Original Article

Delayed Cord Clamping and Haemoglobin and Bilirubin levels in Neonates: A Randomized Controlled trial in term Babies

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Abstract

Objective: To determine the effect of delayed umbilical cord clamping on haemoglobin and bilirubin levels of neonates.

Study Setting and Duration: This study was conducted in the Department of Obstetrics and Gynaecology, Unit 4, Sir Ganga Ram, Hospital / Fatima Jinnah Medical College, Lahore, in six months from July 2010 to December 2010.

Study Design: Randomized controlled trial.

Methodology: A total of 270 pregnant women who fulfilled the inclusion criteria were selected by consecutive sampling for this study. Patients were divided into two groups, group A and group B, randomly by using random table number. Group A included 135 women with early cord clamping (at 15 sec) and group B included 135 women with delayed cord clamping (at 01 minute). After 6 hours of birth, blood was drawn from the neonates for Haemoglobin and serum Bilirubin levels. Samples were sent to the laboratory for analysis. All data was entered on a Performa and analyzed using SPSS version 12.

Results: The mean age of the patients was 27.7±4.6 years in group A and 26.5±4.1 years in group B. The mean gestational age in group A was 39.9±1.4 weeks and in group B it was 39.6±1.6 weeks. Neonates who had anaemia were 14 (11.5%) in group A and 2 (1.5%) in group B, the difference being statistically significant (p value =0.001). Mean serum bilirubin value at 6 hours of birth was 2.5 mg/dl for Group A and 2.7 mg/dl for Group B. The difference in bilirubin after 6 hours in the two groups was insignificant (p=0.186).

Conclusion: Delayed umbilical cord clamping at birth seems to be safe and can be expected to reduce the prevalence of anaemia in the newborns in the first year of life and is of special value in the populations with limited access to health care facilities.

Key Words: Early cord clamping, delayed cord clamping, neonatal anaemia, haematocrit level.

Introduction

One of the most critical factors contributing to neonatal and infant mortality in the developing countries is anaemia.[1] Studies have found that up to 50% infants in developing countries become anaemic by 12 months of age.[2,3] In a survey in India, 70% of the infants between 6 and 11 months of age were found to be anaemic.[4] Iron stores at birth are a major factor influencing the growth and the occurrence of iron deficiency anaemia (IDA) during infancy.[5] IDA in infancy is of particular concern because of potentially detrimental effects on physical and cognitive development.[6] Lower levels of neonatal Hb/dl and serum iron have been found related to higher levels of negative emotionality and lower levels of alertness and soothability.[7] It is therefore important to develop cost effective interventions to improve haematological status of millions of children affected by this condition worldwide. Iron stores at birth correlate with iron stores at 6 to 12 months of age and are determined by the transplacental iron transferred to the fetus and the blood transferred from the placenta at the time of delivery. This is in turn determined by the timing of umbilical cord clamping.

Deferral of cord clamping provides about 80 ml of blood after 1 min and 100 ml after 3 min of birth to the neonate.[8,9] This contributes 40-50 mg/kg of extra iron to the neonate, which might prevent iron deficiency in the first year of life. This blood is also known to be rich in haematopoietic stem cells.[10] Haematologic benefits found in the studies reviewed earlier include findings of increased haematocrit and haemoglobin levels,[11-14] increased blood volume[15], and the reduced need for transfusions in the first 4 to 6 weeks in preterm infants.[11,16] Cardiopulmonary benefits consist of better adaptation with fewer days of oxygen and ventilation needed for preterm infants and higher red blood cell flow to vital organs in the first few days of life of all babies.[13,17] Behavioral benefits suggested by the randomized controlled trials were increased duration of early breast feeding for infants with delayed cord clamping compared with early cord clamped infants.[18]

Possible disadvantages of delayed cord clamping are hypervolaemia, polycythaemia, hyperviscosity and hyperbilirubinaemia. In practice, however, these have not been found to produce clinically relevant increase in neonatal morbidity.[19]

This study was conducted with the objective of determining the effect of delayed cord clamping on Hb level of neonates and to determine its adverse effects in terms of rise in bilirubin after 6 hours of birth.

Operational Definitions

Early Cord Clamping: when cord is clamped 15 seconds after delivery.

