



THE EFFECT OF TOPICAL BREAST MILK APPLICATION ON UMBILICAL CORD SEPARATION TIME IN NEWBORNS AT WANGON I AND JATILAWANG COMMUNITY HEALTHCARE CENTERS

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Abstract

Background: Umbilical cord care is an essential component of neonatal care aimed at preventing infection and promoting the physiological separation of the umbilical cord. Breast milk contains various bioactive components, including lysozyme, lactoferrin, immunoglobulin A (IgA), and growth factors, which possess antimicrobial and anti-inflammatory properties and contribute to tissue healing. **Objective:** This study aimed to determine the effect of topical breast milk application on umbilical cord separation time in newborns at Wangon I and Jatilawang Community Healthcare Centers. **Methods:** This quantitative study employed a quasi-experimental approach using a post-test-only non-equivalent control group design. The study included 60 newborns selected through purposive sampling, consisting of 30 infants in the intervention group who received topical breast milk application and 30 infants in the control group who received open umbilical cord care. Univariate analysis was performed to describe the respondents' characteristics, while bivariate analysis was conducted using the Mann–Whitney test. **Results:** Most respondents were female (33 infants; 55%), and the majority had a birth weight of 3,001–3,500 grams (31 infants; 51.7%). In the intervention group, 17 infants (56.7%) experienced rapid umbilical cord separation, while 13 infants (43.3%) had normal separation. In the control group, 15 infants (50.0%) experienced normal umbilical cord separation, whereas 13 infants (43.3%) experienced delayed separation. The Mann–Whitney test yielded a p -value of 0.001 ($p < 0.05$), indicating a statistically significant effect of topical breast milk application on umbilical cord separation time. **Conclusion:** Topical application of breast milk has a significant effect on accelerating umbilical cord separation in newborns.

Keywords: Neonate, topical breast milk, umbilical cord care, umbilical cord separation time

INTRODUCTION

Efforts to reduce neonatal mortality require optimal strategies to improve the health of newborns. This urgency is based on global and regional phenomena; the World Health Organization (WHO) in 2019 recorded 581 infant deaths in Southeast Asia due to neonatal tetanus. On a national scale, the disparity in infant mortality (IMR) in Indonesia is clearly visible between West Papua Province (74/1,000 live births) as the region with the highest cases, and East Kalimantan (21/1,000 live births) as the lowest. Clinically, this newborn mortality is triggered by low birth weight (LBW) 34%, asphyxia (24%), infection (23%), prematurity (11%), and 8% from other causes. Regarding specific infections, neonatal tetanus infected 84 infants in 15 provinces in Indonesia in 2019 and claimed 54 lives. Risk factor analysis revealed inappropriate umbilical cord care, including the use of alcohol or iodine solutions (15 infants), traditional practices (32 infants), other factors (26 infants), and seven cases with unknown methods. Consequently, the case fatality rate (CFR) for this disease jumped to 64.3% in 2019, higher than the 53.8% recorded in 2017 (Kemenkes, 2020).

Newborns are particularly vulnerable to infection because their immune systems are not yet fully developed. One of the primary entry points for microorganisms during the neonatal period is the umbilical cord, which is still healing after being cut during delivery. If umbilical cord care is not performed properly, the risk of omphalitis, neonatal sepsis, and even death can increase. Therefore, effective umbilical cord care is crucial in reducing neonatal morbidity and mortality (Alemu et al., 2019). Various neonatal umbilical cord care techniques currently include the application of 70% alcohol, alcohol gauze, povidone iodine solution, breast milk (ASI), as well as conventional methods such as wrapping it with dry sterile gauze or leaving it open (Nabella Faizah et al., 2023).

