Effect of Early versus Delayed Cord Clamping on Neonatal Outcome in Term Pregnancy

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***Abstract*- Introduction:** Clamping and cutting of the umbilical cord during birth is by far the oldest and most common interventions in human.The objective of the study was to compare the effect of early versus delayed cord clamping on neonatal outcome in term pregnancy.

Methodology: Hospital based prospective comparative interventional study was conducted in Paropakar Maternity and Women's Hospital, Nepal from August 2014 to January 2015. The study included 100 women having normal vaginal delivery and was divided in to early cord clamping (ECC) and delayed cord clamping (DCC) group. The venous blood of the baby was taken for determining neonatal outcome in emergency laboratory of the hospital. Data analysis was done with the help of computer using SPSS program-16 and the results were depicted as tables, diagrams or charts. For statistical test unpaired student t-test and levene's test were used.

Result: The mean Hb level of the neonate 24 hours after the birth was 17.30g/dl in ECC and 19.81 in DCC group and the result was statistically significant ($p < 0.01$). In this study 18% of the neonate in ECC group and none in DCC group had neonatal anaemia (Hb<15gm/dl). There was increase in mean weight and bilirubin level of the baby in DCC group however phototherapy was not needed.

Conclusion

Delayed cord clamping group has significant increase in neonatal hemoglobin(Hb) level compared to early cord clamping. The practice of delayed cord clamping by at least two minutes is recommended with the advantage of prevention of iron deficiency anaemia and its subsequent complications in developing country like Nepal.

Keywords: *Early cord clamping, delayed cord clamping, Hemoglobin, iron deficiency anemia*

I. Introduction

Anemia is a worldwide public health problem. In Nepal, the prevalence of anemia is estimated to be 43% in children less than four years of age[1]. Newborn is delivered with a placental transfusion of 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 the75 mg/kg of body iron.[2] Therefore, DCC has been suggested to prevent iron deficiency anemia in the first year of life as it could increase iron stores in neonate.[3,4]

Delayed cord clamping is beneficial to newborns in developing countries and resource-poor environments because it is a safe and inexpensive way to prevent infant anemia.[5]Systemic review of early and late cord clamping shows there is no clear evidence for defending any of the modalities of cord clamping in full term neonates.[6] Thus this study has aimed to compare the effect of early versus delayed cord clamping on neonatal outcome in term Pregnancy.

II. METHOD

Hospital based comparative prospective research design was conducted in Paropakar Maternity and Women's Hospital, Kathmandu, Nepal to compare the effect of the early versus delayed cord clamping on neonatal outcome in term pregnancy from August 2014 to January 2015. The study population included all women who were singleton, term and normal pregnancy, expected vaginal delivery with cephalic presentation and nonsmokers admitted in hospital either through antenatal checkup(ANC) outpatient department or emergency ward for delivering the baby.

With 90% power and 95% confidence interval, sample size was 100 where 50 sample in each group of early and delayed cord clamping was taken. Purposive sampling technique was used to select the women in each group within the criteria. In both the randomized group, the person

delivering the baby was instructed to hold the baby on the abdomen until the cord is clamped. In ECC group, the cord was clamped within 30 seconds and in DCC group, the cord was clamped after 2 minute of birth of the baby. All other aspects of obstetric care were managed according to the standard practice at hospital. The interventions consisted of delayed clamping of the umbilical cord (≥120 seconds after delivery) or early clamping of the umbilical cord (≤30s). The time from complete delivery of the baby to the first clamp on the umbilical cord was measured with a stopwatch by nursing staff. All staffs in the delivery unit were instructed in the study procedures before the study started. The venous blood of the baby was taken for determining hemoglobin and bilirubin level in emergency laboratory of the hospital. The reports were collected the same day from laboratory.

Data collection was started after getting letter of permission from the Institutional Review Board, National Academy of Medical Sciences(NAMS) and hospital authority. All the doctors, nursing staff and other concerned person were oriented about the study. Informed consent was taken from women and confidentiality was maintained. All the mothers were asked for permission before intervention by explaining the objective of study, duration, process and time of intervention. The mother along with her child were followed up after one week of discharge from hospital.Data was collected by using pretested structured self-designed questionnaire. Data analysis was done with the help of computer using SPSS program-16 and the results were depicted as tables, diagrams or charts. Appropriate statistical test carried out for testing the significance were unpaired student t-test and levene'stest. P value was considered significant if the value was less than 0.05.

III. RESULT

Table 1 shows that maximum number of women belonged to age group 20-24 where 22(44%) were in ECC and 20(40%) in DCC group. The mean age of women participating in the study was 21.62yrs and 21.64yrs in ECC and DCC group respectively. Most women were primigravida that was 39(78%) in ECC and 36(72%) in DCC group. Regarding the week of gestation 61%of the women were from under 40 weeks of gestation and 39%of the cases were over 40 weeks of gestation. The Hb of women enrolled in the study ranged from 7.8gm% to 13.6gm%. The mean Hb of women participating in the study was 11.6gm% and 11.7gm% in ECC and DCC group respectively. The difference in the age, parity, week of gestation and Hb of women participating in each group was statistically insignificant.

