

Jurnal Info Kesehatan

Vol. 21, No. 2, June 2023, pp. 391-399

P-ISSN 0216-504X, E-ISSN 2620-536X

DOI: [10.31965/infokes.Vol21Iss2.1053](https://doi.org/10.31965/infokes.Vol21Iss2.1053)Journal homepage: <http://jurnal.poltekkeskupang.ac.id/index.php/infokes>**RESEARCH****Open Access****Apgar Score and the Amount of Blood of Mother in Labour in Delayed Cord Clamping Period****Marlina^{1a}, Indah Trianingsih^{1b}, Adinda Juwita Sari^{2c*}, Rosmadewi^{1d}**¹ Department of Midwifery, Politeknik Kesehatan Tanjung Karang, Bandar Lampung, Lampung, Indonesia² Center for Research and Community Service, Politeknik Kesehatan Tanjung Karang, Bandar Lampung, Indonesia^a Email address: marlina@poltekkes-tjk.ac.id^b Email address: indahtrianingsih@poltekkes-tjk.ac.id^c Email address: adindajuwitasari@poltekkes-tjk.ac.id^d Email address: rosmadewi@poltekkes-tjk.ac.id

Received: 24 January 2023

Revised: 09 June 2023

Accepted: 09 June 2023

Abstract

A delay in cutting the umbilical cord in infants can increase the Apgar score in infants who experience asphyxia. Besides that, it can prevent postpartum hemorrhage from occurring. Most deaths from postpartum hemorrhage occur during the first 24 hours after delivery. This increase in the Apgar value proves that the longer the delay in the umbilical cord is carried out, even until it doesn't pulsate, the better the baby's body will be, which results in an increase in hemoglobin in the baby's body. The population in this study were all mothers in the 3-4 stage of labor in the city area. Bandar Lampung. The sample is part of the number and characteristics possessed by the population with 120 maternal. It is known the length of time delayed cord Clamping is performed on babies born (<30 seconds) as many as 3 (2.5%) respondents, while umbilical cord clamping is delayed for 30-180 seconds as many as 117 (97.5%) respondents, the Apgar score in newborns in the category of mild asphyxia - not asphyxia as much as 100%, the amount of blood that came out <250 grams was 93 (77.5%) respondents and the amount of blood that came out 250 grams were 27 (22.5%) respondents. Delayed cord clamping does not increase the incidence of asphyxia and bleeding in laboring mothers, so immediate umbilical cord clamping can be performed by observing the baby's birth condition.

Keywords: Apgar Score, Delayed Cord Clamping, Maternal.***Corresponding Author:**

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1. INTRODUCTION

Maternal Mortality Rate (MMR) is one of the indicators to measure maternal health. MMR is the ratio of maternal deaths during pregnancy, childbirth, and lochia caused by pregnancy, childbirth, and lochia or other procedures, but it is not due to other causes such as accidents or falls in every 100,000 live births. According to the World Health Organization (WHO, 2019) report, the World Maternal Mortality Rate (MMR) in 2019 in underdeveloped countries of the world is high, with an estimated 415 maternal deaths per 100,000 live births with a lifetime risk as high as 1 in 37 for 15-year-old girls in sub-Saharan Africa. In comparison, the same girl living in Australia or New Zealand would have a risk of only 1 in 7,800. Sub-Saharan Africa and South Asia accounted for about 86% (254,000) of estimated global maternal deaths in 2017 whereas sub-Saharan Africa alone accounted for about 66% (196,000). South Asia accounts for nearly 20% (58,000) and Southeast Asia accounts for more than 5% of global maternal deaths (16,000) (Podungge, 2019).

The Intercensal Population Surveys in 2015 show that maternal mortality rate tripled compared to the MDGs target (Kementerian Kesehatan Republik Indonesia, 2022). Based on the graphic chart of maternal death cases in 2019 below, it can be seen that the number of maternal death cases is increased compared to 2018, from 102 cases to 110 cases. It can be seen that the causes of maternal death cases in Lampung Province in 2019 which caused by bleeding are 29 cases, hypertension are 31 cases, infection are 3 cases, circulatory system disorders are 4 cases, metabolic disorders are 1 case and others are 42 cases. The highest number can be found in Central Lampung and East Lampung districts where 16 cases each are recorded and the lowest number can be found in West Tulang Bawang District where there are 2 cases are recorded while in Bandar Lampung city there are found 14 people (Dinas Kesehatan Provinsi Lampung, 2022). When a mother is delivering a baby, the baby is still connected to the mother through the umbilical cord which is part of the placenta (McDonald et al., 2014). The baby will separate from the placenta through the clamping and cutting of the umbilical cord, and these activities are included in the active management of the stage III of Labor (Purisch et al., 2019). The clamping and cutting of the baby's umbilical cord at birth is one of the steps of Normal Delivery Care (APN) and it is an intervention that must be undertaken (Kementerian Kesehatan Republik Indonesia, 2013), but the optimal time to do the clamping and cutting of the umbilical cord is still a controversy and it is still being discussed today (Winkler et al., 2022).

