

STUDY OF “EFFECTS OF EARLY VERSUS DELAYED CORD CLAMPING ON NEONATAL OUTCOME”

¹Dr. Rita D., ²Dr. Akshitha Dadige* and ³Dr. Ravali G.¹Professor and HOD, Department of OBG, NMCH&RC, Raichur.^{2,3}Junior Resident, Department of OBG, NMCH&RC, Raichur.

*Corresponding Author: Dr. Akshitha Dadige

Junior Resident, Department of OBG, NMCH&RC, Raichur.

Article Received on 07/03/2022

Article Revised on 28/03/2022

Article Accepted on 19/04/2022

ABSTRACT

Background-Iron deficiency and iron deficiency anemia are major public health problems in young children worldwide, and are associated with poor neurodevelopment. Delayed umbilical cord clamping has been suggested as a measure to prevent infant iron deficiency. Present study was done to know the effect of delayed and early cord clamping and neonatal outcome. **Aims and objectives:** The objective of the study is to study the benefits and potential harms of early versus delayed cord clamping. **Methods:** Randomized study carried out among 100 pregnant women (50 patients were subjected to Delayed Cord Clamping and 50 to Early Cord Clamping), who have admitted and delivered at Navodaya Medical College (NMC), Raichur, Karnataka. **Results:** Delayed cord clamping in term infants had shown higher hemoglobin levels, i.e. mean hemoglobin in Delayed Cord Clamping was 18.96 and in Early Cord Clamping was 15.28 and there were no significance between groups in hyper-bilirubinemia requiring phototherapy i.e. 3 babies in Delayed Cord Clamping and 1 in Early Cord Clamping needed phototherapy, and mean bilirubin levels in Delayed Cord Clamping is 11 and Early Cord Clamping is 9.41 which was statistically significant. **Conclusion:** Delayed cord clamping in term was a simple, safe, and effective delivery procedure, which should be recommended. Delayed cord clamping reduced prevalence of neonatal anemia, without demonstrable adverse effects. As iron deficiency in infants even without anemia has been associated with impaired development, delayed cord clamping seems to benefit full term infants.

KEYWORDS: Early cord clamping, delayed cord clamping, anemia, phototherapy, bilirubin.**INTRODUCTION**

- Delayed cord clamping is clamping of the cord after 30 s to 5 min or to when the cord stops pulsating.
- Iron deficiency and iron deficiency anemia are major public health problems in young children worldwide, and are associated with poor neurodevelopment.^[1]
- Delayed umbilical cord clamping has been suggested as a measure to prevent infant iron deficiency.^[1]
- Iron is essential for several aspects of brain development, including myelination, dendritogenesis, neurotransmitter function, and neuronal and glial energy metabolism.^[2]
- Iron deficiency anemia in young children is associated with long lasting cognitive and behavioral deficits.^[3]
- Iron deficiency without established anemia has also been associated with altered affective responding, impaired motor development, and cognitive delays.
- Thus, the available evidences suggests that it's important to prevent iron deficiency in infants in order to achieve optimal brain development.
- At the time of birth, the pulmonary and cardiovascular transition from intra-uterine to extra-uterine life depends on two major physiological events, commencement of breathing and transition from dependence of the blood flow through the umbilical circulation.^[5]
- Disturbance in anyone of the functions can result in hypoxia which can progress to an ischemic insult and death.^[4]
- Delayed Cord Clamping allows time for a transfer of the fetal blood in the placenta to the infant at the time of birth.^[6] This placental transfusion can provide the infant with an additional 40% more blood volume(80ml).^[7]
- Neonatal benefits associated with this increased placental transfusion include higher hemoglobin concentrations, additional iron stores and less anemia in infancy and better cardiopulmonary adaptation.^[8]
- Delayed Cord Clamping is also associated with improved developmental milestones at infancy until 4 years of age.

