Comparison of early umbilical cord clamping v/s delayed cord clamping v/s cord milking on neonatal hemoglobin status: A randomized control study

Dr. Manchu Polayya

DOI: https://doi.org/10.33545/26643685.2021.v4.i1b.137

Abstract

Background & Objectives: Anemia is common among children in developing countries. In the National Family Health Survey III of India, 70% of children were anemic. In India 81% of infants between 6 and 9 months of age become anemic most due to iron deficiency. In term infants, a brief delay in clamping the umbilical cord after birth results in higher concentrations of hemoglobin (HB) and hematocrit during the neonatal period, increased serum ferritin levels and a lower incidence of iron-deficiency anemia at 4-6 months of age. This study is conducted to compare the effect of delayed cord clamping or umbilical cord milking to early cord clamping on neonatal hematological status at 48 hours of age in term neonates born in GEMS and Hospital, Jagolu, Srikakulam.

Materials and methods: The study was conducted in the labor room, obstetrics operation theatre and post natal ward of GEMS and Hospital, Jagolu, Srikakulam during November 2019 to May 2021. The newborn babies were divided into three groups of each 55.

Group 1: Early cord clamping at 30 sec after birth
Group 2: Delayed cord clamping at 60 sec after birth.
Group 3: Cord milking in 10-15 sec after birth.

- In our hospital cord clamping is done as early as possible, within 30 sec.
- In this study delayed cord clamping was done at 60 sec after birth because maximum placental transfusion, up to 50-75%, occurs by 1 min after birth.
- Cord milking was done by milking of the unclamped cord towards the umbilicus 4 times in 10-15 seconds followed by clamping and cutting of the cord.

All the newborn babies received the same care. At 48 hours of age the hemoglobin levels were tested.

Results: Total of 165 term babies were included in the study, divided into three groups (early cord clamping, delayed cord clamping and cord milking). There were 55 babies in each group. The mean haemoglobin at 48 hours of life was 17.19±1.86 g/dl in the early cord clamping group, 19.62±1.45 g/dl in the delayed cord clamping group and 19.63±1.45 g/dl in the cord milking group. Milking the umbilical cord four times before clamping and cutting the cord or Delayed clamping of the cord by 60 seconds after delivery showed higher mean haemoglobin levels at 48 hours of life compared to early clamping.

Conclusions: We conclude that both delayed cord clamping and cord milking resulted in significantly higher neonatal hemoglobin at 48 hours of life as compared to early clamping with no adverse outcomes.

Keywords: Early cord clamping, Delayed cord clamping, Cord Milking, Mean Haemoglobin

Introduction

Anemia is common among children in developing countries. In the National Family Health Survey III [1] of India, 70% of children were anemic. In India 81% of infants between 6 and 9 months of age become anemic most due to iron deficiency [2]. Anemia during infancy and early childhood has been shown to affect cognitive brain function [3]. Maternal iron status, infant birth weight and gestational age, as well as the timing of umbilical cord clamping at birth all contribute to the establishment of adequate total body iron at birth [4]. Placental transfusion occurs most rapidly in the first moments after birth amounting to 80 ml of blood in 1 min and 100 ml at 3 minutes after birth [5]. This supplies to 40-50 mg/kg body weight extra iron to body iron at birth which helps to prevent iron deficiency in 1st year of life.

~ 89 ~
In term infants, delayed umbilical cord clamping between 30 and 180 seconds after birth results in higher concentrations of hemoglobin (HB) and hematocrit during the neonatal period, increased serum ferritin levels and a lower incidence of iron-deficiency anemia at 4-6 months of age [6,7].

WHO recommends late cord clamping (approximately one to three minutes after birth) for all births for improved haematological status while initiating simultaneous essential new born care [8].

An alternative method to delayed cord clamping that takes 10-15 seconds and therefore does not interfere with neonatal resuscitation is active placental transfusion (milking the umbilical cord toward the baby before clamping).

**Objectives:** To compare the effect of delayed cord clamping or umbilical cord milking to early cord clamping on neonatal hematological status at 48 hours of age in term neonates.

**Methodology**

**Study area and population:** The study was conducted on 165 Term newborns delivered by Normal vaginal delivery or lower segment cesarian section in the labor room, obstetrics operation theatre and post natal ward of Gems and Hospital, Ragolu, Srikakulam.

**Study design:** Randomized controlled trial

**Time frame:** November 2019 to May 2021

**Inclusion criteria:** Term newborns delivered in Gems and Hospital, Ragolu, Srikakulam.

**Flow chart of study procedure**

### Observations

**Table 1: Distribution of socioeconomic status**

| Socioeconomic status | Cord milking group (%) | Early clamping group (%) | Delayed cord clamping Group (%) | Chi-square | P-Value |
|----------------------|------------------------|--------------------------|---------------------------------|------------|---------|
| High (n=30)          | 9 (30.0%)              | 8 (26.7%)                | 13 (43.3%)                      | 2.150      | .708    |
| Low (n=15)           | 4 (26.7%)              | 6 (40.0%)                | 5 (33.3%)                       |            |         |
| Middle (n=120)       | 42 (35.0%)             | 41 (34.2%)               | 37 (30.8%)                      |            |         |
Fig 1: The socioeconomic status of mothers among three study groups was similar with p value of 0.708

| Variable               | Group                  | Mean   | SD      | F-value | P-value |
|------------------------|------------------------|--------|---------|---------|---------|
| Birth weight in Kg     | Cord milking           | 2.9633 | 0.37951 | 0.768   | 0.465   |
|                        | Early clamping         | 3.0229 | 0.34684 |         |         |
|                        | Delayed cord clamping  | 2.9395 | 0.36403 |         |         |