According to WHO (2022), breast milk is "the ideal food for infants" which provides energy and essential nutrients for the first six months of life. Breast milk is a natural source

of nutrition containing various bioactive components, such as lysozyme, lactoferrin, secretory immunoglobulin A (IgA), cytokines, leukocytes, growth factors, and various antimicrobial compounds that have anti-inflammatory and antibacterial activities, as well as accelerating tissue regeneration. When applied topically to the umbilical cord, breast milk has the potential to accelerate the tissue drying process, inhibit the growth of pathogenic bacteria, and accelerate the separation of the umbilical cord without disturbing the normal flora around the umbilicus (Alemu et al., 2019).

Several studies have reported the benefits of using topical breast milk in umbilical cord care. Research by Alemu et al., (2019) showed that topical breast milk application accelerated umbilical cord separation compared to chlorhexidine and dry methods. Simanungkalit and Sintya reported that the IgA and lactoferrin content in breast milk can inhibit the colonization of bacteria that cause umbilical cord infections (Simanungkalit & Sintya, 2019). Abbaszadeh et al., that using breast milk topically in umbilical cord care resulted in a faster umbilical cord separation time compared to using chlorhexidine (Fatemeh Abbaszadeh, Zanab Hajizadeh, 2016). Liesmayani *et al.*, (2023) emphasized that breast milk contains various immunological components that support the tissue healing process and maintain the balance of normal microbiota in the umbilical cord. Harahap Fitri *et al.*, (2022) explained that faster umbilical cord separation has the potential to reduce the risk of infection, while still paying attention to hygiene principles, such as keeping the area around the umbilical cord clean and washing hands before and after umbilical cord care.

However, most previous studies were conducted outside Banyumas Regency or used different respondent characteristics. To date, there is limited research evaluating the effectiveness of topical breast milk application compared to open care methods in newborns in the Wangon I and Jatilawang Community Health Centers (Puskesmas). This research gap is the basis for this study and its novelty,

providing empirical evidence regarding the effectiveness of topical breast milk application in primary healthcare services with community characteristics.

This study aimed to analyze the effect of topical breast milk application on the time of umbilical cord separation in newborns in the Wangon I and Jatilawang Community Health Centers. The research hypothesis was that topical breast milk application had a greater effect on the time of umbilical cord separation in newborns compared to open care.

RESEARCH METHOD

This study employed a quantitative approach with a quasi-experimental design using a post-test only nonequivalent control group design. The aim of the study was to determine the effect of topical breast milk application on the timing of umbilical cord separation in newborns. The study was conducted in the Wangon I and Jatilawang Community Health Centers (Puskesmas) areas, Banyumas Regency, Central Java.

The study population consisted of all newborns in the Wangon 1 and Jatilawang Community Health Centers (Puskesmas) working areas during April-May 2026. The sample was selected using a purposive sampling technique based on inclusion and exclusion criteria established by the researcher. The sample consisted of 60 neonates divided into two groups: 30 infants in the case group and 30 infants in the control group. This study used daily observation sheet instruments (no, respondent's name, date of birth, time of birth, address, cell phone number, day, date, morning, afternoon) and worksheets (respondent's name, date of birth, address, telephone number of the baby's parents, gender, birth weight, gestational age, type of umbilical cord care (control and case groups), date of umbilical cord loss, and duration of umbilical cord detachment). Before the study began, the researcher obtained ethical clearance and a research permit from the relevant agencies. Next, coordination was conducted with the community health center midwife and the village midwife, who acted as

enumerators. Parents of infants who met the study criteria were provided with an explanation of the study's purpose, benefits, procedures, and respondent rights. After agreeing to participate in the study, parents signed an informed consent form.

In the case group, umbilical cord care was performed by applying two drops of breast milk to the base of the umbilical cord twice daily, in the morning and evening after bathing. Topical breast milk application began when the infant was approximately 2–24 hours after birth and continued daily until the umbilical cord fell off naturally. After application, the umbilical cord was left open for 5 minutes and kept clean and dry. In the control group, infants received dry cord care according to health service standards. Observations in the case group were conducted daily from the first day of birth until the umbilical cord fell off. Monitoring was carried out through home visits and communication using the WhatsApp application, with parents asked to send daily photos of the umbilical cord condition. In addition, parents completed daily observation sheets recording the time of care and the date of cord detachment. Researchers and enumerators verified the collected data to ensure completeness and accuracy.

