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### RELATIONSHIP OF TIMING OF CORD CLAMP TO THE NEONATAL HAEMATOLOGICAL STATUS OF NEWBORN - A COMPARISON IN TERM BABIES BORN VIA NORMAL VAGINAL DELIVERY & CESAREAN DELIVERY

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**ABSTRACT: AIM:** To study the relationship of timing of cord clamping to the hematocrit and hemoglobin values within 0- 6 hours of life - comparison in term normal vaginal delivery to cesarean delivery. Clamping and cutting of the umbilical cord at birth is by far the oldest and most prevalent intervention in humans. In spite of that the optimal time of cord clamping has been a controversial issue for decades. There are no formal practice guidelines as such but practitioners in western countries clamp and cut the cord immediately after birth while the practice worldwide is variable. **OBJECTIVE:** To study and observe the effect of timing of cord clamping on neonatal hematocrit and hemoglobin within 0 – 6 hours of life & compare in term normal vaginal delivery to cesarean delivery. **METHODS:** This is a randomized, control trial conducted in the Dept. of Pediatrics and Dept. of Gyn & Obst., Mahatma Gandhi Medical College & hospital. Jaipur, between 20<sup>th</sup> to 30<sup>th</sup> September 2013. Patients admitted in labor ward were selected according to the inclusion criteria of the study. Group A included 50 term normal vaginal delivery babies in whom the time of cord clamp from birth was noted and a cord blood or venous blood of baby was send within 6 hours of life for estimation of hematocrit & hemoglobin values, while group B included 50 term babies born via cesarean section and same procedure was followed. **RESULTS:** It was observed that delayed cord clamping (at 1 or 2 minutes after birth) in healthy term newborns increases hematocrit & hemoglobin value within physiologic ranges without causing any harmful effects. Umbilical cord clamping at 1 minute of life increases hematocrit in no more than much 8- 10 points compared with cord clamping in first 15 seconds after birth. As per normal practice of early cord clamping in Indian scenario timing of cord clamping in term normal vaginal delivery was at least more than 30 seconds to 1 minute while in term babies born via cesarean section was 15 to 30 seconds on an average. **Limitations:** For further evaluation of hematological status of healthy infants beyond 6 hours of life it is difficult to get consent of parents without any obvious cause to investigate. **CONCLUSION:** Delayed cord clamping at birth increases neonatal hematological status within a physiologic range. Neither significant differences nor harmful effects were observed among the two groups. Furthermore, this intervention seems to reduce neonatal anemia. This practice has been shown to be safe and should be implemented to increase the hematological status of Indian newborn babies.

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New born Baby

**AIM:** Relationship of timing of cord clamp to the hematocrit & hemoglobin values within 0- 6 hours of life of newborn - comparison in term babies born via normal vaginal delivery to cesarean delivery.

**INTRODUCTION:** Clamping and cutting of the umbilical cord at birth is by far the oldest and most prevalent intervention in humans. In spite of that the optimal time of cord clamping has been a controversial issue for decades.<sup>1</sup> There are no formal practice guidelines as such but practitioners in western countries clamp and cut the cord immediately after birth while the practice worldwide is variable.<sup>2</sup>

Previous research has suggested that early clamping of the cord (within the 5 to 10 seconds of birth), compared with later clamping, results in a decrease to the neonate of 20 to 40 ml of blood per kilogram of body weight,<sup>3</sup> which would provide the equivalent of 30 to 35 mg of iron.

It has been argued that early cord clamping puts the newborn at increased risk of hypovolemic damage and iron loss, as well as several disorders and type 2 diabetes, as a consequence of loss of hematopoietic stem cells.<sup>4</sup>

Early cord clamping has been postulated as a major cause of anemia in infancy, and this has led some investigations to recommend late clamping as a low cost intervention to reduce anemia during initial hours of life. It is believed that the increase in blood volume to the neonatal circulation resulting from delays in clamping may be harmful and could result in overloading the neonatal blood volume, thus increasing likelihood of respiratory distress, neonatal jaundice and polycythemia. In addition, early clamping is a part of active management of third stage of labor to assist with delivery of the placenta.