Table 2: Birth Weight

Fig 2: The mean birth weight of babies in all three groups was comparable with p value of 0.465

| Variable               | Group                  | Mean   | SD      | F-value | p-value |
|------------------------|------------------------|--------|---------|---------|---------|
| Maternal Hemoglobin in g/dl | Cord milking        | 11.587 | 1.2123  | 1.160   | 0.316   |
|                        | Early clamping         | 11.240 | 1.2675  |         |         |
|                        | Delayed cord clamping  | 11.484 | 1.2026  |         |         |
Fig 3: Means of maternal hemoglobin (g/dl) of babies in all three groups were comparable with p value of 0.627

Table 4A: Hemoglobin at 48hrs of life

| Variable                     | Group                        | Mean  | SD    | F-value | p-value |
|------------------------------|------------------------------|-------|-------|---------|---------|
| Hemoglobin at 48hrs g/dl     | Cord milking (n=55)          | 19.635| 1.4572| 42.439  | .000    |
|                              | Early clamping (n=55)        | 17.192| 1.8630|         |         |
|                              | Delayed cord clamping (n=55) | 19.623| 1.4507|         |         |

Fig 4A: The mean hemoglobin levels of babies subject to cord milking (19.63±1.42) and those subject to delayed cord clamping (19.62±1.45) were significantly higher than the mean hemoglobin levels of babies in the early clamping group (17.19±1.86) with p value of 0.000

Table 4B: Comparison of mean haemoglobin at 48hrs among the cord milking and delayed cord clamping

| Variable                     | Group                        | Mean  | SD    | t-value | p-value |
|------------------------------|------------------------------|-------|-------|---------|---------|
| Hemoglobin at 48hrs g/dl     | Cord milking (n=55)          | 19.635| 1.4572| 42.439  | .968    |
|                              | Delayed cord clamping (n=55) | 19.623| 1.4507|         |         |
Fig 4B: The mean hemoglobin levels of babies subject to cord milking were 19.63±1.42 and mean HB in the delayed cord clamping was 19.62±1.45. There was no statistically significantly difference in the mean Hemoglobin in the two groups (p value of 0.968)

Table 4C: Comparison of mean haemoglobin at 48hrs among the cord milking and early clamping groups

| Variable               | Group                        | Mean  | SD    | t-value | p-value |
|------------------------|------------------------------|-------|-------|---------|---------|
| Hemoglobin at 48hrs g/dl| Cord milking (n=55)          | 19.635| 1.4572| 7.68    | 0.0001  |
|                        | Early clamping (n=55)        | 17.192| 1.8630|         |         |

Fig 4C: The mean hemoglobin levels of babies subject to cord milking (19.63±1.45) was significantly higher than the mean hemoglobin levels of babies in the early clamping group (17.19±1.86) with p value of 0.0001
Table 4D: Comparison of mean haemoglobin at 48hrs among the delayed cord clamping and early clamping

| Variable                  | Group                        | Mean   | SD    | t-value | p-value |
|---------------------------|------------------------------|--------|-------|---------|---------|
| Hemoglobin at 48hrs g/dl  | Delayed cord clamping (n=55) | 19.625 | 1.4507| 7.64    | 0.0001  |
|                           | Early clamping (n=55)        | 17.192 | 1.8630|         |         |

Fig 4D: The mean hemoglobin levels (in g/dl) of babies subject to delayed cord clamping (19.62±1.45) was significantly higher than the mean hemoglobin levels of babies in the early clamping group (17.19±1.86) with p value of 0.0001

Table 5: Hemoglobin at 48 hours in babies born to anemic mothers

| Variable                        | Group                        | Mean   | SD    | F-value | p-value |
|---------------------------------|------------------------------|--------|-------|---------|---------|
| Hemoglobin (g/dl) of babies at 48hours born to anemic Mothers (n=53), (HB<11g/dl) | Cord milking* (n=18)         | 19.71  | 1.18  | 13.04   | 0.000   |
|                                 | Early clamping (n=20)        | 17.33  | 2.01  |         | *0.597  |
|                                 | Delayed cord clamping* (n=15)| 19.48  | 1.29  |         |         |

Fig 5: The mean hemoglobin levels at 48hrs in babies delivered to anemic mothers were significantly higher in those subject to cord milking and to delay cord clamping compared to early clamping (p value of 0.000)

Discussion
Total of 165 term babies were included in the study, divided into three groups (early clamping, delayed cord clamping and cord milking). There were 55 babies in each group. The mean haemoglobin at 48 hours of life was 17.192±1.86 g/dl in the early cord clamping group, 19.623±1.45 g/dl in
the delayed cord clamping group and 19.635±1.45 g/dl in the cord milking group which were similar to studies conducted by MI March et al. [9]. The mean haemoglobin levels of babies subjected to cord milking (19.635±1.45 g/dl) and those subject to delayed cord clamping (19.623±1.45 g/dl) were almost similar. Rabe et al. (2011) concluded that milking the cord four times achieved similar placenta-fetal blood transfusion as delaying clamping the cord [10].

