Original Article

Evaluating the Impact of Delayed Cord Clamping and Umbilical Cord Milking on the Level of Haemoglobin, Bilirubin and Ferritin 48 Hours after Delivery in Term Neonates during Caesarean Section

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Abstract

Objectives: Iron deficiency and anemia arising from that, are one of the major health problems in the world and especially in Iran. It can cause impaired growth evolution, impaired Coordination of the nervous system, reducing the power of learning, decrease underachievement, impaired immune system. In this study, we are going to show that delayed cord clamping and milking at birth can reduce iron deficiency and it's complications in newborn extending into infancy. **Materials and Methods:** This cohort study was performed on 100 neonates born with cesarean section at Amiralmomenin Hospital, in Zabol, in 2014, who were randomly assigned in 2 groups, 50 neonates with early cord clamping and 50 neonates with milking the cord 5 times toward baby and clamping after 1 minute of birth. Then all neonates were examined for hemoglobin level at 48 hours, serum billirubin at 48 hours of birth and serum ferritin at 6 weeks of age. **Results:** The mean hemoglobin levels at 48 hours of life and the mean ferritin levels at 6 weeks of age were significantly higher in intervention group as compared with control group ($p<0.05$). No significant difference was observed in serum billirubin level in 2 groups ($P>0.05$). **Conclusion:** Umbilical cord milking and delayed cord clamping vs. early cord clamping are safe procedures that improve hemoglobin and ferritin levels in infancy without causing significant increase in jaundice and need of phototherapy so these prosedures maybe reduce the prevalence of iron deficiency anemia.

Keywords: Delayed cord clamping; Umbilical cord milking; Hemoglobin

Introduction

Delayed cord clamping is done at least 1 to 9 minutes after birth. On the contrary, early cord clamping is done less than 91 seconds after birth. [1] The proper time for clamping the umbilical cord has been discussed since the mid-1950s, and despite many studies that have taken place on the benefits of delayed clamping in comparison to the early form, the ideal and appropriate time to do so has not yet been agreed upon. [2,3] Delayed cord clamping in term newborns can increase the level of hemoglobin and ferritin in early infancy and it can be considered as a safe way to prevent anemia in infancy. [4] In some studies, a slight increase in bilirubin levels without jaundice, and the need for phototherapy and the creation of benign polycytonis are considered as possible complications for delayed cord clamping in term neonates. [5] Using delayed cord clamping technique provides several advantages in preterm and LBW infants, including increased levels of hemoglobin, volume and blood pressure in the infant, resulting in reduced blood transfusion and complications. [6] Also, delayed cord clamping leads to a 50% reduction in intrahepatic hemorrhage and neurological complications due to anemia in these infants. [7] Umbilical cord milking includes the transfusion of milk from placenta to the baby during which about 20 to 40 ml of blood and 30 to 35 mg of iron are injected into the baby's body. [8] During umbilical cord milking, the baby can be kept at the same level of placenta if it is a cesarean section and below the placenta if it is natural delivery. In most studies, the umbilical cord is milked 3 to 5 times. Delayed cord clamping and umbilical cord milking can be done one after the other, depending on priority. [9] In a group of studies, the umbilical cord was first clamped at a distance of 25 cm from the baby's body, placed the baby under the heater, and the cord is milked three times at a speed of 10 centimeters per second. In most cases, the umbilical cord is milked to a maximum of 9 times, because there remains no noticeable amount of blood in the umbilical cord after 3 times. [10] In some other studies, the cord is milked before getting clamped. Shaking before the clamping may result in the transfer

How to Cite this Article: Forghani F, et al. Evaluating the Impact of Delayed Cord Clamping and Umbilical Cord Milking on the Level of Haemoglobin, Bilirubin and Ferritin 48 Hours after Delivery in Term Neonates during Caesarean Section. Ann Med Health Sci Res. 2018;8:233-235

of excess blood from placenta to the baby and provide a higher level of hemoglobin. [11] Eventually, "placenta transfusion" and blood transfusion to the embryo from birth to umbilical cord can cause higher hemoglobin levels and less anemia. [12] In this study, we are going to show that delayed cord clamping and milking at birth can reduce iron deficiency and it's complications in newborn extending into infancy.

Method

The present observational, analytical, cohort study was conducted on pregnant women admitting to the hospital for elective cesarean delivery. Having a history of various diseases such as diabetes, hypertension, anemia, and smoking was the main exclusion criteria. Considering the 95% confidence level and the test power of 90 and the hemoglobin level of 12 hours in two groups of case and control, 15.1(2.5) and 13.1(2.1), based on previous studies, [13] the sample size was determined to be 45 subjects in each groups using the mean comparison formula; for higher confidence, the sample size of each group was determined to be 50 subjects required data was collected through an information form consisting of several sections including individual characteristics, gestational age, maternal hemoglobin level before cesarean section, the level of hemoglobin in the baby 48 hours after birth, neonatal bilirubin levels 48 hours after birth and neonatal ferritin level sic weeks after birth. After processing the collected data in SPSS, first, assuming the normal distribution of data, Kolmogorov-Smirnov and t-test were used for analysis. $p<0.05$ was considered as a significant level. Descriptive statistics of variables were also presented in the form of mean, standard deviation, percentage of frequency and charts.