The active treatment involves clinicians to more actively intervene in Stage III, which includes uterotonic injection, umbilical cord clamping, controlled umbilical cord stretching and uterine massage after the baby is born. Active management of stage III here means cord clamping is undertaken immediately after the baby is born (Mercer, 2001). It means that after the baby is born, they will immediately clamp and cut the umbilical cord in the first one minute of the baby's birth (Rashwan et al., 2022).

WHO since 2012 recommends to undertake delayed cord clamping as part of the active management of stage III of labor at least 1-3 minutes after birth for all infants regardless of gestational age or fetal weight and it is not recommended to undertake immediate cord clamping (<1 minute) unless asphyxia occurs in the infant and requires immediate resuscitation (WHO, 2012).

Infants who have an apgar score with severe asphyxia category (0-3), who postponed the procedure for the umbilical cord until it does not pulsate, are able to drastically increase their apgar score to the category of mild asphyxia or fit infants (7-10) (Rendra et al., 2013). This increase of apgar score proves that the longer the delay of the procedure of the umbilical cord is undertaken, even until it does not pulsate, the better it will be, which results in the increase in hemoglobin in the baby's body (Hutchon, 2012). When the hemoglobin level in the baby's

body is quite plenty, then this hemoglobin will bind more oxygen so that it can help infants with asphyxia in their breathing adaptation (Rendra et al., 2013).

Post-partum bleeding is the main cause of maternal death in low-income countries and accounts for nearly a quarter of all maternal deaths globally. Post-partum bleeding which occurs during the first 24 hours after the delivery leads to the deaths (WHO, 2012).

According to Andersson et al., (2013), by waiting until the umbilical cord stops pulsating naturally can reduce the risk of bleeding. Riksani, (2012), stated that delayed cord clamping can reduce the risk of bleeding after giving birth although there are still few evidences to suggest that delayed cord clamping can reduce the risk of having heavy bleeding after giving birth.

Riksani, (2012), recommended to undertake clamping and cutting the umbilical cord that after the umbilical cord stops pulsating where the range of time is about 3-5 minutes after the baby is born, and early umbilical cord clamping is not recommended. According to the Indonesian Ministry of Health, (2013) cord clamping is undertaken 2 minutes after the baby is born (Kementerian Kesehatan Republik Indonesia, 2013). The delay in cutting the umbilical cord immediately after the baby is born is still a polemic in conducting midwifery care because standard delivery care requires immediate action to cut the umbilical cord when the baby has no complications besides that there is still little evidence base related to research on this procedure. There is no research directly related to the relationship between cutting the umbilical cord immediately with the APGAR score in newborns, and the relationship between cutting the umbilical cord and bleeding in postpartum mothers made researchers interested in doing this research. This study aimed to determine the relationship between delayed cord clamping and the apgar score in newborn infants in Bandar Lampung City in 2021.

2. RESEARCH METHOD

The type of research used in this study is quantitative research with a descriptive survey approach. The research was conducted in September - December 2021 at Praktik Mandiri Bidan (Independent Midwifery Practice) in Bandar Lampung.

The population in this study was all mothers in labor period stage II and IV in Bandar Lampung City, where a total of the average mother which will be giving birth in a month was 120 maternity mothers. *Purposive Sampling* was conducted. Measuring instruments used in the form of test instruments (closed-ended question) using digital scales and observation sheets to measure the weight *underpad* which the mother has used during the fourth stage of Labor, the apgar score and the length of the cutting umbilical cord duration. The stage of data collection including Observing the duration of *Delayed Cord Clamping*: As soon as the infants are delivered, it is placed on the mother's stomach or on the bed and covered with a dry and warm cloth. Injecting oxytocin to the mother Monitoring the release of the placenta from the uterine wall and allowing the placenta comes out without clamping intervention umbilical cord. Putting the placenta on the basket or placental container Replacing the mother's underpad with a new one, observing the stage IV (2 hours postpartum). Observing the umbilical cord cutting time, immediately after birth or <15 seconds and between 30-180 seconds Delayed Cord Clamping process, then write on the observation sheet. Conducting a post-test on the mother of stage IV by measuring the weight of the underpad used, measuring with the underpad on a digital scale after two hours postpartum, if underpad weight <250gram: no bleeding underpad weight \geq 250gram: bleeding. The process of calculating the amount of bleeding in the underpad in the normal state of the mother who does not experienced such pathological postpartum as postpartum seizures according to the inclusion criteria. Measuring the apgar score in newborns

