

## The Effect of Delayed Umbilical Cord Clamping on the Hemoglobin Level of Newborn

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### Abstract

Iron deficiency on anemia often occurs in infants with the highest occurrences under 24 months. The effect of anemia in infant links to morbidity and mortality increase rate, impaired the physical and brain growth, motor, mental and intelligence development. Delayed in the umbilical cord cutting might overcome these issues. The aim of this study is to determine the effect of different length of time of delayed umbilical cord clamping and cutting on the hemoglobin level of newborn. This study is a qualitative study. This is a quasi experimental research with post test only control group design. Fifteen newborn babies with delayed umbilical cord clamping and cutting until its stop pulsating as an intervention group. Fifteen newborns have delayed umbilical cord cutting for 120 seconds after birth as a control group. The data from the blood serum were taken afterward for examination of haemoglobin level on the both groups. The data was analysed with t test. The results showed that in the intervention group with delayed umbilical cord clamping and cutting until the umbilical cord stops pulsating has the average time of 218 seconds, with the average of hemoglobin level is 19,76g /dL. It was higher than the ones in control group at 18,31 g/dL. There is a significance difference in the mean hemoglobin levels between the two groups with p value at 0.001 (<0.05). the different mean of the level of haemoglobin is 1.44. It is concluded that the haemoglobin level at newborn who delayed umbilical cord clamping and cutting until the umbilical cord stops pulsating is higher than of its at newborn who delayed umbilical cord cutting at 120 seconds. The health providers might concern on another factors affecting the level of haemoglobin at newborn.

**Key words:** Delayed cutting, hemoglobin, Umbilical cord

### Introduction

One cause of infant mortality rate in Indonesia is infection, including respiratory infection and diarrhea. Based on a study in Mexico, the highest prevalence of anemia occurs on children under one year old is 14,6%, between 1 and 2 years is 48,9%, between 5 and 11 years 14,6 to 22%.<sup>(1)</sup> The prevalence rate of anemia in the world is one of the highest rank health issues. The ones who are highly infected are categorized as follow: babies and children under 2 years old (48%), pre-school children (25%), pregnant mother and elderly (50%).<sup>(2)</sup>

Iron-deficiency anemia for babies is a health issue which can be found in every developing country, especially, baby under 2 years. It might correlate with the inadequacy of iron supplies which may disturb the growth and development. The iron-deficiency anemia problem on baby is a serious health issue because it will disturb the mental and cognitive development of the baby in his/her adult life.

A delayed umbilical cord cutting might help the problem. The baby might add the iron at around 40-50 mg/kg during labour process. This might prevent iron-deficiency until the baby reaches one year old.<sup>(3)</sup> A delayed of clamping and cutting of the umbilical cord means delaying for a moment to perform the clamping and cutting of the umbilical cord or preventing of clamping the umbilical cord early (Riksani Ria, 2010). For the delay time, even WHO (2007) recommends it. WHO states that the optimal time to perform the clamping and cutting of the umbilical cord for every baby, without considering gestational age and the infant's weight, is when the *circulation* or pulsation in the umbilical cord has stopped and the umbilical cord looks horizontal. Which is estimate around 3 minutes after the baby is born.<sup>(4,5)</sup>

A study stated that there is a significant difference of the average of hemoglobin level in newborn babies. Where the average of hemoglobin level for newborns whose umbilical cord clamping performed about 60-120 seconds is higher than the ones performed about 30-60 seconds.<sup>(6)</sup> Furthermore, a similar research was done by Dr. Manju Bala Dash, et al in 2014 resulted that there is a significant difference in hemoglobin level between the time when the baby was born and 24 hours after the baby was born. Between the babies which are given an intervention of a delayed the umbilical cord cutting around 15 seconds and 3 minutes. Babies who are given a delayed their umbilical cords cutting have a higher hemoglobin level compared to the ones experiencing an early cutting or directly of their umbilical cords.<sup>(7)</sup>

According to the procedur of Asuhan Persalinan Normal/ Normal Labour Procedur Guidance 2010, in point 30, that –two minutes after postpartum, clamp the umbilical cord with a clamp about 3cm from the baby's navel. Push the remains of the content in the umbilical cord toward the distal (maternal) and clamp it again about 2cm distal from the first clamp.<sup>(8)</sup>