The main variable observed was the duration of umbilical cord detachment, calculated from the day of birth until the cord spontaneously fell off and expressed in days. After all data was collected, editing, coding, data entry, cleaning, and tabulation were carried out using SPSS software (Hastono, 2022., Notoatmodjo, 2018).

Data analysis began with univariate analysis to describe the characteristics of the respondents. Before conducting bivariate analysis, a data normality test was conducted. Because the data was not normally distributed, the Mann–Whitney test was used with a significance level of 95% ($\alpha = 0.05$) to compare the average time for umbilical cord removal between the intervention group and the control group (Sugiyono, 2022). This research was conducted while still paying attention to the principles of research ethics (Hidayat, 2017).

RESULT

Table 1. Frequency Distribution of Newborn Characteristics by Sex at Wangon I and Jatilawang Community Health Centers

Gender	Case group		Control group		Total	
	f	%	f	%	f	%
Man	12	20	15	25	27	45
woman	18	30	15	25	33	55
Total	30	50	30	50	60	100

Source: Primary Data, 2026

Based on Table 1. above, it is known that the majority of respondents in the case group were female, namely 18 respondents (30%), and the control group had the same number of 15 respondents (25%).

Table 2. Frequency Distribution of Newborn Characteristics by Birth Weight at Wangon I and Jatilawang Community Health Centers

Birth weight	Case group		Control group		Total	
	f	%	f	%	f	%
2500-3000	14	23.3	11	18.3	25	41.7
3001-3500	15	25.0	16	26.7	31	51.7
3501-4000	1	1.7	3	5.0	4	6.7
Total	30	50	30	50	60	100

Source: Primary Data, 2026

Based on Table 2 above, it is known that in the case group, the majority of respondents had a birth weight of 3001-3500 grams, namely 15 respondents (25%), and in the control group, the majority had a birth weight of 3001-3500 grams, namely 16 respondents (26.7%).

Table 3. Frequency Distribution of Umbilical Cord Separation Time Among Newborns at Wangon I and Jatilawang Community Health Centers

Umbilical Cord Separation Time	Case group		Control group		Total	
	f	%	f	%	f	%
Early	17	28.3	2	3.3	19	31.6
Normal	13	21.7	15	25.0	28	46.7
Delayed	0	0	13	21.7	13	21.7
Total	30	50	30	50	60	100

Source: Primary Data, 2026

Table 3 shows that in the topical breast milk method group, the majority of infants experienced rapid cord detachment (17 infants (28.3%)), while in the open method

group, the majority were in the normal category (15 infants (25%)).

Table 4. Effect of Topical Breast Milk Application on Umbilical Cord Separation Time Among Newborns at Wangon I and Jatilawang Community Health Centers

Grup	f	Median	Minimum	Maximum	Mean rank	p-value
Case group	30	4.00	3	6	19.57	< 0.001
Control group	30	6.00	4	10	41.43	

The analysis results showed $p < 0.001$, which means the p value is smaller than the specified significance limit ($\alpha = 0.05$). The results of the Mann-Whitney test on the duration of detachment variable in the two sample groups showed a p-value of < 0.001 ($p < 0.05$), meaning there is an effect of the topical breast milk application method on the time of umbilical cord detachment.

DISCUSSIONS

Distribution of Newborn by Sex

Based on research on 60 respondents in the case group, the majority of respondents were female, namely 18 respondents (30%), and the control group had the same number of 15 respondents (25%). Gender is a biological characteristic that babies are born with. However, gender is not the primary factor influencing the umbilical cord shedding process. The umbilical cord shedding process is more influenced by the process of umbilical cord tissue necrosis, colonization by normal skin flora, the baby's immune system, umbilical cord care techniques, and the cleanliness of the environment where the baby is cared for. Based on the explanation above, umbilical cord shedding in both male and female babies is not influenced by gender (Kirk, A. H. P., Yang, J., Sim, W. C., Chia & Y. X., & Lau, 2019).