Delayed Cord Clamping: When cord is clamped 01 minute after delivery.

Neonatal Anaemia: when infants are born at term with haematocrit level of <45%, measured by automatic haematology analyzer, 6 hours after birth.

Hypothesis: Early cord clamping leads to increased risk of neonatal anaemia as compared to delayed cord clamping.

Methodology

The study was conducted in the labour room, post-operative and postnatal wards of gynae unit 4 of Sir Ganga Ram Hospital, Lahore, by randomized controlled trial. The calculated sample size was 135 cases in each group. The duration of the study was six months from July to December 2010, and the sampling technique was of non-probability consecutive type.

The Inclusion Criteria

1. Mothers with Hb% level 10.0g/dl.
2. Singleton pregnancy confirmed on ultrasound.

3. Gestational age 37-42 weeks confirmed on 1st trimester scan.

The Exclusion Criteria

1. Transfusion of blood during labour.
2. Maternal medical disorders diagnosed on investigations during pregnancy, like Hypertension, Diabetes mellitus and Jaundice.

Data collection procedure: According to sample size women who fulfilled the inclusion criteria were selected from labour room by consecutive sampling technique. A written informed consent was obtained from the mothers of the neonates for treating them by either method and using their data in the study. Patients were divided in two groups, group A and group B, randomly by using random table number. In Group A cord was clamped at 15 sec and in group B it was done at 01 minute after delivery. Neonate's haemoglobin and bilirubin was evaluated 06 hours after birth. Neonate with haematocrit <45% were considered as anaemic. All this information was recorded on a specifically designed Performa.

Statistical Analysis: Collected data was entered into SPSS version 12 and analyzed accordingly. The relevant variables included were age of mother and gestational age. These were mentioned as frequencies and proportions, and then their mean and standard deviations were calculated. Outcome variables i.e. neonatal anaemia was presented by calculating frequency and percentage and it was compared between two groups and the difference of percentage found in the two groups was tested for statistical significance by applying Chi square test. P-value of <0.05 was considered as significant. Mean serum bilirubin level was measured in both groups and compared by calculating the p-value.

Results

The mean age of patients in group A was 27.7±4.6 years and in group B it was 26.5±4.1 years. The mean gestational age in group A was 39.9±1.4 weeks and in group B, was 39.6±1.6 weeks.

In group A 14 (11.5%) neonates had anaemia while in group B, there were 2 (1.5%) neonates who had anaemia (Figure 1).

Mean neonatal serum bilirubin level was 2.5 in group A and 2.7 in group B, being higher in the group with delayed clamping, but it was not statistically significant (Figure 2).

