



## The Timing of Umbilical Cord Clamping and Its Effect on Maternal and Neonatal Outcomes in a Private Hospital, Bangkok, Thailand

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**Background:** The timing of umbilical cord clamping after birth is important to neonatal health, and immediate umbilical cord clamping may have negative effects on the newborn's health. In 2017, the American College of Obstetricians and Gynecologists recommended a delay in umbilical cord clamping in vigorous term and preterm infants for at least 30 to 60 seconds after birth.

**Objective:** To study the timing of umbilical cord clamping after birth and its effects on mothers and newborns in a private hospital.

**Methods:** The descriptive prospective observational study was conducted in the labor ward of a private hospital in Bangkok, Thailand. A total of 159 pregnant women were purposively recruited during August 1, 2017, to September 30, 2017. The time after the birth of the umbilical cord clamping was observed and recorded without the knowledge of the obstetricians. Data were analyzed using descriptive statistics.

**Results:** The mean time of the umbilical cord clamping was  $6.20 \pm 1.42$  seconds (range, 2 - 10 seconds) after the birth which was shorter than the recommendation. No significant association was found between variables and the timing of the umbilical cord clamping. No significant adverse neonatal condition was found.

**Conclusions:** This study found that time of umbilical cord clamping in a private hospital was shorter than the recommendation and no known side effect to newborns.

**Keywords:** Umbilical cord clamping, Maternal outcomes, Neonatal outcomes

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## Introduction

Before the mid-1950s, the term early umbilical cord clamping (UCC) was defined as clamping of the umbilical cord within one minute of birth and late clamping was that of more than 5 minutes after birth. In a series of small studies of the changes in the blood volume after birth, it was reported that volume of 80 to 100 mL of blood transfers from the placenta to the newborn occurred in the first 3 minutes after birth.<sup>1,2</sup> Because of these early observations and the lack of specific recommendations regarding optimal timing, the interval between the birth and umbilical cord clamping began to be shortened, and it became common practice to clamp the umbilical cord shortly after birth, usually within 15 to 20 seconds. However, more recent randomized controlled trials of term and preterm infants as well as physiologic studies of the blood volume, oxygenation, and arterial pressure have evaluated the effects of immediate versus delayed umbilical cord clamping (usually defined as cord clamping at least 30 to 60 seconds after birth).<sup>3,4</sup> Thus, delayed umbilical cord clamping has appeared to be beneficial for term and preterm infants. In term infants, delayed umbilical cord clamping increases the hemoglobin levels at birth and improves iron stores in the first several months of life, which may have a favorable effect on developmental outcomes. In preterm infants, the rates of intraventricular hemorrhage and necrotizing enterocolitis are lower, and fewer newborns require transfusion when delayed umbilical cord clamping is employed. This growing body of evidence has led to a number of professional organizations to recommend delayed umbilical cord clamping in term and preterm infants. For example, the American College of Obstetricians and Gynecologists (ACOG) has recommended deferring umbilical cord clamping for healthy term and preterm infants for at least 2 minutes after birth. Additionally,<sup>5</sup> the American College of Nurse-Midwives (ACNM) has suggested delayed umbilical cord clamping for term and preterm infants for 2 to 5 minutes after birth.<sup>6</sup> The universal implementation of delayed umbilical cord clamping has raised concern that this may impede the timely resuscitation efforts,

if needed, especially in preterm infants. However, because the placenta continues to perform gas exchange after delivery, sick and preterm infants are likely to benefit most from an additional volume of blood derived from continued placental transfusion. Another concern is that a delay in umbilical cord clamping could increase the potential for excessive placental transfusion. To date, the literature does not show any evidence of an increased risk of polycythemia or jaundice. However, in some studies, a slightly higher rate of jaundice was found to meet the criteria for phototherapy in term infants.

In 2014, the World Health Organization (WHO) recommended that the umbilical cord should not be clamped earlier than 1 minute after birth in term or preterm infants who do not require positive pressure ventilation.

Recently, Neonatal Resuscitation Program (NRP) guidelines from the American Academy of Pediatrics (AAP) has recommended delayed umbilical cord clamping for at least 30 to 60 seconds for most vigorous term and preterm infants.<sup>7</sup> In January 2017, the ACOG recommended a delay in umbilical cord clamping for at least 30 to 60 seconds after birth in vigorous term and preterm infants for the benefits to most newborns and in concordant with other professional organizations.<sup>5</sup>

It is interesting to study the practice of obstetricians, especially in a private hospital in Thailand whether they were aware of and practice according to the recommendation. This study aimed to explore time after birth of umbilical cord clamping in a private hospital and the effects of the timing on the health of mothers and newborns.