Distribution of Newborn by Birth Weight

Based on the research results, it was found that in the case group, the majority of respondents had a birth weight of 3001-3500 grams, namely 15 respondents (25%), and in

the control group, the majority had a birth weight of 3001-3500 grams, namely 16 respondents (26.7%). According to Kartikasari *et al.*, (2019), a baby's birth weight can affect the time it takes for the umbilical cord to separate. The reason is because the umbilical cord contains Wharton's Jelly, which keeps the cord moist. The drying of the umbilical cord is greatly influenced by the loss of water content in the gel. Therefore, the larger the umbilical cord, the longer it takes to fall off. Babies with high birth weight will have larger umbilical cords, which take longer to dry. Wharton's Jelly is a jelly-like substance that acts as a mucoid connective tissue. Loss of water The gel content in the fluid causes the umbilical cord to mummify soon after the baby is born.

Distribution of Umbilical Cord Separation Time

Based on the research results, in the topical breast milk method group, most babies experienced fast umbilical cord separation (17 babies (28.3%) and normal (13 babies (21.7%). Meanwhile, in the open method group, most babies were in the normal category (15 babies (25%) and slow (13 babies (21.7%). According to Nabella Faizah *et al.*, (2023), the speed of umbilical cord detachment in newborns is determined by multiple factors. Obstructions in this detachment are often triggered by the application of antiseptics, which risk killing local microorganisms around the umbilicus and suppressing the number of leukocytes crucial for lysing umbilical cord tissue. Other problems, such as infection, can also cause the umbilical cord to become moist, thus slowing tissue dehydration.

Furthermore, according to Harahap *et al.*, (2022), the duration of umbilical cord shedding is highly sensitive to the hygiene methods applied, humidity levels, sanitary cleanliness around the neonate, and the incidence of infection due to manipulation that does not meet sterile regulations. Medical management errors in this area result in delayed tissue shedding and the risk of further infection. The systemic impact of this

umbilical infection includes severe pathologies such as sepsis and meningitis that require further clinical intervention.

Effect of Topical Breast Milk Application on Umbilical Cord Separation Time

The results of this study indicate that infants who received topical breast milk umbilical cord care experienced faster umbilical cord separation than infants who received open care. Analysis using the Mann-Whitney test showed a statistically significant difference between the two groups ($p < 0.001$), thus topical breast milk application was proven effective in accelerating umbilical cord separation.

The results of this study are in line with the research of Simanungkalit & Sintya (2019), in their research showed that in umbilical cord care with topical breast milk, the duration of fast umbilical cord release was 13 babies (86.7%) whose umbilical cord release was fast and 2 babies (13.3%) whose umbilical cord release was normal. Also in line with the results of the study by Alemu *et al.*, (2019) the average duration of umbilical cord release in newborns in the breast milk group was 5 days shorter than the chlorhexidine group and 2 days shorter than the dry group only. This study is also in line with research conducted by Sari, F., Nurdianti, D.S., & Astuti., (2016), the treatment group was a group of babies who were given umbilical cord care with topical breast milk. The results showed that the average umbilical cord care using topical breast milk was 6.18 days and the average umbilical cord care with the dry technique was 7.14 days. The results of this study are also consistent with previous studies that reported that topical breastfeeding is a safe, easy-to-implement, and inexpensive method of umbilical cord care, and can accelerate cord separation compared to dry cord care. Therefore, topical breastfeeding has the potential to be an alternative umbilical cord care method that can be implemented in evidence-based midwifery practice.