Placenta is an organ shaped like a particular disc attached on cervix and connected to the fetus through umbilical cord. It contains components of the fetus, and components of the mother. It consists of the fetal tissue and the mother tissue is completely formed at 16 weeks or 4 months of pregnancy.<sup>(9,10)</sup> The most important gase exchange is oxygen and carbondioxide. The oxygen saturation in the intervillion part of the placenta is 90%, meanwhile the partial pressure is 90 mmHg. Although the PO<sub>2</sub> pressure on fetus only 25 mmHg, high hemoglobin on fetus allows the absorbtion of oxygen from the placenta. In addition, the difference in H<sup>+</sup> ions and high levels of carbon dioxide from the fetal circulation allows exchange with oxygen (bohr effect).<sup>(10,11)</sup>

Meiliya, E & Karyuni, E.K. (2007) stated that as long as the placenta sticks on the cervix, the umbilical cord will produce blood, which is called the umbilical cord blood.<sup>(12)</sup> The blood will not be produced for a long time. After the placenta is detached and there is no pulsation on the umbilical cord, the bloodstream from the umbilical cord will also stop. Once the fetus is born, it no longer needs oxygen from the mother, because it can breathe on its own. Therefore it is no longer needed, so that this cord must be cut and clamped or fastened.<sup>(11)</sup>

In normal birth, the delayed of cord clamping is done until the umbilical cord stops pulsating. Lotus birth is a practice when they do not do the clamping and cutting the umbilical cord, and this cord dislodged itself. When the baby begins to breathe and reaches the normal blood circulation volume, the cord will stop pulsating (the cord will look white and soft). It can take about 3 to 7 minutes for the baby to transition and to form a normal volume of blood in his body physiologically, but this process can take longer for some babies.<sup>(11)</sup>

WHO states that the optimal time to clamp the umbilical cord for all infants, regardless of gestational age or fetal weight. It happens when the circulation or pulsation in the umbilical cord stopped, and the umbilical cord is flat and pulseless (about 3 minutes or more after birth). There are several factors affecting hemoglobin level in newborn including maternal hemoglobin level, maternal age, parity, gestational age, multiple pregnancy, birth weight, blood loss, and co-morbidities in pregnancy.<sup>(5)</sup>

The aim of this study is to identify the characteristic of potpartum mother, the hemoglobin levels on newborn baby, and analyse the average of hemoglobin levels on newborn baby in the itervention group and control group.

## **Method**

This study is pre-experimental design with post only control group design. This quantitative study is a cross-sectional approach. The subject was recruited from two midwifery independent clinical practice at Semarang during 3 months at 2017. The number of sample used a Slovin pattern.<sup>(13)</sup> The sampling technique was a purposive sampling. All subject involving in this study were normal labour women who deliver their normal baby. Using Slovin Pattern on the number of subject, there were 16 babies as intervention group and 15 babies as control group. During the study a subject withdraw because of unwanted to be as a participant. Both two group were observated from delivery process until the third stage of labour.

There were 4 enumerators helping this study. The observation made from the third stage of labor, which is delaying on cutting of the umbilical cord until it stopped pulsating at midwifery clinic A as an intervention group. Midwives calculated the duration of the pulsation of the umbilical cord. It used a digital timer with a Tech-Up brand with number 67540000MN. After the cord stopped pulsating, the researcher clamped and cut the umbilical cord. A droplet of blood,  $\pm 0.05$  out of the remains of the umbilical cord cut is used to measure hemoglobin (Hb) level using digital hemoglobin with brand Tech Up. The data were noted from the results of the time of the umbilical cord pulsating stopped and the hemoglobin (Hb) levels. In the control group, the blood sampel were gained from 120 minutes delayed cord cutting at midwifery clinic B.