- In Rh-alloimmunised infants Early cord clamping is preferred due to potential risk of hyperbilirubinaemia and exacerbation of anaemia. This was probably due to hemolysis by residual anti-Rh antibodies.
- The ferritin concentration significantly higher, and the iron deficiency anemia at 4, 8 and 12 months of age was significantly less prevalent in Delayed Cord Clamping group.^[9]
- A brief delay of 30–60 s in cord clamping was beneficial in improving short-term neurobehavioral outcome of late preterm infants (34–36 weeks), who showed a higher score in both motor development vigor (MDV) and alertness orientation at 37 weeks post-conceptual age.^[10]
- The higher mean blood pressure (BP) may contribute to an improved hemodynamics and organ perfusion in newborns, which may benefit from an effective placental transfusion and extra blood volume from Delayed Cord Clamping.
- The umbilical cord blood also contains various stem cells that play an essential role in repairing tissue and building immune-competence. Delayed Cord Clamping with effective placental transfusion improved hemodynamic stability, thus reducing the vulnerability of infants to inflammatory processes.^[11]
- Delayed Cord Clamping improved the hematological status of the babies in early infancy with a risk of polycythemia and jaundice requiring phototherapy.
- To reduce postpartum hemorrhage and the need for blood transfusions to the mother, Early Cord Clamping was recommended. However, some studies had reported no association between Delayed Cord Clamping in term and preterm infants, and maternal risk of postpartum hemorrhage, blood loss at delivery, or the need for blood transfusion.^[12]
- Human umbilical cord blood contains significant amounts of stem and progenitor cells and is currently used in the treatment of several life-threatening diseases.
- Delayed Cord Clamping enhanced blood flow from the placenta to the neonate, which should increase stem cell supply to newborns
- The prevalence of iron deficiency was significantly higher in early cord clamping group than in the delayed clamping group (6% vs 1%).

OBJECTIVES

- The objective of the study is to study the benefits and potential harms of early versus delayed cord clamping.

MATERIALS AND METHODS

- This Randomized study was conducted among pregnant women who have admitted and delivered at Navodaya Medical College and Research Centre, Raichur after obtaining ethical clearance.
- Statistics was calculated by using SPSS software version 21.0.

INCLUSION CRITERIA

- 1) Women with no complications
- 2) FHR on admission 110-160bpm
- 3) Gestational age >37weeks

EXCLUSION CRITERIA

- 1) Women with still birth
- 2) Congenital anomalies
- 3) Multiple gestations
- 4) Rh incompatibility
- 5) Preterm

RESULTS

Table 1: Shows there is no significant difference in age group in early and delayed cord clamping.

| A | CORD CLAMPING | | Total | Chi-square value | p-value |
|-----------|---------------|-----|-------|------------------|---------|
| | DCC | ECC | | | |
| Age group | < 25 | 25 | 22 | 47 | 0.361 |
| | > 25 | 25 | 28 | | |

Table 2: Shows there is no significant difference in mode of delivery in early and delayed cord clamping.

| | CORD CLAMPING | | Total | Chi-square value | p-value |
|----------|---------------|-----|-------|------------------|---------|
| | DCC | ECC | | | |
| DELIVERY | C section | 34 | 24 | 58 | 4.105 |
| | Vaginal | 16 | 26 | | |

Table 3: Need for phototherapy in delayed cord clamping group is for 3 newborns out of 50 and in early cord clamping group it was 1 out of 50, which not significant.

| | CORD CLAMPING | | Total | Chi-square value | p-value |
|-----------------------|---------------|-----|-------|------------------|---------|
| | DCC | ECC | | | |
| NEED FOR PHOTOTHERAPY | NO | 47 | 49 | 96 | 1.042 |
| | YES | 3 | 1 | | |

Table 4: Mean hemoglobin and Mean bilirubin in early and delayed cord clamping groups.

| | DCC | | ECC | | T | p-value |
|------------|-------|------|-------|------|--------|---------|
| | Mean | SD | Mean | SD | | |
| AGE | 25.26 | 4.20 | 24.62 | 3.08 | 0.869 | 0.387 |
| HEMOGLOBIN | 18.96 | 1.22 | 15.28 | 1.03 | 16.307 | 0.001 |
| BILIRUBIN | 11.00 | 2.87 | 9.41 | 2.34 | | |

- Mean hemoglobin in delayed cord clamping group is 18.96 whereas in early cord clamping is 15.28 which was statistically significant.
- Mean bilirubin in delayed cord clamping group is 11 whereas in early cord clamping is 9.41 which was statistically significant.

DISCUSSION

- During early neonatal period, we observed less anemia in delayed cord clamping group.
- There were no significant differences between groups with regard to need for phototherapy.
- In our study there were no group difference in need for phototherapy even though we observed a relatively large difference in hemoglobin concentration at 2 days of age.
- Our study results therefore strongly suggest that delayed cord clamping is not associated with any increase in need for phototherapy in term infants, which is coinciding with recent meta analysis by Hutton EK et al.
- In our study we found a higher risk of low hemoglobin in early cord clamping group(18.9g/dl vs 15.2g/dl), but no infant required treatment which was coinciding with results of Emhamed MO et al.(18.5g/dl vs 17.1g/dl)

| | Mean Hemoglobin (g/dl) | |
|------------------|------------------------|------|
| | ECC | DCC |
| Our Study | 15.2 | 18.9 |
| Emhamed Mo et al | 17.1 | 18.5 |

