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## Research Article

## Neonatal Haemoglobin and Haematocrit Level on Delayed Cord Clamping

### Kadar Hemoglobin dan Hematokrit Neonatus pada Penundaan Penjepitan Tali Pusat

Lita R. Astrianti, Wim T. Pangemanan, Nuswil Bernolian, Kms. Yakub

Department of Obstetrics and Gynecology  
Faculty of Medicine University of Sriwijaya/  
Dr. Mohammad Hoesin General Hospital  
Palembang

## Abstract

**Objectives:** To assess neonatal haemoglobin and haematocrit level during delayed cord clamping on normal delivery.

**Methods:** This was a randomised control trial with simple random sampling method. During March until June 2011, we collected blood sample from venous umbilical cord on newborn baby. Twenty babies were assigned to the first group, of which the clamping of the umbilical was delayed until 2 minutes (DCC). The other 20 babies were assigned to the second group, of which the clamping of the umbilical was performed as early as 10 second (ECC) after delivery of the whole body of the baby. The haemoglobin and haematocrit level was noted and compared between two groups using Mann-Whitney U test in SPSS 16 for Windows.

**Result:** There were no difference on maternal characteristic between two groups, except for the maternal education and maternal economic status. The median neonatal haemoglobin level on DCC group was 15.77 g/dl and on ECC group was 14.36 g/dl. There was statically significant higher neonatal haemoglobin level on DCC group ( $p=0.005$ ). The median neonatal haematocrit level was 44.1% on DCC group and was 43.35% on ECC group. There was no difference on neonatal haematocrit level between two groups ( $p=0.652$ ).

**Conclusion:** Delaying cord clamping until at least two minutes after delivery could increase haemoglobin level on newborn babies. Therefore, this method was suggested for every delivery in area where there is a risk of anemia in neonates such as Indonesia.

[Indones J Obstet Gynecol 2012; 36-1:24-7]

**Keywords:** delayed cord clamping, haemoglobin, haematocrit

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## Abstrak

**Tujuan:** Menilai perubahan kadar hemoglobin dan hematokrit bayi pada penundaan penjepitan tali pusat pada persalinan normal.

**Metode:** Penelitian acak terkontrol dengan metode pengambilan sampel acak. Selama Maret hingga Juni 2011 kami mengumpulkan sampel darah dari vena umbilikalis dari tali pusat bayi yang baru lahir. Sebanyak 20 bayi dimasukkan ke dalam kelompok yang dilakukan penundaan penjepitan tali pusatnya hingga dua menit setelah kelahiran (DCC). Dua puluh bayi lainnya dimasukkan ke dalam kelompok yang penjepitan tali pusat segera sebelum sepuluh detik setelah kelahiran seluruh badan bayi (ECC). Dilakukan pengukuran kadar hemoglobin dan hematokrit bayi dan kedua kelompok dibandingkan menggunakan Mann-Whitney U test (SPSS 16 untuk Windows).

**Hasil:** Tidak terdapat perbedaan karakteristik ibu di antara kedua kelompok penjepitan tali pusat, kecuali pendidikan dan status ekonomi. Rerata kadar hemoglobin bayi pada kelompok DCC adalah 15,77 g/dl. Rerata hemoglobin bayi pada kelompok ECC adalah 14,36 g/dl. Kadar hemoglobin bayi pada kelompok DCC lebih besar dibandingkan kelompok ECC, hasil tersebut bermakna secara statistik ( $p=0,005$ ). Rerata kadar hematokrit pada kelompok DCC adalah 44,1% dan pada kelompok ECC adalah 43,35%. Tidak terdapat perbedaan yang bermakna pada kadar hematokrit bayi di antara kedua kelompok ( $p=0,652$ ).

**Kesimpulan:** Penundaan penjepitan tali pusat hingga dua menit setelah kelahiran seluruh badan bayi akan meningkatkan kadar hemoglobin bayi. Metode ini disarankan pada setiap kelahiran yang lahir pada daerah yang memiliki risiko anemia negara berkembang seperti Indonesia.

[Maj Obstet Ginekol Indones 2012; 36-1:24-7]

**Kata Kunci:** hematokrit, hemoglobin, penundaan penjepitan tali pusat

## INTRODUCTION

It is estimated that there are 3.6 billion people in the world who were experiencing iron deficit. Two billion of them were anemic. Unfortunately most of them were women on reproductive age and children above 5 years of age in developing country.<sup>1</sup> Anaemia in children is often caused by the lack of iron substance in diet. The effort to overcome this issue by supplementation and fortification seems

failed or show little success, especially on developing and poor country.

This problem ignites the idea of enhancing iron storing as early as during the delivery of the child. On delivery, when the baby takes their first breath, there was a huge transition on the lungs. In utero, fetal lung was an organ filled with and produced liquid about 400 ml/day.<sup>2</sup> During the end of third semester, the fluid production was decreased but

not ceased. Thus, at birth, the newborn's lung must make immediate dramatic changes in both function and structure. The lung function must change from a fluid-producing organ in the fetus to one of gas exchange in the neonate. The lung structure must change from the fluid-filled state in the fetus to that of open gas-filled alveoli with excellent capillary circulation.

The lungs are compressed during delivery. This compression allows liquid on the lung to strike out. After the baby is delivered, the lung is opened with air and the function is changed to oxygen exchange during neonatal period.

At this time, the blood from fetoplacental circulation is transfused to the neonate's circulation. This transfusion happens as long as the umbilical cord is not clamped yet. Delaying cord clamping is assumed to hold the transfusion even longer and therefore will enhance the blood volume of the newborn babies. This extra blood volume will add iron store in the body, and reducing the risk of anaemia.