The normality of data was using the *shapiro-wilk* test because of less than 50 subjects. The data were analysed by univariate and bivariate with descriptive statistic which is used to report result in frequency distribution and percentage (%). The univariate analysis is presented as *mean, median, minimum, maximum*, and standard deviation. Then, the bivariate analysis was using *t-test*.<sup>(13)</sup>

## Results

**Table 1. Characteristics of the postpartum women, data normality, and homogeneity data.**

Character istic	Group	Category	f	%	<i>p</i> * <i>Sapiro W</i>	<i>p</i> * <i>homo</i>
Maternal Age	Intervention	20-27 years	10	66,6	0,310	0,278
		28-35 years	5	33,3		
	Control	20-27 years	10	66,7	0,023	
		28-35 years	5	33,3		
Occupatio n	Intervention	Housewife	6	40	0,001	0,889
		private	9	60		
		Civil servant	0	0		
	Control	Housewife	4	26,7	0,006	
Private		3	20,0			
Civil servant		8	53,3			
Education	Intervention	<i>Elementary</i>	-	-	0,001	0,007
		<i>Junior-Senior high school</i>	11	73,4		
		<i>Undergarduat e</i>	4	26,6		
	Control	<i>e</i>	4	26,7	0,002	
		<i>Elementary</i>	8	53,3		
		<i>Junior-Senior high school Undergarduat e</i>	3	20,0		
Parity	Intervention	Primipara	5	33,3	0,001	0,224
		Multipara	10	66,7		
	Control	Primipara	7	46,7	0,001	
		Multipara	8	53,3		
<i>Gestationa l age</i>	Intervention	37-41 weeks	15	100,0	0,059	0,924
	Control	37-41 weeks	15	100,0	0,009	
Pulse	Intervention	80-100x/ minutes	15	100,0	0,017	0,740
	Control	80-100x/ minutes	15	100,0	0,017	
Temperatu re	Intervention	36,5-37 <sup>0</sup> C	15	100,0	0,210	0,001
	Control	36,5-37 <sup>0</sup> C	15	100,0	0,001	
<i>Respiratio n Rate</i>	Intervention	18-24 x/ minutes	15	100,0	0,089	0,331
	Control	minutes	15	100,0	0,043	

		18-24 minutes	x/ minutes			
DJJ	Intervention	120-160x/	15	100,0	0,312	0,860
	Control	120-160x/	15	100,0	0,803	
Upper arm circumference length	Intervention	≥ 23,5 cm	15	100,0	0,044	0,063
	Control	≥ 23,5 cm	15	100,0	0,199	
Maternal Hb	Intervention	≥ 11 g/dl	15	100,0	0,187	0,334
	Control	≥ 11 g/dl	15	100,0	0,319	
Baby's weight	Intervention	2,5 - 4 kg	15	100,0	0,519	0,303
	Control	2,5 - 4 kg	15	100,0	0,199	

The postpartum women aged 20-27 years in the intervention and control group amounted to 10 people each (66.6%), while the subjects aged 28-35 years same as in both group amounted to 5 people each (33, 4%). The level of education in the intervention is lower than the level of education in the control group. Most women are multipara in both groups. All subject have an upper arm circumference length more than 23 cm.

Job characteristics in the intervention group consist of 15 subjects, with 6 subjects (40% Housewife), and 9 subjects (60%) work as employees of private companies. In the control group, there are 4 subjects (26.7%) who are Housewife, 3 subjects (20.0%) work as employees of private companies and 8 subjects (53.35) work as civil servants. In the intervention and control group, all 30 subjects (100.0%) had a gestational age of ≥37- ≤41 weeks as aterm pregnancy. The results of vital signs examination and observation, upper arm circumference length, fetal heart rate, and birth weight of the infant are in a normal state.

**Tabel 2. Mean, Median, Modus, and Standard Deviation of Duration in the Delayed Umbilical Cord Cutting and Hemoglobin Levels on Newborns in the Intervention and Control Group.**

No	Characteristic	Group					
		Intervention			Control		
		Mean	Median	Std. Dev	Mean	Median	Std. Dev
1	Duration of Delayed Umbilical Cord Cutting	218.3	220.0	26.3	-	-	-
2	Haemoglobin Level	19.760	19.600	0.6501	18.313	18.300	0.53166

The average duration of delay time on cutting the umbilical cord until the umbilical cord stop pulsating is about 218.3 seconds or about 3.5 minutes. The haemoglobin level is 19.76 gr/dl. While in the control group, it is 18.313 gr / dl. This result is almost the same as that of Lubis, Muara.P in Medan in 2008 entitled "The Impact of Umbilical Cord Clamping Delays on Hemoglobin and Hematocrit Increase of Infant in Normal Delivery" which one of the results is the hemoglobin level in infant with a delay cutting the umbilical cord after about 2 minutes is around 18,3 g/dL.