This study has received ethical approval from the Health Research Ethics Committee of Tanjung Karang Health Polytechnic with Number No. 249 / KEPK-TJK/X / 2021. Data analysis was performed using univariate and bivariate (chi-square).

3. RESULTS AND DISCUSSION

Table 1. Frequency distribution of *Delayed Cord Clamping* duration in newborns.

Variable	Categories	f	%
Delayed Cord Clamping	DCC (duration \geq 120 seconds)	47	39.2
	No DCC (duration $<$ 120 seconds)	73	60.8

Table 1, it is known that 73 (60.8%) out of 120 respondents are in No DCC category (duration $<$ 120 seconds) and 47 (39.2%) out of 120 respondents are in DCC category (duration \geq 120 seconds).

Based on the result of the research, it is found 73 respondents (60.8%) out of 120 respondents did not go through the DCC process (duration $<$ 120 seconds). Immediate umbilical cord cutting is defined as cutting the umbilical right after birth or before one minute for a full-term baby and immediately cutting the umbilical cord for a premature baby (Wickham, 2006). Umbilical cord cutting that less than 15 seconds is categorized as immediate umbilical cord cutting (Setiawan, 2009).

Delayed clamping (or not clamping at all) is a physiological way of caring for the cord, and early clamping of the cord is an intervention that still requires further evidence (Utami et al., 2021). Based on the result of the research, it was found that 47 respondents (39.2%) went to the DCC process category (duration $>$ 120 seconds), it is because in Indonesia, the period to undertake umbilical cord cutting changes to 2 minutes after birth and after oxytocin is being given (Departemen Kesehatan Republik Indonesia, 2008). Currently, WHO or The World Health Organization stated "The optimal time to clamp the umbilical cord for all infants regardless of gestational age or fetal weight is when the circulation or pulsation in the umbilical cord has stopped, and the umbilical cord is flat and pulseless (30-60 minutes after delivery) and at the same time early initiation of breastfeeding in newborns is undertaken. Thus, based on this, it is seen that in normal births, the delay in umbilical cord clamping is done within $>$ 30 seconds, and there is a delay in umbilical cord clamping is because there are some opinions states that the umbilical cord clamping immediately after the baby is born can cause complications for the mother as well (Rahmawati, 2017). Some evidences prove that clamping the umbilical cord immediately after the baby is born increases the risk of postpartum hemorrhage and retention of the placenta by *engorging the placenta* with the baby's blood (Riksani, 2012). This makes it harder for the uterus to contract and release the placenta. For some women, feto-maternal bleeding may increase the probability of serious blood incompatibility problems (rhesus) in subsequent pregnancies (Mercer, 2001).

Table 2. Frequency distribution of Apgar score in newborns in *Delayed Cord Clamping* period

Variable	Categories	f	%
Apgar Score	Severe Asphyxia (0-3)	0	0
	Moderate Asphyxia (4-6)	4	3.3
	Mild Asphyxia / No Asphyxia (7-10)	116	96.7

Table 1 shows that 116 (6.7%) respondents are in mild asphyxia - no asphyxia category where the Apgar score is 7-10, and 4 respondents (3.3%) are in moderate asphyxia categories where the *Apgar score* is 4-6, and there is no baby in severe asphyxia category where the Apgar score is 0-3.

Based on the results, it was found that 116 (6.7%) out of 120 respondents are in the mild asphyxia - no asphyxia category where the Apgar score 7-10, and 4 respondents are in moderate

asphyxia category where the Apgar score 4-6, and there is no baby in severe asphyxia category where the Apgar Score 0-3.

Infants who have an apgar score with severe asphyxia category (0-3) who postponed the procedure for the umbilical cord until it does not pulsate, are able to drastically increase their apgar score to the category of mild asphyxia or fit infants (7-10). The increase of the apgar score proved that the longer the delay of doing the procedure of the umbilical cord is undertaken, even until it does not pulsate, the better it will be, which results in the increase in hemoglobin in the baby's body. When the hemoglobin level in the baby's body is quite plenty, then this hemoglobin will bind more oxygen so that it can help the infants with asphyxia in their breathing adaptation (Asisdiq et al., 2017).