**REVIEW:** Timing of cord clamp has been and still is a highly controversial issue.<sup>5</sup> The current western medicine is to clamp the cord within 10-15 seconds after birth. However, there is no sound evidence in favor of this approach in comparison to the millennial practice of clamping the cord between 1 and 3 minutes after birth.

In some studies it was observed that delayed cord clamping could contribute to preventing iron-deficiency anemia in first year of life.<sup>6</sup>

A recent systematic review confirms the benefit of delayed cord clamping.<sup>7</sup> The reason for this effect is based on the fact that after birth the newborn is delivered with a placental transfusion of

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around 80 ml of blood at 1 minute after birth and 100 ml at 3 minutes after birth. This volume will supply 40 to 50 mg/kg of extra iron to the 75 mg/kg of body iron that newborn term infants have, reaching a total of 115- 120mg/kg, which might prevent iron deficiency in newborn.

Iron deficiency early in life may have a pronounced central nervous system effects such as cognitive function impairment, main cause of anemia in infancy and one of the most serious conditions especially in developing countries like India.

Conversely some observational studies suggest that delayed umbilical cord clamping puts newborns at a higher risk of suffering from polycythemia, respiratory symptoms, hyperbilirubinemia, and other neonatal disorders.

In view of above considerations we performed a prospective randomized, controlled clinical trial to determine the benefits of delayed cord clamping.

Our hypothesis was that delayed cord clamping (at 1 or 2 minutes after birth) in healthy term newborns born via normal or cesarean delivery increases the hematocrit and hemoglobin within physiologic ranges without causing any harmful effects.

### **MATERIALS & METHODS:**

- Study location - Mahatma Gandhi Medical College & hospital, Sitapura, Jaipur.
- Study population - All term babies born via normal or cesarean deliveries.
- Study period - September 15<sup>th</sup> to 30<sup>th</sup>, 2013.
- Sample size – 50 term normal delivered babies & 50 term cesarean delivered babies.
  
- **Inclusion criteria:**
  1. All healthy term pregnant ladies with haemoglobin concentration of more than 6 gram%
  2. Term appropriate for date babies born more than 2 kg or above only.
  
- **Exclusion criteria:**
  1. Maternal diseases i.e. anemia, diabetes, etc.
  2. Preterm babies or low birth weight babies.
  
- **Limitation:** For further evaluation of hematological status of healthy infants beyond 6 hours of life it is difficult to get consent of parents without any obvious cause to investigate.

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### OBSERVATIONS & RESULT:

► Babies born via normal delivery -

Time of cord clamp after birth	Hematocrit conc. (within 0-6 hours of life)	Haemoglobin conc. (within 0-6 hours of life)
• (1) 80 sec	• 51.9	• 17
• (2) 38 sec	• 34	• 12.5
• (3) 40 sec	• 58.6	• 20.2
• (4) 35 sec	• 54.6	• 13.6
• (5) 48 sec	• 52	• 14.2
• (6) 42 sec	• 48	• 16
• (7) 38 sec	• 49	• 16.4
• (8) 50 sec	• 54	• 18
• (9) 46 sec	• 50	• 16
• (10) 35 sec	• 38	• 12.6
• (11) 52 sec	• 54	• 18
• (12) 38 sec	• 41.6	• 13.8
• (13) 51 sec	• 48	• 16
• (14) 34 sec	• 41.2	• 13.3
• (15) 46 sec	• 52	• 17

