

Timing of umbilical cord clamping and neonatal haematological status

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Abstract

Objectives: To determine the effect of delayed umbilical cord clamping on Hb (haemoglobin) and bilirubin levels of neonates and to identify newborn babies with anaemia and refer them for treatment.

Methods: This Randomized Controlled Trial was conducted in the Department of Obstetrics and Gynaecology, Unit V, Dow Medical College and Lyari General Hospital and Department of Pathology, Lyari General Hospital, between 1st November, 2006 and 15th July, 2007. Patients admitted to labour ward were selected according to inclusion criteria of the study. They were randomly allocated to 2 groups. Group A included women in whom umbilical cord was clamped immediately after birth. In Group B, clamping was delayed until cessation of pulsations in the cord. After cutting the cord, sample of blood was collected from the cut end of cord of the newborn for Hb and bilirubin. After 6 hours of birth, another sample of blood was drawn from antecubital vein for serum bilirubin. Samples were sent to laboratory for analysis. All data were entered and analyzed using SPSS version 11.

Results: Two hundred women were studied, 100 in each of the 2 groups. Mean maternal Hb was 9.75 g/dl in Group A and 9.95 g/dl in Group B. The average neonatal Hb was 14.1 g/dl in Group A and 15.2 g/dl in Group B ($p=0.008$). In all 49% neonates in Group A and 37% in Group B had Hb < 14 g/dl. Serum bilirubin values at birth and at 6 hours of birth were 1.8 mg/dl and 2.5 mg/dl for Group A and 1.9 mg/dl and 2.7 mg/dl for Group B, respectively. The difference in bilirubin after 6 hours in the 2 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 anaemic newborn babies in our community (JPMA 59:468; 2009).

Introduction

Perinatal iron deficiency has received little attention in the past, due to thinking that infants are protected from iron deficiency unless the mother is markedly anaemic. Studies have found that up to 50% infants in developing countries become anaemic by 12 months of age.^{1,2} In a survey in India, 70% of infants between 6 and 11 months of age were found anaemic.³

Iron stores at birth are a major factor influencing growth and the occurrence of iron deficiency anaemia (IDA) during infancy.⁴ IDA in infancy is of particular concern because of potentially detrimental effects on physical and cognitive development.⁵ Lower levels of neonatal Hb and serum iron have been found related to higher levels of negative emotionality and lower levels of alertness and soothability.⁶ It is therefore important to develop cost effective interventions to improve haematologic status of millions of children affected by this condition worldwide.

Iron stores at birth correlate with iron stores at 6 to 12 months of age³ and are determined by the transplacental iron transferred to the foetus 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.^{7,8} This

contributes 40-50 mg/kg of extra iron to the neonate, which might prevent iron deficiency in the first year of life.^{9,10}

Another potential benefit of delayed cord clamping is increase in haemopoietic stem cells transferred to the newborn which might play role in different blood disorders and immune conditions.¹¹

There is no clear evidence to indicate optimum timing of cord clamping in term delivery.¹² Delayed cord clamping until pulsations cease is the physiologic way of treating the cord and is not associated with adverse effects in normal deliveries.¹³

Possible disadvantages of this blood transfusion are hypervolaemia, polycythaemia, hyperviscosity and hyperbilirubinaemia. In practice, however, these have not been found to produce clinically relevant increase in neonatal morbidity.¹⁴

This study was conducted with the objective to determine 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. The study also aimed to identify newborn babies with anaemia and refer them for treatment.

Patients and Methods

This study was a randomized controlled trial, conducted in the Department of Obstetrics and Gynecology, Unit V, Dow

Medical College and Lyari General Hospital and Department of Pathology, Lyari General Hospital, Karachi. Duration of study was between 1st November 2006 and 15th July 2007.

Inclusion criteria were patients admitted to labour ward with singleton, term pregnancy, irrespective of parity and mode of delivery.

Exclusion criteria were patients with Rhesus negative blood group, multiple pregnancy, diabetes, pre-eclampsia, eclampsia, in-utero growth restriction, ante-partum haemorrhage, congenital malformation, foetal death and preterm labour. Informed verbal consent was obtained from the patients.

Patients were randomly allocated to 2 groups: Group A included women in whom umbilical cord was clamped immediately after delivery of baby, while in Group B clamping was delayed until cessation of pulsation in the cord.

After delivery, the baby was kept between the legs of the mother, at approximately the same level as placenta. After cutting the cord, sample of blood was collected from the cut end of the umbilical cord of the neonate for Haemoglobin and bilirubin levels. After 6 hours of birth, another sample of blood was drawn from the antecubital vein for serum bilirubin. Samples were immediately sent to the laboratory.

Neonates were considered anaemic if the cord blood Hb was < 14 g/dl (Reference Normal Range: 14-20 g/dl¹⁵ and 14-24 g/dl⁴). Mothers of these babies were counselled to attend paediatric out patient for further evaluation and management.

The entire data was entered and analyzed by using SPSS version 11. Percentiles were determined for categorical variables, while mean values with standard deviation were calculated for quantitative variables. Student's T test was applied to determine significance of results.

Results

During the study period 447 deliveries were conducted in the Department. Problems were encountered as patients at Lyari General Hospital tend to leave very early after normal deliveries and therefore, obtaining the second blood sample was difficult. Patients with incomplete data were excluded from the study. Finally, 200 patients were included, 100 in each group.

Baseline characteristics of mothers with birth weight and gender of neonates were comparable in both groups as shown in Table.

Mean neonatal Hb was 14.1 g/dl in Group A and 15.2 g/dl in Group B (Figure-1).

