(3), 420–430. <https://doi.org/10.37363/bnr.2023.43241>
- Kemenkes RI. (2023). *Laporan Kinerja Kemenkes RI*.

- Malik, S., Kapu, M., Kumar Jain, M., Patel, B., & Kabra, N. (2024). Effects of timing of cord clamping on neonatal hemoglobin and bilirubin levels in preterm and term infants – A prospective observational cohort study. *PLoS ONE*, 19(1 January). <https://doi.org/10.1371/journal.pone.0295929>
- Mena, N., & Mohammed, A. (2023). Effects of Delayed Cord Clamping on Neonatal Hematological Status at Maternity Teaching Hospital in Sulaimani City/Iraq. *Mosul Journal of Nursing*, 11(2), 316–325. <https://doi.org/10.33899/mjn.2023.180108>
- Ramadhan, A. K., Danianto, A., & Cholidah, R. (2023). Anemia in Pregnancy: Cause and Effect. *Jurnal Biologi Tropis*, 23(1), 464–470. <https://doi.org/10.29303/jbt.v23i1.6074>
- Restya, E. R., Lailaturohmag, L., Lukmawati, D., & Septiana, F. (2024). The Effect Of Delaying Umbilical Cord Cutting On Hemoglobin Levels In Newborn Babies. *Health Gate*, 2(3), 223–227. <https://doi.org/10.70111/hg2304>
- Jafra, B. S., Mehendiratta, S. K., Jafra, P. R., & Jafar, A. (2023). Effect of timing of cord clamping (early vs delayed) on hemoglobin level among newborns: an Indian study. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*, 12(6), 1775–1779. <https://doi.org/10.18203/2320-1770.ijrcog20231553>
- Santi, M., Wardani, Z., & Permata Sari, N. (2021). Effect of Delayed Cord Clamping on Hemoglobin Levels of Newborn. *ARKESMAS*, 6(2). <https://www.researchgate.net/publication/360559291>
- Suryani, L. (2019). Efektifitas Waktu Penundaan Pematongan Tali Pusat Terhadap Kadar Hemoglobin Pada Bayi Baru Lahir Di RS Anutapura Kota Palu. *Jurnal Kesehatan Manarang*, 5(1). <http://jurnal.poltekkesmamuju.ac.id/index.php/m>
- Sutni, A., & Nulhakim, L. (2023). Original Research The Relationship Between Anemia Incidence In Pregnant Mothers And Low Birth Weight Baby Delivery. In *International Journal of Nursing and Midwifery Science (IJNMS)* (Vol. 7). <http://ijnms.net/index.php/ijnms>
- Triani, A., Maternity, D., & Fitria. (2022). Penundaan pematongan tali pusat terhadap kadar hemoglobin Pada bayi baru lahir. *MJ (Midwifery Journal)*, 2(1), 41–48.
- Xodo, S., Xodo, L., & Berghella, V. (2018). Delayed cord clamping and cord gas analysis at birth. *Acta Obstetrica et Gynecologica Scandinavica*, 97(1), 7–12. <https://doi.org/10.1111/aogs.13233>
- Zanardo, V., Guerrini, P., Tortora, D., Severino, L., Sandri, A., & Strafece, G. (2023). *Effect of early and delayed umbilical cord clamping on placental transfusion in two-step delivery: a randomised clinical trial*. <https://doi.org/10.21203/rs.3.rs-2858823/v1>