Time of cord clamp after birth	Hematocrit conc. (within 0-6 hours of life)	Haemoglobin conc. (within 0-6 hours of life)
• (16) 40 sec	• 42.2	• 14
• (17) 46 sec	• 50	• 16
• (18) 32 sec	• 46.4	• 15
• (19) 38 sec	• 44	• 14
• (20) 28 sec	• 38	• 12.8
• (21) 50 sec	• 48.3	• 15.6
• (22) 34 sec	• 46	• 15
• (23) 32 sec	• 42	• 14.5
• (24) 54 sec	• 53	• 17
• (25) 49 sec	• 39.6	• 13.8
• (26) 18 sec	• 32	• 10.4
• (27) 22 sec	• 38.8	• 12.9
• (28) 38 sec	• 44	• 14
• (29) 46 sec	• 52	• 17.2
• (30) 50 sec	• 60	• 20.2
• (31) 14 sec	• 39	• 13
• (32) 18 sec	• 42	• 14.6
• (33) 24 sec	• 48	• 16
• (34) 28 sec	• 50	• 16.8
• (35) 39 sec	• 49.2	• 16

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Time of cord clamp after birth	Hematocrit conc. (within 0-6 hours of life)	Haemoglobin conc. (within 0-6 hours of life)
▪ (36) 24 sec	▪ 46	▪ 12
▪ (37) 19 sec	▪ 58	▪ 19.2
▪ (38) 29 sec	▪ 62	▪ 20.4
▪ (39) 36 sec	▪ 54	▪ 18
▪ (40) 18 sec	▪ 48.2	▪ 16.2
▪ (41) 24 sec	▪ 50	▪ 16.8
▪ (42) 29 sec	▪ 48	▪ 16
▪ (43) 34 sec	▪ 52.5	▪ 17.2
▪ (44) 28 sec	▪ 48.9	▪ 16.9
▪ (45) 38 sec	▪ 52	▪ 17
▪ (46) 22 sec	▪ 54	▪ 18
▪ (47) 27 sec	▪ 62	▪ 20.2
▪ (48) 30 sec	▪ 55	▪ 18
▪ (49) 20 sec	▪ 48.4	▪ 16
▪ (50) 38 sec	▪ 55	▪ 18.3

➤ Babies born via cesarean delivery -

Time of cord clamp after birth	Hematocrit conc. (within 0-6 hours of life)	Haemoglobin conc. (within 0-6 hours of life)
▪ (1) 20 sec	▪ 39.9	▪ 13
▪ (2) 18 sec	▪ 28.5	▪ 9.3
▪ (3) 22 sec	▪ 44.5	▪ 14
▪ (4) 23 sec	▪ 27.6	▪ 9
▪ (5) 17 sec	▪ 44	▪ 14.2
▪ (6) 40 sec	▪ 48	▪ 16
▪ (7) 38 sec	▪ 49	▪ 16.4
▪ (8) 30 sec	▪ 43.8	▪ 14
▪ (9) 46 sec	▪ 50	▪ 16
▪ (10) 35 sec	▪ 38	▪ 12.6
▪ (11) 32 sec	▪ 39.4	▪ 13
▪ (12) 38 sec	▪ 41.6	▪ 13.8
▪ (13) 21 sec	▪ 48	▪ 16
▪ (14) 34 sec	▪ 41.2	▪ 13.3
▪ (15) 12 sec	▪ 32	▪ 10.4

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Time of cord clamp after birth	Hematocrit conc. (within 0-6 hours of life)	Haemoglobin conc. (within 0-6 hours of life)
• (16) 32sec	• 42.2	• 14
• (17) 22sec	• 39.7	• 13
• (18) 17 sec	• 46.4	• 15
• (19) 38 sec	• 44	• 14
• (20) 28 sec	• 38	• 12.8
• (21) 50 sec	• 48.3	• 15.6
• (22) 14sec	• 46	• 15
• (23) 32 sec	• 42	• 14.5
• (24) 54sec	• 53	• 17
• (25) 15 sec	• 33	• 11
• (26) 18 sec	• 32	• 10.4
• (27) 22 sec	• 38.8	• 12.9
• (28) 38 sec	• 44	• 14
• (29) 26sec	• 38	• 12.6
• (30) 50 sec	• 60	• 20.2
• (31) 14sec	• 39	• 13
• (32) 18 sec	• 42	• 14.6
• (33) 24sec	• 48	• 16
• (34) 28 sec	• 50	• 16.8
• (35) 30sec	• 35	• 11