In group A, 49% neonates were found to have Hb < 14 g/dl, as compared to 37% in Group B. Cord blood bilirubin was

Table: Baseline characteristics of patients.

Characteristics	Group A n= 100	Group B n= 100
Mothers' age, mean $\pm$ SD	27.6 $\pm$ 4.9	28.2 $\pm$ 5.3
Parity, mean $\pm$ SD	2.45 $\pm$ 2	2.9 $\pm$ 2.6
Antenatal booking, %	36	45
No of antenatal visits, mean $\pm$ SD	2 $\pm$ 2.1	2.5 $\pm$ 2.1
Maternal Hb, mean $\pm$ SD	9.75 $\pm$ 0.97	9.95 $\pm$ 0.87
Delivery by caesarean section, %	21	26
Gestational age, mean $\pm$ SD	38.4 $\pm$ 1.3	38.7 $\pm$ 1.2
Birth weight (kg), mean $\pm$ SD	3.06 $\pm$ 0.39	3.15 $\pm$ 0.55
Sex of Newborns Male, %	53	65
Female, %	47	35

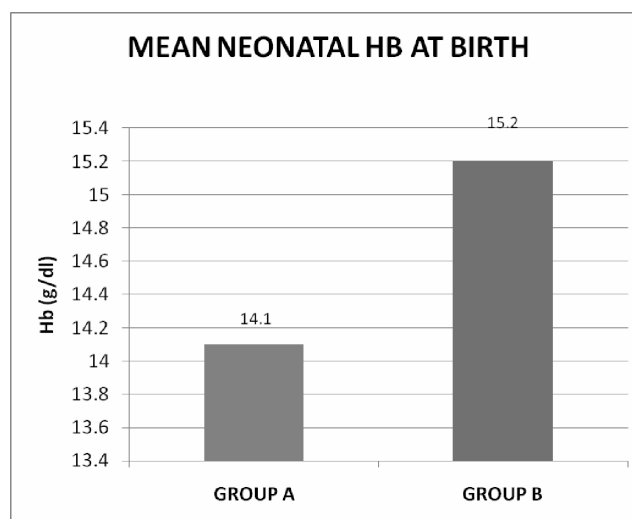


Figure 1: NB: p = 0.008.

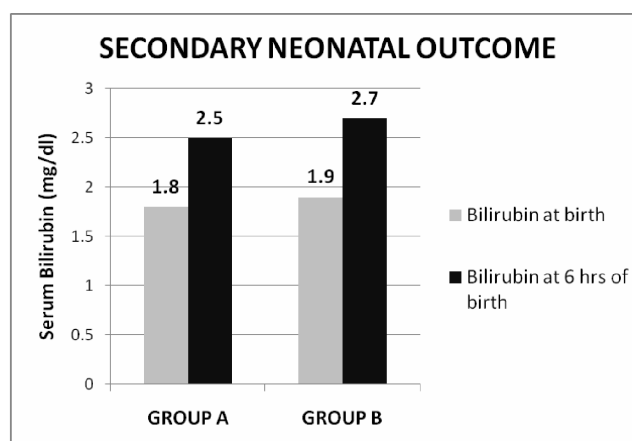


Figure 2: NB: P = 0.206 for Serum Bilirubin at Birth in Group B versus Group A. P = 0.095 for Serum Bilirubin after 6 hours of Birth in Group B versus Group A. P = 0.186 for rise in bilirubin in Group B versus Group A.

1.8 mg/dl in Group A and 1.9 mg/dl in Group B. Serum bilirubin checked at 6 hours after birth was 2.5 mg/dl in Group A and 2.7 mg/dl in Group B (Figure-2).

Discussion

Early cord clamping was recommended as part of active management of labour, in 2002, to prevent post-partum haemorrhage.¹⁶ The benefits of early cord clamping in the prevention of post-partum haemorrhage have not been established separately from the use of prophylactic uterotonic agents.^{1,13} Doubts about delayed cord clamping probably exist due to variations in its definition reported in literature. For simplification, we have used physiological cessation of cord pulsation to describe delayed cord clamping, rather than time interval in minutes. This is also recommended by Chaparro CM, in his study in Mexican infants.¹ This study has demonstrated that the mean neonatal Hb was significantly higher in the delayed clamping group as compared to early clamping group. It has also shown that frequency of anaemia in the newborns was considerably lower in the delayed clamping group.

In a randomized controlled trial conducted in Argentina,⁷ newborns were assigned to cord clamping within 15 seconds (group 1), at 1 minute (group 2) or at 3 minutes (group 3) after birth and infants' venous haematocrit was measured. It was observed that the prevalence of newborns with haematocrit less than 45% was significantly higher in group 1 (8.9 %) as compared to group 2 (1%) and group 3 (0%). The mean venous haematocrit remained within physiologic limits in all groups. In another study conducted in Mexico city, 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, body iron and stored iron in the delayed clamping group.¹ A similar study from India 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).³

Serum bilirubin was taken as a secondary outcome measure in our study and we tested if it rises significantly as an adverse effect of delayed cord clamping. Second sample was taken after 6 hours, as majority of patients were not available thereafter. It was observed that serum bilirubin on both occasions was slightly higher in the delayed as compared to early clamping group, but the rise was not significant. More importantly, the difference in bilirubin after 6 hours in the two groups was also statistically insignificant. Plasma bilirubin values at 24-48 hours of age were found similar in comparison groups by Ceriani Cernadas, et al.⁷ Difference in clinical jaundice between early cord clamping group and delayed cord clamping group was insignificant as found by Chaparro CM.¹ Similar results have been reported by other authors.^{12,17-21} 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.²²

Conclusion

In term newborn babies, delayed cord clamping results in an increase in Hb, 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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