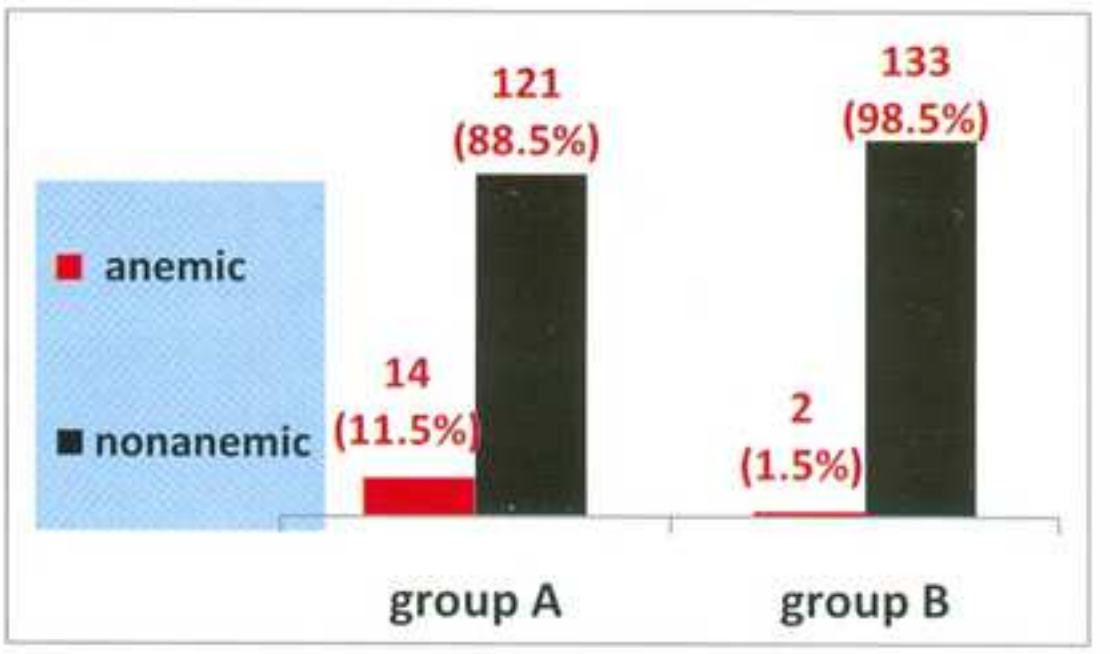

Figure 1. Distribution of anemic neonates (hematocrit < 45%) in the two groups

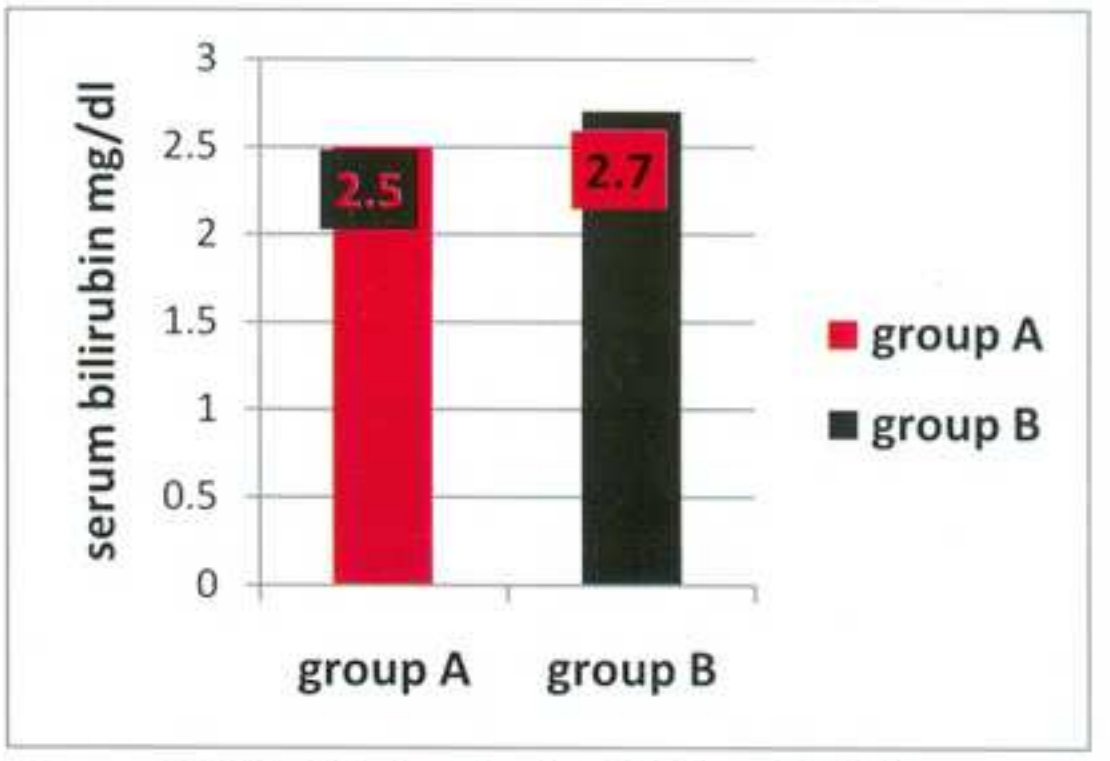

Figure 2. Bilirubin level after 06 hrs of birth

Discussion

The optimal timing of cord clamping has been a controversial issue for decades.[20-23] There are no formal practice guidelines, but most practitioners in Western countries clamp and cut the cord immediately after birth, while the practice worldwide is variable.[24, 25]

The Delayed cord clamping at birth increases neonatal mean venous haematocrit within a physiologic range. Furthermore, this intervention seems to reduce the rate of neonatal anaemia. This practice has been shown to be safe and should be implemented to increase neonatal iron storage at birth. Another benefit of delayed clamping would be the increase of haematopoietic stem cells transfused to the newborn, which might play a role in different blood disorders and immune conditions. The advantages of umbilical cord clamping at least at 1 minute after birth could decrease the prevalence of iron-deficiency anaemia in the first year of life, especially in the populations with limited access to health care facilities.[26]

In our study the mean age of the patients was 27.7±4.6 years in group A and 26.5±4.1 years in group B. The study of Ceriani-Cernadas et al[8] shows the mean age of the patients as 28.8±5.7 years in early clamping group and 28.6±6.1 years in delayed clamping group, which is comparable with our study.