#### METHOD

During March until June 2011, forty women were included in the trial at obstetric ward of Dr. Moh. Hoesin hospital of Palembang. Women at 37-42 weeks gestational age who were undergoing normal labor were recruited. The inclusion criteria were women with singleton pregnancy at 37-42 weeks gestation and underwent normal labor without any complication. The exclusion criteria were preeclampsia, history of antepartum haemorrhage, anemic mother (Hb < 10 g/dl) and other than cephalic presentation. If after delivery, the baby needs resuscitation, it will directly be excluded from the trial. The sample was drawn from venous blood of umbilical cord. Through simple random sampling, each of the subject receive sealed envelope, which divide the mother into two groups. The first group was assigned to early cord clamping group. After delivery, the cord was clamped as early as 10 seconds after whole body of the baby was born (early cord clamping group). The second group was assigned to delayed cord clamping until two minutes. The haemoglobin and haematocrit level of the two groups and the mother were noted and compared using Mann-Whitney U test. The characteristic of the mother was compared using Pearson Chi Square and Fisher Exact test. Data were analysed using SPSS 16 for Windows.

#### RESULT

The characteristic of the mother was shown at Table 1.

**Table 1.** Material Characteristic

Material Characteristic	Early cord clamping		Delayed cord clamping		p
	n	%	n	%	
Maternal Age					0.118*
< 20 yers	5	25	1	5	
20-30 years	12	60	12	60	
30-40 years	3	15	7	35	
> 40 years	0	0	0	0	
Total	20	100	20	100	
Maternal Education					0.010*
≤ 9 years (SD-SMP)	14	70	6	30	
10-15 years (SMA-D3)	6	30	14	70	
≥ 15 years (S1-S3)	0	0	0	0	
Economic Status					0.041*
Low	10	50	3	15	
Medium	10	50	17	85	
High	0	0	0	0	
Parity					0.698*
1-3	18	90	18	90	
> 3	2	10	2	10	
Gestational Age					0.731*
37-38 weeks	12	30	7	35	
39-40 weeks	28	70	13	65	

\*Tested with Pearson-Chi Square  
#Tested with Fisher Exact Test

Most of the women included in this trial aged between 20-30 years with 1-3 parity. The number of women with 39-40 weeks of gestational age was higher than 37-38 weeks. Women on delayed cord clamping groups seemed to have higher education level with p=0.01. Maternal economic status was statistically different between the two groups.

Maternal haemoglobin, haematocrit and erythrocyte level is shown in Table 2.

**Table 2.** Maternal Haemoglobin, Haematocrit and Erythrocyte Level

Blood	Early cord clamping		Delayed cord clamping		p
	n	x:SD	n	x:SD	
Haemoglobin (g/dl)	20	11.1±0.751	20	11.28±1.00	0.547
Haematocrit (%)	20	33.95±2.892	20	33.35±3.36	0.549
Erythrocyte (million)	20	3.7±0.392	20	3.76±0.449	0.691

Tested with Mann-Whitney U test

The median maternal haemoglobin in the delayed cord clamping group was 11.28 g/dl, while in the early cord clamping was 11.1 g/dl. There is no difference between the two groups. This will minimize the bias between the subjects. The haematocrit and erythrocyte level were all the same.

Table 3 shows the neonatal haemoglobin, haematocrit and erythrocyte level of the two groups.

**Table 3.** Neonatal Haemoglobin, Haematocrit and Erythrocyte Level

Blood	Early cord clamping		Delayed cord clamping		p
	n	x±SD	n	x±SD	
Haemoglobin (g/dl)	20	14.36±1.812	20	15.77±1.042	0.005
Haematocrit (%)	20	43.35±5.678	20	4.41±4.723	0.652
Erythrocyte (million)	20	4.03±0.525	20	4.162±0.435	0.387

Tested with Mann-Whitney U test

Neonatal haemoglobin level on delayed cord clamping was higher from early cord clamping group. The median haemoglobin was 15.77 g/dl and 14.36 g/dl in the DCC and ECC group, respectively. There were statically significant different between two groups ( $p=0.005$ ). Neonatal haematocrit and erythrocyte level of the two groups were similar.

#### DISCUSSION

Maternal haemoglobin was all the same between these two groups. Unfortunately this trial did not examine maternal post partum hematologic status. Other trial such as McDonald's trial<sup>3</sup> didn't find any difference on maternal post partum hemologic status, indicating that there are no haemorrhagic post partum happen during the delay of cord clamping.

Gupta<sup>4</sup> and Enhamed<sup>5</sup> delayed cord clamping on anemic mother, and followed up the neonates' hematologic status, which shows that the iron store on delayed cord clamping baby increased until 3 months after delivery.

Neonatal haemoglobin level on delayed cord clamping is higher than the early cord clamping group.<sup>6-9</sup> Longer time of delaying cord clamping seems to make haemoglobin become higher, even in preterm babies.<sup>10-13</sup>

This trial revealed that even though there was a higher haemoglobin level on delayed cord clamping groups, the haematocrit level seems to be the same. It could be caused by the higher estimated neonatal blood volume on the newborn babies. The difference with other trial is because the time of delaying cord clamping was different.<sup>14,15</sup>

Delaying cord clamping should be preferred during delivery in the condition of poor setting or if

the incidence of anaemia on baby was high.<sup>16,17</sup> But other complications of delaying cord clamping such as polisitemia and the need of phototherapy on newborn baby should also be considered. On the Cochrane study,<sup>18</sup> it revealed that even though the incidence of polisitemia status was higher on delayed cord clamping group, the result was not statistically significant.<sup>19</sup>

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