## Methods

### Participants

This prospective descriptive observational study included 159 mothers and newborns who were delivered in a delivery room in a private hospital in Bangkok, Thailand. They were purposively recruited, informed, and signed a consent form to join the study, which was conducted during August 4, 2017, to September 30, 2017.



## Ethics

The study was approved by the Human Research Ethics Committee of Faculty of Medicine Ramathibodi Hospital, Mahidol University (No. MURA2017/445 on August 3, 2017). The request letter from the Dean of the Faculty of Graduate Studies was sent to the Head of the Obstetricians and Gynecologists Department and Head of the Labor Ward at a private hospital for permission and cooperation for collection of the data. When mothers came into the delivery room, they were screened, informed, and asked to participate in the study by signing the consent forms.

## Data Collection

Pregnancy characteristics including age, para, gestational age, obstetrician, time of delivery, type of delivery, and neonatal outcome were collected. During delivery, the time of the umbilical cord clamping after birth was recorded by using a stopwatch without the awareness of obstetricians and pediatricians. After delivery, the mothers and newborns were followed-up, and their health status was recorded until they were discharged from hospital. Among 159 cases of delivery, there were 12 obstetricians delivered babies and 15 neonatologists took care of babies.

## Statistical Analysis

The SPSS version 18 (PASW Statistics for Windows, Version 18.0. Chicago: SPSS Inc; 2009) was used for analyzing the data. Descriptive statistic of percentage, mean, and standard deviation (SD) were applied to analyze the data.

## Results

The average time of the umbilical cord clamping was 6.20 seconds (median, 6.00; SD, 1.42) after birth. Most mothers were clamped at 7 seconds (27.67%) and 5 seconds (25.16%), respectively. Only 2 cases (1.26%) of newborns had their umbilical cord clamped at 10 seconds (Table 1).

The average age of mothers was 32.87 years (SD, 4.09). Most of them (76.73%) were aged 31 to 36 years, and nearly the same number again (56.60%) were primigravida.

The average gestational age at delivery was 38.3 weeks (SD, 0.87). Most mothers (48.43%) delivered at 38 weeks of gestation.

There were 12 obstetricians participating in this study without their awareness that they were observed. Most cases that 1 obstetrician delivered was 39 cases. The average number of years of practice of the obstetricians was 15.2 years (SD, 8.35). Most of them (53.46%) had practiced for 0 to 9 years. Fifty eight obstetricians (36.48%) had practiced for 20 to 29 years, whereas 11 obstetricians (6.92%) had practiced for 30 years or more. Eighty-five obstetricians (53.46%) were male. About two-thirds of the total number of mothers (66.04%) delivered their babies between 06.00 to 11.59 hours (day shift), and 17 cases (10.69%) delivered between 18.00 to 05.59 hours (night shift). Most mothers (80.50%) delivered by cesarean section.

Regarding the newborn's characteristics, a little over half of the total number (52.20%) were male and the average birth weight was 3078.48 g (SD, 355.42). However, half of them (49.69%) weighed 3000 to 3499 g. Only 5 newborns (3.15%) weighed less than 2500 g, and 11 newborns (6.92%) were admitted into the neonatal intensive care unit, most due to tachypnea (10 cases). One newborn was admitted into the neonatal intensive care unit because of early jaundice. All of newborns had transcutaneous bilirubinometry at 72 hours after birth, which resulted in the average level of bilirubin of 176.34  $\mu$ mol/L (SD, 42.59). A little more than half of them (52.83%) had a bilirubin level of 171.00 to 256.49  $\mu$ mol/L.

**Table 1. Number and Percentage of the Time of Umbilical Cord Clamping**

Time After Birth, s	No. (%)
4	19 (11.95)
5	40 (25.16)
6	28 (17.61)
7	44 (27.67)
8	20 (12.58)
9	6 (3.77)
10	2 (1.26)



Only 3 newborns (1.89%) had a bilirubin level greater than or equal to 256.50  $\mu\text{mol/L}$ . Moreover, only 36 newborns had their blood analysis with indications of pallor, fetal growth restriction (FGR), and gestational diabetes mellitus in the mother. The average hematocrit was 51.95% (SD, 8.24).