These findings support the theory that breast milk contains various bioactive components, such as immunoglobulin A (IgA),

lysozyme, lactoferrin, leukocytes, and epidermal growth factor, which have antimicrobial and anti-inflammatory activities and can accelerate tissue regeneration. These components help protect the umbilical area from colonization by pathogenic bacteria while accelerating the mummification process and physiological shedding of the umbilical cord (Alemu et al., 2019). Breast milk contains various bioactive components, such as nutrients, immune factors, anti-allergic compounds, antibodies, and anti-inflammatory and antimicrobial components, including immunoglobulin A (IgA), lysozyme, lactoferrin, and leukocytes in high concentrations. Furthermore, breast milk contains proteins that play an important role in the tissue healing process. These proteins can interact with proteins in the umbilical cord, triggering an immune response and apoptosis, which support tissue repair. This mechanism contributes to the regeneration of damaged cells, accelerates wound healing, and accelerates the release of the umbilical cord. Therefore, breast milk can be used as a method of umbilical cord care because of its nutritional content and bioactive components that have immunological, anti-allergic, anti-inflammatory, and antimicrobial properties. These anti-inflammatory effects are primarily derived from the lysozyme enzyme contained in breast milk proteins, which works by destroying bacterial cell walls, thereby helping to protect the baby from infection (Susilawati & Ilma, 2022).

According to the theory proposed by Lawrence, R.A., & Lawrence., (2022), breast milk contains secretory IgA, which functions to protect mucosal and skin tissues from colonization by pathogenic microorganisms. Furthermore, lactoferrin in breast milk can bind iron ions, which are needed by bacteria for growth, thereby inhibiting bacterial proliferation in the umbilical cord area. The accelerated umbilical cord shedding in the topical breast milk group occurred because breast milk aided in the mummification (drying) of the umbilical cord tissue while protecting it from infection. In the group not given topical breast milk, the drying process relied solely on

the body's natural mechanisms, resulting in a longer shedding time. Furthermore, the absence of additional immunological properties resulted in a slower healing process compared to the breast milk group (Husaidah & Amru, 2025).

However, this study has several limitations. Researchers were unable to control for all factors that could potentially influence the timing of umbilical cord separation, such as environmental humidity, temperature, home cleanliness, maternal hygiene practices, and diaper change frequency. Furthermore, maternal compliance with breastfeeding could not be directly monitored at all times, as some monitoring was conducted through regular visits and WhatsApp. This study also only evaluated the timing of umbilical cord separation without assessing the incidence of infection, bacterial colonization, or microbiological tissue healing.

CONCLUSION

Based on the time of umbilical cord release in the case group in the fast category as many as 17 babies (28.3%) and the normal category as many as 13 babies (21.7%), while in the control group most were in the normal category as many as 15 babies (25%), the slow category as many as 13 babies (21.7%), and the fast category as many as 2 babies (3.3%). This study shows that topical breastfeeding has a significant effect on the time of umbilical cord release in newborns at the Wangon 1 and Jatilawang Health Centers, Banyumas Regency.

RECOMMENDATION

The results of this study are expected to provide a basis for health workers, particularly midwives, to educate postpartum mothers about the benefits and procedures for using topical breast milk as a safe and effective method of umbilical cord care. Community health centers can develop standard operating procedures (SOPs) for umbilical cord care in primary healthcare facilities. Furthermore, mothers and families are expected to implement topical breast milk umbilical cord care according to health

workers' instructions to support faster cord detachment and reduce the risk of infection. For educational institutions, the results of this study can serve as a scientific reference in learning about evidence-based midwifery practices for newborn care. It is recommended that further research use a randomized controlled trial design with a larger sample size and involve multiple healthcare facilities to improve the generalizability of the results. In addition to evaluating the timing of cord removal, future research should also assess the incidence of umbilical cord infection, bacterial colonization, maternal compliance with care procedures, and the effectiveness of topical breastfeeding in various infant groups, including low birth weight and preterm infants.

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