In our study the mean gestational age in group A was 39.9±1.4 weeks and in group B was 39.6±1.6 weeks, which is comparable to the mean gestational age in early clamping group being 39.3±1.4 weeks and in delayed clamping group being 39.1±1.2 weeks in study done by Ceriani-Cernadas et al.[8]

In our study the neonatal anaemia with a haematocrit level of <45% at 6 hours was significantly higher in the early cord clamping group i.e.11.5% neonates versus 1.5% neonates in delayed cord clamping group. This is comparable with the results of Ceriani-Cernadas et al study,[8] which showed that early cord clamping group had 8.9% anaemic neonates and delayed cord clamping group had only 1% anaemic neonates.

In another study conducted in Mexico City,[2] newborn capillary Hb and haematocrit were found significantly higher in the delayed clamping group. This study followed the infants up to 6 months of age and found significantly higher mean corpuscular volume, serum iron and stored iron in the delayed clamping group. A similar study from India[4] reports higher infant Hb at 3 months age in the delayed cord clamping group (9.9 g/dl) versus early clamping group (8.8 g/dl).

The haematological effects of the timing of umbilical cord clamping in term infants 24 h after birth was evaluated by a study in Libya. [20] Mother-infant pairs were randomly assigned to early cord clamping (within 10sec after delivery) or delayed clamping (after the cord stopped pulsating). This study also, favoured delayed cord clamping (until the pulsations stop), as it increases the red cell mass in term infants. They concluded that as it is a safe, simple and low cost delivery procedure, it should be incorporated in integrated programmes aimed at reducing iron deficiency anaemia in infants in the developing countries.

A meta-analysis evaluated the potential of delayed cord clamping for improving the iron status and reducing the anaemia in term infants and also for increasing the risk of polycythaemia and hyperbilirubinaemia. [26] Four trials from developing and four from industrialized countries were finally assessed. Two of the four studies from developing countries found a significant difference in infant haemoglobin levels at 2-3 months of age in favor of delayed cord clamping. This difference was more marked when mothers were also anaemic. Three of the four studies from industrialized countries showed a significant difference in haematocrit levels in favor of de-

layed cord clamping. Although meta-analysis showed an increased risk for hyperbilirubinaemia of 12%, no study reported the need to apply phototherapy or perform exchange transfusion. They concluded that delayed cord-clamping in term infants, especially those from anaemic mothers, increases the haemoglobin concentration in infants at 2-3 months of age and reduces the risk of anaemia, without an associated increased risk of perinatal complications. In the developing countries where fetal anemia is common, the advantages of delayed cord-clamping might be especially beneficial.[19]

In our study mean serum bilirubin level, 06 hours after birth was 2.5 in group A and 2.7 in group B, being high in group with delayed clamping but it was statistically not significant (p value = 0.186). Serum bilirubin was taken as a secondary outcome measure and we tested it as to whether it rises significantly and thus be an adverse effect of delayed cord clamping. Difference in clinical jaundice between early cord clamping group and delayed cord clamping group was found insignificant in Chaparro CM study as well.[2] Similar results have been reported by other authors. Plasma bilirubin values at 24-48 hours of age were found similar in a randomized controlled trial by Ceriani Cernadas, et al.[8] An increased risk for hyperbilirubinaemia of 12% has been reported in a systematic review published in 2004, but none of the studies reported need for phototherapy or exchange transfusion.[19]

Conclusion

In term newborn babies, delayed cord clamping results in a significant increase in haemoglobin levels, without causing unacceptable side effects. It can be used as a simple and cost free intervention for reducing prevalence of anaemia in infants in developing countries.

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