Time of cord clamp after birth	Hematocriteconc. (within 0-6hours of life)	Haemoglobinconc. (within 0-6hours of life)
▪ (36) 14 sec	▪ 44	▪ 12
▪ (37) 19 sec	▪ 33	▪ 11
▪ (38) 29 sec	▪ 62	▪ 20.4
▪ (39) 36 sec	▪ 54	▪ 16
▪ (40) 18 sec	▪ 48.2	▪ 15.2
▪ (41) 24 sec	▪ 50	▪ 16.8
▪ (42) 19 sec	▪ 38	▪ 12
▪ (43) 34 sec	▪ 52.5	▪ 17
▪ (44) 28 sec	▪ 43.9	▪ 14.9
▪ (45) 18 sec	▪ 52	▪ 17
▪ (46) 22 sec	▪ 34	▪ 14
▪ (47) 17 sec	▪ 47.5	▪ 15.2
▪ (48) 30sec	▪ 52	▪ 18
▪ (49) 20 sec	▪ 48.4	▪ 16
▪ (50) 18 sec	▪ 45	▪ 15

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### RESULT:

Results -		
<p>&gt; In babies born via normal vaginal delivery –</p>		
<p>Average Time of cord clamp after birth</p> <p>• 30 – 50 secs</p>	<p>Average Hematocrit conc. (within 0-6 hours of life)</p> <p>• 50 +/- 5</p>	<p>Average Haemoglobin conc. (within 0-6 hours of life)</p> <p>• 17 +/- 2</p>
<p>&gt; In babies born via cesarean delivery –</p>		
<p>Average Time of cord clamp after birth</p> <p>• 10-20 secs</p>	<p>Average Hematocrit conc. (within 0-6 hours of life)</p> <p>• 40 +/- 5</p>	<p>Average Haemoglobin conc. (within 0-6 hours of life)</p> <p>• 12 +/- 2</p>
<p>&gt; Test of significance (t) of hematocrit- 10 , Probability (P) value- 0.000</p> <p>&gt; Test of significance (t) of haemoglobin- 12.5, Probability (P) value- 0.000</p> <p>&gt; Result - statistically highly significant.</p>		

Hematological status of babies delivered by cesarean section was towards lower side as compared to normal delivered babies due to early cord clamping.

**DISCUSSION:** In our project we have studied the haematological status in newborn within 0-6 hours of life, in term babies with some probable sepsis or pathological condition i.e. respiratory distress or pneumonia or TTNB (transient tachypnea of newborn) etc. who needed NICU care because of the LIMITATION - to prick the healthy newborn to get the blood sample without a cause to investigate as it is very difficult to get permission of parents.

While rest of the studies were conducted on newborns with multiple cause to investigate due to some prolonged systemic illness or disease that even gives parents allowance to get samples of blood to study the hematological status side by side and get a prolonged follow up and management.

Hematological status of babies delivered by cesarean section was towards lower side as compared to normal delivered babies due to early cord clamping in cesarean delivery.

This is a simple and easy project to increase the hematological status of newborn by a little delay in the time of cord clamp at birth in a normal delivery as well as baby born via cesarean delivery.

**CONCLUSION:** Hematological status of babies delivered by cesarean section was towards lower side as compared to normal delivered babies due to early cord clamping.

Therefore delaying the clamping of the umbilical cord for 1 to 2 minutes in full term neonates following birth is beneficial to the newborn irrespective of the mode of delivery and improves the hematological status extending into infancy.

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It can be used as a simple and cost free intervention for reducing prevalence of anemia in infants in developing countries like India.



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