According to researchers, 116 out of 120 infants which is in mild asphyxia category – no asphyxia with Apgar Score 7-10 and 4 (3.3%) respondents which is in moderate asphyxia category with Apgar Score 4-6, and no infants in severe asphyxia category with Apgar Score values 0-3 is in line with the theory that reveals that the delay of doing umbilical cord cutting could elevate the erythrocyte which was being transferred to the infants and it also led to the increase of hematocrit of newborn infants (Sundari, 2016). The method of cutting directly after the baby is born can remove the blood needed by the baby and cause the baby to lack blood which eventually causes anemia in the baby. Not caring for it properly can cause an extended discharge (Buwana et al., 2015). Hb and Ht levels had an important function in delivering oxygen during the transition from fetus to baby, and adequate levels of HB concentration in newborns would determine the level of oxygenation in the brain, so that early umbilical cord binding was considered not physiological and can harm the baby (McDonald et al., 2014). The delay in clamping and cutting the umbilical cord took more time in transferring blood from the placenta to the baby; in this case, this placental transfusion process will increase the baby's blood volume up to 30% (Purisch et al., 2019).

Table 3. Frequency distribution of the amount of blood from bleeding in Delayed Cord Clamping period

Variable	Categories	f	%
The amount of blood from bleeding	Bleeding \geq 250 grams	27	22.5
	No bleeding $<$ 250 grams	93	77.5

Based on the table 3, it is observed that 93 (77,5%) out of 120 respondents are in the category of $<$ 250 gram and 27 (22.5%) respondents are in the category of \geq 250gram.

According to Andersson, et al., (2013), by waiting until the umbilical cord stops pulsating naturally can reduce the risk of bleeding. Stated that delayed cord clamping can reduce the risk of bleeding after giving birth (Sundari, 2016). Even though there is still little evidence to suggest that delayed cord clamping can reduce the risk of heavy bleeding after giving birth.

According to the researchers, in this study, it was seen that mothers who applied delayed clamping of the umbilical cord did not experience postpartum bleeding. This can be seen in the mothers who did not bleed more when compared to those who experienced bleeding. The results of this study also found that mothers who experienced bleeding were mothers with parity who were at risk. This can be seen based on the known effects of 27 respondents who experienced bleeding \geq 250 grams, with parity at risk (1 and $>$ 3) as many as 15 people. This follows the theory which reveals that parity at risk is one of the factors that can influence the occurrence of bleeding in the mother during the delivery process. Postpartum hemorrhage compared to mothers who have parity \leq 3 times (Satriyandari, 2017).

High parity will have an impact on the health problems for both mothers and the newborn infants (Pradana, 2021). Repeated pregnancy and childbirth caused damage to blood vessels in the uterine wall and decreased flexibility (elasticity) of tissues that are repeatedly affected during pregnancy, thus they tend to cause abnormal placement or abnormal placental growth

and fetal growth which leads to giving birth to a baby with low birth weight (Pinontoan, & Tombokan, 2015)

According to researchers, the occurrence of bleeding with >250grams can also be caused by various factors such as, in this study, is a mother with a risk age (<20 years and >35 years) where there were 5 people found with this condition (Podungge, 2019). The ideal reproductive age is 20-35 years because at the age of 35 years of concomitant diseases such as hypertension and diabetes mellitus can affect fetal growth and development due to lack of food supply to the placenta. The age of 35 years is a risk factor that can cause complications during pregnancy and childbirth that can threaten the mother's life. The age of 35 years is associated with progressive damage to the endometrium that hinders the supply of nutrients to the placenta for fetal growth and development (Harry, 2010).

Table 4. The relation between *Delayed Cord Clamping* and Apgar Score in newborn infants.

Delayed Cord Clamping	Apgar Score				Total	<i>p-value</i>
	Moderate Asphyxia (4-6)		Mild Asphyxia / No Asphyxia (7-10)			
	n	%	n	%		
DCC (duration ≥ 120 seconds)	4	8.5	43	91.5	47	100
No DCC (duration <120 seconds)	0	0	73	100	73	100

Based on table 4, it is seen that 47 respondents go through the DCC process (duration ≥120 seconds) where 4 respondents (8.5%) are in the moderate asphyxia (4-6) category and 43 (91.5%) are in mild asphyxia/ no asphyxia category. 73 respondents do not go through the DCC process (duration <120 seconds) where 0 respondent is in moderate asphyxia and 73 (100%) respondents are in mild asphyxia / no asphyxia category. Based on the result of statistical test, in which p-value <0.05, it is 0.011, thus it can be concluded that there is a relation between *Delayed Cord Clamping* with Apgar Score in newborn infants in Bandar Lampung City in 2021.