**Table 2. Maternal and Newborn Characteristics and Time Umbilical Cord Clamping**

Characteristic	No. (%)	Mean (SD)
Age of the mother, y		
21 - 30	37 (23.27)	6.27 (1.20)
31 - 36	122 (76.73)	6.18 (1.48)
Para		
Primigravida	90 (56.60)	6.16 (1.43)
1 - 3	69 (43.40)	6.26 (1.40)
Gestational age, wk		
37 - 38	102 (64.15)	6.31 (1.54)
39 - 41	57 (35.85)	6.00 (1.14)
Obstetricians		
AC	39 (24.53)	6.23 (1.48)
PP	33 (20.75)	6.09 (1.46)
YW	17 (10.69)	5.76 (1.39)
WH	14 (8.81)	7.00 (1.25)
AJ	12 (7.55)	5.92 (0.95)
AA	11 (6.92)	5.45 (1.23)
SS	10 (6.29)	6.50 (0.92)
CT	10 (6.29)	7.10 (1.22)
CH	7 (4.4)	6.29 (1.91)
SK	4 (2.52)	5.75 (0.43)
KW	1 (0.63)	5.00 (0)
WS	1 (0.63)	7.00 (0)
Obstetricians' years of practice, y		
0 - 9	85 (53.46)	6.35 (1.41)
10 - 19	5 (3.14)	5.60 (0.49)
20 - 29	58 (36.48)	6.17 (1.45)
$\geq 30$	11 (6.92)	5.45 (1.23)
Time of delivery		
Day shift	142 (89.31)	6.15 (1.41)
Night shift	17 (10.69)	6.65 (1.41)

Most of them (88.89%) had hematocrit greater than or equal to 45%, and only 4 newborns (11.12%) had hematocrit less than 45%. There was no significant association between the above factors and time of umbilical cord clamping (Table2).

**Table 2. Maternal and Newborn Characteristics and Time Umbilical Cord Clamping (Continued)**

Characteristic	No. (%)	Mean (SD)
Type of delivery		
Vaginal delivery	31 (19.50)	5.90 (1.03)
Cesarean section	128 (80.50)	6.27 (1.49)
Newborn's gender		
Male	83 (52.20)	6.05 (1.42)
Female	76 (47.80)	6.37 (1.39)
Birth weight, g		
< 2000	2 (1.26)	6.00 (1.00)
2000 - 2499	3 (1.89)	6.67 (1.70)
2500 - 2999	52 (32.70)	6.21 (1.51)
3000 - 3499	79 (49.69)	6.33 (1.34)
> 3500	23 (14.47)	5.70 (1.33)
Tachypnea		
No	149 (93.71)	6.18 (1.37)
Yes	10 (6.29)	6.50 (2.01)
Admitted into the neonatal intensive care unit		
No	148 (93.08)	6.17 (1.36)
Yes	11 (6.92)	6.64 (1.57)
Transcutaneous bilirubinometry, $\mu\text{mol/L}$		
$\leq 85.49$	5 (3.14)	123.15 (20.01)
85.50 - 170.99	67 (42.14)	105.36 (22.57)
171.00 - 256.49	84 (52.83)	105.53 (25.65)
$\geq 256.50$	3 (1.89)	108.27 (8.04)
Neonatal hematocrit (n = 36), %*		
25.00 - 34.99	2 (5.56)	8.00 (2.00)
35.00 - 44.99	2 (5.56)	8.00 (0)
45.00 - 54.99	15 (41.67)	6.40 (1.50)
$\geq 55.00$	17 (47.22)	5.71 (1.07)

Abbreviations: SD, standard deviation.

\* Hematocrit was determined in only 36 newborns of diabetic mothers, at 3 hours after birth, to evaluate risk of hyperbilirubinemia.



## Discussion

In this study, the average time of umbilical cord clamping was  $6.20 \pm 1.42$  seconds after birth which was very short compared with the recommendations. The results were against the recommendations of WHO, ACNW, and ACOG. They found that in term infants, delayed umbilical cord clamping had the benefits of increasing the hemoglobin levels at birth and improved the iron storage in the first several months of life, which may have a favorable effect on the developmental outcome. Among preterm infants, the rates of intraventricular hemorrhage and necrotizing enterocolitis were lower, and fewer newborns required a blood transfusion when delayed umbilical cord clamping was employed. This growing body of evidence has led these organizations to recommend delayed umbilical cord clamping in both term and preterm infants.

In the past, immediate cord clamping (< 15 seconds) was generally practiced.<sup>8</sup> This study showed that the practice had not been changed although several recommendations had been issued. It may be due to the fact that the updated knowledge had not been widely disseminated, or the obstetricians did not believe in it and did not change their practice.

Issuing a recommendation or a clinical practice guideline would be an appropriate way to improve the practice of physicians. Nowadays, physicians tend to practice according to the recommendations or guidelines. In Saudi Arabia, female doctors had a higher tendency to only follow guidelines when they were written and clearly documented. They also found that agreement of the delay time of umbilical cord clamping significantly depended on the gender of the obstetricians. Female obstetricians significantly agreed more with delayed umbilical cord clamping than male obstetricians. They postulated that female doctors tended to practice in accordance with a recommendation or clinical practice guideline than male doctors. This study found no significant difference in the timing of umbilical cord clamping when comparing characteristics of obstetricians.<sup>9</sup>

McDonald et al,<sup>4</sup> studied effect of timing of umbilical cord clamping of term infants on maternal and neonatal outcomes and found that hemoglobin concentration in infants at 24 to 48 hours was significantly lower in the early cord clamping group. This difference in hemoglobin concentration was not seen at subsequent assessments. However, improvement in iron stores appeared to persist, with infants in the early cord clamping over twice as likely to be iron deficient at 3 to 6 months compared with infants whose cord clamping was delayed (relative risk [RR] 2.65; 95% confidence interval [CI], 1.04 - 6.73). They also found that fewer infants in the early cord clamping group required phototherapy for jaundice than in the late cord clamping group (RR, 0.62; 95% CI, 0.41 - 0.96).