**Tabel 3. Un-Paired T-test results on Hb (Hemoglobin) level of Newborns in Intervention or Control Group**

	Mean	t	df	Sig p*
Haemoglobin level at intervention and control group	1.44667	6.672	28	0.001

The results of statistical examination using parametric Un-Paired T-Test, obtained p-value = 0.001 (<0.05). There is a difference of Hb (Hemoglobin) level in newborn between the group with delayed of umbilical cord cutting until the umbilical cord stops pulsating and the one with delay of umbilical cord cutting after 2 minutes. The difference mean of haemoglobin (Hb) level in intervention and control group is 1.4g/dl

### Discussion

From the results of the above research it can be seen some characteristics of subjects ranging from the age of subjects to weight newborn baby. High parity in pregnant women will cause effects, one of them is anemia in infants who are born.<sup>(14)</sup> The education level and age of a woman are concerned with the health of her pregnancy, as women tend to delay the age of pregnancy even up to the age of 40, for reasons such as education, professional work, and economics. Furthermore age and parity are influential, because pregnant women at age > 35 years are related to preeclampsia, premature birth, LBW, and cesarean section. It also in pregnancy during <20 years of age may cause anemia.<sup>(15)</sup> All subject have an upper arm circumference length more than 23 cm. It is indicated that they are good nutritional status.

The duration of umbilical cord delay in the intervention group was 218 seconds or 3.5 minutes. This result is compatible with the recommendation from Emhamed, et al (2004), whose research in Libya recommends on clamping and cutting the umbilical cord after the cord stops pulsating, i.e. after 2 - 4 minutes.<sup>(16)</sup> Meanwhile in the control group, it is 120 seconds or for 2 minutes. With results in the intervention group state the hemoglobin level of newborns is 19.76 g/dL. These results are almost similar compared with the results of research from DR. Manju entitled -Effect of Delayed Cord Clamping on Hemoglobin Level among Newborns in Rajiv Gandhi Government Women & Children Hospital, Puducherry in 2014. In DR. Manju's research, stated that the group that performed the cutting of the umbilical cord for 3 minutes had an average Hb (Hemoglobin) level of 19.97 g/dL.<sup>(7)</sup> While the mean hemoglobin level in the control group was 18.3 g / dl This result is almost the same as that of Lubis, Muara.P in Medan in 2008 entitled "The Impact of Umbilical Cord Clamping Delays on Hemoglobin and Hematocrit Increase of Infant in Normal Delivery" which one of the results is the hemoglobin level in infant with a delay cutting the umbilical cord after about 2 minutes is around 18,3 g/dL.<sup>(17)</sup>

It is a need for health provider to concern another factor influencing level of haemoglobin on newborn for practising the delay cord clamping and cutting. Some factors, especially nutritional status of the pregnant woman might influence on the level of the newborn. The pregnant women might be supported to consume much vegetable, such as daun kacang panjang to improve their level of haemoglobin.<sup>(18)</sup>

Autoimmune of the fetus might correlate with the delay of umbilical cord clamping and cutting. Woman who has different rhesus with the baby might in the dangerous state if they were delayed umbilical cord clamping, because of autoimmunized of bloodstream.

### Conclulsion

From the research findings above, it can be concluded that most of the subjects from both control and intervention groups aged 20-27 years. Most of the subjects are housewives and employees of private companies. All 30 subjects are mostly educated from Junior to senior High School. Most of them are multipara. The average gestational age of the respondent is 37- 41 weeks. The results are from examination and monitoring of vital signs, fetal heart rate, upper arm circumference length and maternal Haemoglobin of all subjects and their babies under normal circumstances. The average birth weight of infants born by maternal subjects has a normal weight of > 2500 g and <4000 g.

The delay of umbilical cord cutting until the umbilical cord stops pulsating has the average time of 218 seconds, with mean hemoglobin level of newborns in intervention group is 19,76g /dL. It is higher than the ones in control group at only 18,31 g/dL with value of difference of mean 1,44.

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