There is a relation between *Delayed Cord Clamping* and Apgar Score in newborn infants in Bandar Lampung City in 2021. Apgar scores on the first and fifth minute of birth. The first-minute apgar score indicated the baby's tolerance to the birth process, and the next fifth-minute indicated the baby's adaptation to his new environment (Kementerian Kesehatan Republik Indonesia, 2022). If the apgar score was still below 7 then the baby needs resuscitation, then the assessment was conducted every five minutes until normal or age 20 minutes while normal infants have apgar values more than 7 (Winkler et al., 2022). The best time to perform umbilical cord cutting is still being discussed up until now by the experts. WHO recommends a clamping delay of between 60-120 seconds (Purisch et al., 2019). The debate about delaying umbilical cord cutting has been going on for a long time, the answer to the question of the best time to do clamping or delayed clamping is still uncertain since the experts are still discussing it (Panburana et al., 2020)

The delay in umbilical cord binding can increase the number of erythrocytes transfused into the baby's body and this is seen with an increase in hemoglobin and hematocrit levels in newborn infants (Cernadas, 2006). Hb and Ht levels have an important function in delivering oxygen during the transition from fetus to baby, and adequate levels of HB concentration in newborns will determine the level of oxygenation in the brain, so that early umbilical cord binding is considered not physiological and can harm the baby (Hutchon, 2012).

Another study stated that there was an effect of delaying cord clamping on Hb levels in BBL in the working area of Sipatana Health Center Gorontalo City. It can be seen from the levels of Hb in the delayed clamping category which was higher than those who got immediate clamping. This showed that the longer it takes the better it is in which it increases the amount of Hemoglobin and hematocrit in infants (Podungge, 2019). Delayed umbilical cord clamping and cutting gave more time in the process of transferring blood from the placenta to the baby and in this case the process of placental transfusion will increase the baby's blood volume up to 30%

Umbilical cord clamping undertaken 3 minutes after birth can increase HB and Ht levels that benefit the baby. The midwifery services in Indonesia refers to the policies on labour care guide that recommends to clamp and cut the umbilical cord after 2 minutes after labour. However, many midwifery and hospital still do the immediate umbilical cord clamping and cutting (less than 2 minutes) (Kohn, 2013), although delaying cord clamping has been shown to be beneficial for newborns. This shows the gap between the facts and the existing literature. This is due to not being socialized yet, and few scientific studies examine the positive and negative effects of delaying the umbilical cord cutting in newborns.

Various assumptions suggest that delayed cord clamping can increase polycythemia (Chaparro, 2011). Polycythemia is defined as an Ht level greater than 65% and occurs in about 2% -5% of full-term infants. Delayed clamping can increase the baby's hematocrit value because there is additional blood volume (Pong et al., 2022). The main concern with Polycythemia is related to blood hyperviscosity, which can increase bilirubin levels, but good blood flow allows the liver to process bilirubin more efficiently (Purisch et al., 2019).

For decades, various studies have shown that clamping the umbilical cord immediately after the baby is born will interfere with the normal physiology, anatomy and birth process. Dr. Mercer insisted the practice of immediate umbilical cord clamping is developed without considering the baby's needs and can cause the baby's blood volume to vary by 25% to 40% (Mercer, 2001). Whereas the immediate umbilical cord clamping can reduce the process of transition and contribute to hypovolemic damage, low blood volume, lack of oxygen and hypoxia in newborns, especially vulnerable infants (premature, asphyxia, LBW). This study is inseparable from limitations, where the sample taken is not homogeneous besides the small sample, so it does not represent the actual condition of postpartum mothers and newborns.

4. CONCLUSION

There is a relation between Delayed Cord Clamping and Apgar Score in newborn infants in Bandar Lampung City in 2021. In the process of childbirth, DCC action can be implemented but it is expected that the umbilical cord clamping can be undertaken immediately by looking at the condition of the infants. Further research is needed to see the influence of DCC with apgar score and bleeding incidence by considering confounding variables such as: maternal haemoglobin levels, parity, age, spasing, and time.

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