Milking the umbilical cord four times before clamping and cutting the cord showed higher mean haemoglobin levels (19.635±1.45 g/dl) at 48 hours of life compared to early clamping (17.192±1.86 g/dl), the difference was found to be statistically significant (p value 0.0001). Similar results shown by Upadhyay et al. [11] and Ericson-Owen et al. [12] in their studies. Delaying clamping of the cord by 60 seconds after delivery showed higher mean haemoglobin levels (19.623±1.45 g/dl) at 48 hours of life compared to early clamping (17.192±1.86 g/dl), the difference was found to be statistically significant, (p value 0.0001). Hutton and Hassan; [13] Andersson et al. [14] concluded the same in their studies. Babies born to mothers with anemia, the mean hemoglobin at 48 hours in the early clamping group was 17.33 g/dl which was significantly less than that in the delayed clamping (19.48 g/dl) and cord milking group (19.71 g/dl) which was similar to studies conducted by Upadhyay et al. and Guptha et al. [11, 15]. No differences were observed between the groups with regard to baseline variables (sex, birth weight, gestational age, APGAR scores of the new born babies, maternal age, parity, socioeconomic status, Mode of delivery, gestational diabetes and haemoglobin levels).

Conclusions
We conclude that both delayed cord clamping and cord milking resulted in significantly higher neonatal hemoglobin at 48 hours of life as compared to early clamping with no adverse outcomes.

References
1. Ministry of Health and Welfare. National Family Health Survey III (2005-2006): Nutrition in India, Government of India, Publication Reports, 2009, 3-17.
2. Chaparro CM. Timing of umbilical cord clamping: effect on iron endowment of the newborn and later iron status. Nutr Rev. 2011;69(Suppl 1):S30-36.
3. Walter T. Impact of iron deficiency on cognition in infancy and childhood Eur J Clin Nutr. 1993;47:307-16.
4. Chaparro CM. Setting the stage for child health and development: Prevention of iron deficiency in early infancy, J Nutr. 2008;138:2529-2533.
5. Linderkamp O, Nelle M, Kraus M, Zilow EP. The effect of early and late cord-clamping on blood viscosity and other hemorheological parameters in full-term neonates Acta Paediatr. 1992;81(10):745-750.
6. Raju TN. Timing of umbilical cord clamping after birth for optimizing placental transfusion, Curr Opin Pediatr. 2013;25(2):180-187.
7. Maheshwari A, Carlo WA. Blood disorders, Anemia in the Newborn infant. In: Kliegman RM, Stanton BF, St Geme JW, Schor NF, Behrman RE. Nelson text book of Pediatrics, 19th edition, Philadelphia: Saunders, 2011, 614.
8. Fawole B, Awolude OA, Adeniji AO, Onafowokan O. WHO recommendations for the prevention of postpartum hemorrhage: RHL guideline (last revised: 1 May 2010), The WHO reproductive health library. Geneva, WHO, 2010.
9. MI March, MR Hacker2, AW Parson, AM MODEST, and M de Veciana. The effects of umbilical cord milking in extremely preterm infants: A randomized controlled trial J Perinatal. 2013;33(10):763–767. DOI: 10.1038/jp.2013.70
10. Rabe H, Jewison A, Alvarez RF. Milking compared with delayed cord clamping to increase placental transfusion in preterm neonates: A randomized controlled trial Obstet Gynecol. 2011;117:205-11.
11. Upadhyay A, Gothwal S, Parihar R, Garg A, Gupta A, Chawla D, et al. Effect of umbilical cord milking in term and near term infants: Randomized control trial, Am J Obstet Gynecol. 2013;208(2):120.e1-6. DOI: 10.1016/j.ajog.2012.10.884. Epub2012, Oct31.
12. Erickson-Owens DA, Mercer JS, Oh W. Umbilical cord milking in term infants delivered by cesarean section: A randomized controlled trial J Perinatol. 2012;32(8):580-584. DOI: 10.1038/jp.2011.159.Epub 2011 Nov17.
13. Hutton EK, Hassan ES. Late vs early clamping of the umbilical cord in full-term neonates: systematic review and meta-analysis of controlled trials Jama. 2007;297(11):1241-1252.
14. Andersson O, Hellström-Westas L, Andersson D, Domellöf M. Effect of delayed versus early umbilical cord clamping on neonatal outcomes and iron status at 4 months: Randomized controlled trial BMJ. 2011;343:d7157. DOI: 10.1136/bmj.d7157
15. Gupta R, Ramji S. Effect of delayed cord clamping on iron stores in infants born to anemic mothers: a randomized controlled trial, Indian Pediatr. 2002;39(2):130-5.