- We observed an unexpected difference in cord blood hemoglobin concentration; the delayed cord clamping group had 3.68g/L higher cord hemoglobin concentration than the early cord clamping group which was coinciding with Cochrane report, with mean difference in hemoglobin concentration of 4.2g/L.

| | Difference of Mean Hemoglobin In ECC & DCC (g/dl) |
|-----------|---|
| Our study | 3.68 |
| Cochrane | 4.2 |

CONCLUSION

- Term infants appear to derive benefit from delayed umbilical cord clamping, therefore, delayed cord clamping for at-least 30-60sec is recommended in term fetus, except when immediate cord clamping is necessary because of neonatal or maternal indications.

- In term infants, delayed cord clamping increases Hb levels at birth and improves iron stores in first several months of life which may have favourable effect on developmental outcomes, and seemed to benefit infants even in regions with a relatively low prevalence of iron deficiency anemia.
- There is small increase in jaundice requiring phototherapy in term infants undergoing delayed cord clamping.
- Delayed cord clamping is associated with significant neonatal benefits, including improved transitional circulation, better establishment of RBC volume, decreased need for blood transfusion and lower incidence of necrotising enterocolitis and intraventricular hemorrhage.
- Delayed cord clamping is feasible and safe and there should be no hesitation in implementing this procedure routinely.
- Delayed clamping also reduced the prevalence of neonatal anemia at 2days of age without increasing the rate of respiratory symptoms or need for phototherapy.
- Iron deficiency even without anemia has been associated with impaired development among infants. Therefore delayed cord clamping also benefits infant health in regions with a relatively low prevalence of iron deficiency and should be considered as standard care for full term deliveries after uncomplicated pregnancy.

REFERENCES

1. Van Rheenen PF, Brabin BJ. A practical approach to timing cord clamping in resource poor settings. *BMJ*, 2006; 333(7575): 954-8.
2. Beard J. Recent evidence from human and animal studies regarding iron status and infant development. *J Nutr.*, 2007; 137(2): 524-30S.
3. Lozoff B, Brittenham GM, Wolf AW, McClish DK, Kuhnert PM, Jimenez E, et al. Iron deficiency anemia and iron therapy effects on infant developmental test performance. *Pediatrics*, 1987; 79(6): 981-95.
4. Gao Y, Raj JU. Regulation of the pulmonary circulation in the fetus and newborn. *Physiol Rev.*, 2010; 90(4): 1291-335.
5. Hooper SB, Polglase GR, Te Pas AB. A physiological approach to the timing of umbilical cord clamping at birth. *Arch Dis Child Fetal Neonatal Ed.*, 2015; 100(4): F355-60.
6. Cort RL, Příbylová H. Placental transfusion and fluid metabolism on the first day of life. *Arch Dis Child.*, 1964; 39: 363-70.

7. Farrar D, Airey R, Law GR, et al. Measuring placental transfusion for term births: weighing babies with cord intact. *BJOG An Int J ObstetGynaecol*, 2011; 118(1): 70–5.
8. McDonald S, Middleton P, Dowswell T, Morris S. Effect of timing of umbilical cord clamping of term infants on maternal and neonatal outcomes. *Cochrane Database Syst Rev.*, 2013; 7: 74.
9. Kc A, Rana N, Malqvist M, Jarawka Ranneberg L, Subedi K, Andersson O. Effects of delayed umbilical cord clamping vs early clamping on anemia in infants at 8 and 12 months: a randomized clinical trial. *JAMA Pediatr*, 2017; 171(3): 264–70.
10. Datta V, Kumar A, Yadav R. A randomized controlled trial to evaluate the role of brief delay in cord clamping in preterm neonates (34–36 weeks) on short-term neurobehavioural outcome. *J Trop Pediatr*, 2017; 63(6): 418-24.
11. Tolosa JN, Park DH, Eve DJ, Klasko SK, Borlongan CV, Sanberg PR. Mankind's first natural stem cell transplant. *J Cell Mol Med.*, 2010; 14(3): 488–495.
12. Lalonde A, Daviss BA, Acosta A, Herschderfer K. Postpartum hemorrhage today: ICM/FIGO initiative 2004–2006. *Int J Gynaecol Obstet*, 2006; 94(3): 243–253.
13. Lawton C, Acosta S, Watson N, Gonzales-Portillo C, Diamandis T, Tajiri N, Kaneko Y, Sanberg PR, Borlongan CV. Enhancing endogenous stem cells in the newborn via delayed umbilical cord clamping. *Neural Regen Res.*, 2015; 10(9): 1359–1362.