Table 1: Distribution of the respondent according to the age N=100

	ECC group		DCC group		P value
	No.	%	No.	%	
Age in years					0.98
<19	18	36.0	17	34.0	
20-24	22	44.0	20	40.0	
25-29	5	10.0	11	22.0	
30-34	5	5.0	2	4.0	
Parity					
0	39	78.0	36	72.0	0.49
1-3	11	22.0	14	28.0	
4 or above	0	0.0	0	0.0	
Week of gestation					
37-39	28	56.0	33	66.0	0.84
40-42	22	44.0	17	34	
Maternal Hb before delivery of the baby					
<7	0	0.0	0	0.0	0.56
7-10	7	14.0	5	10.0	
10-12	20	40.0	20	40.0	
>12	23	46.0	25	50.0	

P value significant at <.05

Table 2 shows that the mean weight of the baby participating in the study was 2893gms and 3005 gms in ECC and DCC group respectively and each arm comprising of 3(6%) and 4(8%) <2500 gm birth weight of baby respectively. There were no differences in 5 minutes Apgar score of the babies in both group where all had 7-9 Apgar score. The mean Hemoglobin and hematocrit of the babies participating in the study was 17.30gm% and 19.81gm%, 51.9% and 59.4% in ECC and DCC group respectively. The mean bilirubin level of neonates participating in the study was 6.41mg% and 7.04 mg% in ECC and DCC group respectively. Among the cases enrolled in the study there was no need for phototherapy in both group. There were total of 2 neonatal admissions in ECC group. The difference in the hemoglobin, hematocrit and bilirubin level of the babies in each group was statistically significant.

IV.

Table 2: Comparison of Neonatal outcome in ECC and DCC group

N=100

	ECC Group		DCC Group		P value
	No.	%	No.	%	
Baby Weight(gm) after clamping of the cord					0.184
<2500	3	6.0	4	8.0	
2500-2999	25	50	21	42.0	
3000-3499	18	36.0	14	28.0	
3500-3999	4	8.0	8	16.0	
>4000	0	0.0	3	6.0	
Apgar score					
<7	0	0.0	0	0.0	
7-9	50	100.0	50	100.0	
>9	0	0.0	0	0.0	
Hemoglobin level(gm/dl) of baby at 24 hours after birth					0.001
<10	0	0.0	0	0.0	
10-14	9	18.0	0	0.0	
15-19	33	66.0	27	54.0	
20 or more	8	16.0	23	46.0	
Hematocrit level (%) of the neonate at 24 hours after birth					
<45	9	18.0	0	0.0	0.009
46-55	26	52.0	5	10.0	
56-65	14	28.0	37	74.0	
>66	1	2.0	8	16.0	
Bilirubin level (mg%)of the neonate at 24 hours after birth					
<5	9	18.0	0	0.0	0.018
5-9	37	74.0	45	90.0	
10-14	4	8.0	5	10.0	
Need for phototherapy					
Yes	0	0.0	0	0.0	
No	50	100.0	50	100.0	
Need for neonatal admission					0.3
Yes	2	4.0	0	0.0	
No	48	96.0	50	100.0	

P value significant at <.05

V. Discussion

The mean gestational age was 39.76 and 39.24 weeks of gestation in ECC and DCC group respectively which is similar to the study done by Ola A. in Sweden (40.0 and 40.1weeks).[2] There was no significant difference in the maternal characteristics between the ECC and DCC groups in the study. The finding is similar with the study done in Sweden.[2]

In this study the average weight of the baby after birth in ECC & DCC is 2893gm & 3005gm respectively, which is comparatively less than the study done by Ola A in which 3533gm &3629gm in ECC &DCC. In this study weight is statistically insignificant but significant in the study done by Ola Andersson[2.] But in both the studies the average weight of the baby was higher in DCC group.

In this study, there was no difference in 5 minute Apgar score of the babies in both group where all had 7-9 Apgar score. This finding is supported by the study done in Australia[7] and Lowa city, US[8]where no significant difference was found in Apgar score at five minute.

This study shows that mean hemoglobin level of the neonates was 17.3gm% and 19.8gm% in ECC and DCC group respectively. This finding is similar with the study done in Libya by Emhamed and associates[9] where the mean neonatal hemoglobin level was higher in the delayed clamping group (18.5g/dl versus17.1g/dl;*p=0.0005)*measured at 24 hours of delivery. Similarly, the study conducted in Egypt[10]and in USA[11] also shows the elevation of hematocrit and hemoglobin level among late cord clamping group compared to early group with significant differences present at 24 hours of birth.[10] The another study done in Egypt[12] and in the systematic review of different randomized and nonrandomized studies also shows the higher haematocrit and haemoglobin levels in DCC group.[13, 14] A delay in cord clamping facilitates transition of blood from the placenta to the neonatal circulation leading to increased blood volume at birth.[15]

This study shows that 74mg% and 90mg% bilirubin level in ECC and DCC respectively. There is significant difference (*p*=0.018) in bilirubin level in both of groups. This finding refute the studies of Hutan[16], Mc Donald et al[7] and Mercer JS[13] which have shown that there was no significant difference in hyperbilirubinemia. A study conducted in Sweden[3] and in Netherland[5] revealed that though there was increased risk of hyperbilirubinemiain DCC group, there was no need for phototherapy[5] which supports the findings of this study as per the need for phototherapy which was stastically insignificant.

Contrastly, Mercer JS[14] resulted in no difference in clinical jaundice or polycythaemia which refutes the findings of this study as there was increased risk of hyperbilirubinemia and polycythaemia in DCC.

Eman et al shows delaying clamping of the cord for more than one minute can be advantageous for the infant by improving hematological values especially the status which may be of clinical value particularly in developing countries where infants access to good nutrition is poor.[10]

This study reveals that the hematocrit value less than 45% was seen in 18 % of the babies in ECC group which is supported by the study done in Argentina where the hematocrit values less than 45% at 24 to 48 hours of birth in ECC group was 16.8%.[17]

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