Table 1: Frequency distribution table of maternal age, gestational age, newborn weight, maternal weight and hemoglobin in two groups of case and control.

Variables		Mean and SD	Maximum	Minimum
Maternal age	Control	16.31 (56.5)	42	18
Years	Case	3.27 (68.5)	39	15
	Total	23.29 (92.5)	42	15
Gestational age	Control	24.38 (55)	40	37
Weeks	Case	72.38 (83)	41	38
	Total	48.38 (74)	41	37
Infant birth weight	Control	3120 (314)	3740	2100
Grams	Case	3152 (465)	4500	2250
	Total	3136 (395)	4500	2100
Maternal weight	Control	22.73 (1.11)	102	56
Kilograms	Case	28.72 (3.13)	101	47
	Total	75.72 (22.12)	102	47
Maternal hemoglobin	Control	54.12 (63)	7.13	11
Mg/dl	Case	46.12 (71)	7.13	7.10

Table 2: Frequency distribution table of hemoglobin variables 12 hours after birth, hemoglobin and bilirubin 42 hours after birth and ferritin 2 weeks after birth in two groups of case and control.

Variables		Mean (SD)	p-value
Hgb 12 hours after birth	In case group	15.73 (1.46)	0.000
	In control group	13.77 (1.34)	
Hgb 48 hours after birth	In case group	12.91 (1.00)	0.000
	In control group	11.13 (1.30)	
Billirubin 48 hours after birth	In case group	2.17 (5.76)	0.210
	In control group	6.26 (1.74)	
Ferritin 6 days after birth	In case group	177.88 (42.74)	0.012
	In control group	155.86 (43.69)	

Results

The present study involves measuring the level of hemoglobin 48 hours after birth, bilirubin 48 hours after birth and ferritin 6 week after birth in 100 neonates born through cesarean section delivery at Amiral-Momenin Hospital in Zabol. Neonates were divided into two groups of case (delayed cord clamping and umbilical cord milking) and control (immediate cord clamping) each with 50 subjects. 45% of newborns were female and 55% were male. Ferritin 6 days after birth [Table 1 and Table 2].

There was a significant difference between the mean hemoglobin level in 48 hours postpartum in both groups (p-value<0.05), and the level of hemoglobin was higher in the group with delayed cord clamping and umbilical cord milking 48 hours after birth. There was no significant difference between the mean of baby's bilirubin level in two groups 48 hours after birth (p=0.210). There was a significant difference between the mean ferritin level 6 weeks after birth in both groups (p-value<0.05), and the level of ferritin was higher in the group with delayed cord clamping and umbilical cord milking six weeks after birth.

Discussion

Delayed cord clamping and umbilical cord milking can increase the level of hemoglobin and ferritin during infancy in comparison with immediate cord clamping; this method can possibly remove side effects such as hyperbilirubinemia and the need for phototherapy to prevent the onset of anemia. In Sarani's study (2006), which was conducted on 276 newborns, there turned out to be a significant difference between the control and case group in hematocrit level 6 hours after birth. Also, there was no significant difference in bilirubin levels between the three groups (first group immediately after birth, group two with one minute delay and group three with a 3-minute delayed clamping). [14] The results of this research were similar with the present one, with the difference that the neonates were studied in three groups instead of two. The results of Anderson's study on 400 neonates were consistent with the findings of the present research. These results showed a significant difference between the two groups in the incidence of hemoglobin 48 hours after birth (p=0.02) and ferritin at the age of 4 months (p<0.001). The study also found that the delayed cord clamping leads to a reduction in the anemia prevalence at the age of 4 months without increasing the need for phototherapy or an increase in respiratory symptoms in the infant. [3] The results of Jaleel et al. study, which was conducted on 200 term neonates, showed that infants with delayed cord clamping had higher hemoglobin in comparison with the control group (p=0.008), and the difference between the two groups was not significant in regard with the level of bilirubin 6 hours after birth (p=0.186). [15] The results of both studies confirm the impact of delayed cord clamping on decreased prevalence of anemia in infants without side effects.

The only difference was that the cord was clamped after cord beat stopped in the present study and also Eileen K. Hutton et al. in a systematic review and meta-analysis mentioned that, Delaying clamping of the umbilical cord in full-term neonates for a minimum of 2 minutes following birth is beneficial to the newborn, extending into infancy. Although there was an increase in polycythemia among infants in who cord clamping was delayed, this condition appeared to be benign. They also estimated a significant 47% reduction in risk of anemia and 33% reduction in risk of having deficient iron stores at ages 2 to 3 months with late clamping. [16]

Conclusion

Umblical cord milking and delayed cord clamping vs. early cord clamping are safe procedures that improve hemoglobin and ferritin levels in infancy without causing significant increase in jaundice and need of phototherapy so these procedures maybe reduce the prevalence of iron deficiency anemia. According to the results of the present study, in order to prevent the incidence of neonatal iron deficiency anemia, it is recommended to conduct further studies on delayed cord clamping and umbilical cord milking before clamping.

Conflict of Interest

The authors disclose that they have no conflicts of interest.

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