This study found that there was no significant difference in the rate of admitted into the neonatal intensive care unit, tachypnea, hemoglobin and hyperbilirubinemia, and time of umbilical cord clamping. It may be because the sample size and incidence of the complications were very small. The variation of time in both groups may be not large enough to show any differences. For the calculation of the sample size, the incidence of hyperbilirubinemia was used. In this study, the incidence of hyperbilirubinemia was measured by subcutaneous bilirubinemia ( $> 171.04 \mu\text{mol/L}$ ) was 54.72%. Hence, there was no significant difference in the bilirubin level and time of umbilical cord clamping.

To verify the effects of umbilical cord clamping on maternal and neonatal outcomes, a larger sample size and long-term follow up were needed. If possible, a randomized controlled trial should be used. However ethical issue should be considered.

## Conclusions

Time of umbilical cord clamping in the study was very short compared with the recommendations. The practice of obstetricians in a private hospital in Thailand was still not up-to-date. They clamped umbilical cord of newborn very early which was against the recommendations.



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# ระยะเวลาการหนีบตัดสายสะดื้อทารกแรกเกิดและผลต่อสุขภาพทารกแรกเกิดที่โรงพยาบาลเอกชนแห่งหนึ่งในกรุงเทพฯ ประเทศไทย

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**บทนำ:** ระยะเวลาหลังเกิดของการหนีบตัดสายสะดื้อ มีความสำคัญต่อสุขภาพของทารกแรกเกิด และหากหนีบตัดสายสะดื้อทันทีหลังเกิดอาจมีผลเสียต่อทารกแรกเกิดได้ ในปี ก.ศ. 2017 วิทยาลัยสูตินรีแพทย์แห่งสหรัฐอเมริกาแนะนำว่าควรหลีกหนีบตัดสายสะดื้อทารกแรกเกิดครบกำหนดที่ตีนตัวและทารกเกิดก่อนกำหนดเป็นเวลาไม่น้อยกว่า 30 - 60 วินาที หลังเกิด

**วัตถุประสงค์:** เพื่อศึกษาระยะเวลาการหนีบตัดสายสะดื้อทารกแรกเกิดและผลต่อมาตราและทารกแรกเกิดในโรงพยาบาลเอกชนแห่งหนึ่ง ในประเทศไทย

**วิธีการศึกษา:** การศึกษานี้เป็นการสังเกตเชิงพรรณนา โดยเก็บข้อมูลจากการดูแลและทารกแรกเกิดที่ห้องคลอด โรงพยาบาลเอกชนแห่งหนึ่ง ในประเทศไทย มาตรฐาน 159 คน ได้รับการคัดเลือกแบบเจาะจง ระหว่างวันที่ 1 เดือนสิงหาคม พ.ศ. 2560 ถึงวันที่ 30 เดือนกันยายน พ.ศ. 2560 เก็บข้อมูลโดยการสังเกตและบันทึกเวลาหลังเกิดของการหนีบตัดสายสะดื้อทารกแรกเกิด โดยที่สูติแพทย์ไม่ทราบการวิเคราะห์ข้อมูลใช้สติ๊กเกอร์ชี้งวดู

**ผลการศึกษา:** ระยะเวลาหลังเกิดของการหนีบตัดสายสะดื้อทารกแรกเกิดมีค่าเฉลี่ยเท่ากับ  $6.20 \pm 1.42$  วินาที (พิสัย 2 - 10 วินาที) โดยไม่พบว่ามีปัจจัยใดที่มีความสัมพันธ์อย่างมีนัยสำคัญกับเวลาหนีบตัดสายสะดื้อทารกแรกเกิด และระยะเวลาการหนีบตัดสายสะดื้อไม่มีผลเสียต่อทารกแรกเกิด

**สรุป:** ระยะเวลาการหนีบตัดสายสะดื้อทารกแรกเกิดในโรงพยาบาลเอกชนแห่งหนึ่ง สั้นมากเมื่อเปรียบเทียบกับคำแนะนำขององค์กรต่างๆ โดยไม่พบผลเสียต่อทารกแรกเกิด

**คำสำคัญ:** การหนีบตัดสายสะดื้อ ผลต่อมาตรา ผลต่อทารก

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