

THE EFFECT OF WARM BETEL LEAF COMPRESSES ON REDUCING BREAST PAIN CAUSED BY BREAST ENGORGEMENT AMONG

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ABSTRAK

Latar Belakang : Bendungan ASI merupakan salah satu masalah yang sering dialami ibu nifas akibat pengosongan payudara yang tidak optimal sehingga menyebabkan pembengkakan, rasa tidak nyaman, dan nyeri payudara. Nyeri akibat bendungan ASI dapat mengganggu proses menyusui dan berpengaruh terhadap keberhasilan pemberian ASI eksklusif. Oleh karena itu, diperlukan penatalaksanaan yang tepat dan aman, salah satunya melalui pendekatan nonfarmakologis berupa kompres hangat daun sirih.

Tujuan : Penelitian ini bertujuan untuk mengetahui pengaruh kompres hangat daun sirih terhadap penurunan nyeri payudara akibat bendungan ASI pada ibu nifas di Wilayah Kerja Puskesmas Kelapa Kabupaten Bangka Barat Tahun 2026.

Metode : Penelitian ini menggunakan desain quasi experimental dengan pendekatan one group pretest-posttest design. Teknik pengambilan sampel menggunakan total sampling dengan jumlah 31 responden. Untuk waktu pemberian terapi kompres hangat daun sirih yaitu sebelum ibu menyusui, terutama saat ibu merasa payudara penuh atau nyeri. Tingkat nyeri payudara diukur menggunakan Numeric Rating Scale (NRS) sebelum dan sesudah intervensi. Sehingga terdapat pengaruh kompres hangat daun sirih terhadap penurunan nyeri payudara akibat bendungan ASI pada ibu nifas.

Hasil : Analisis data menggunakan Wilcoxon Signed Rank Test. Hasil uji Wilcoxon diperoleh $p < 0,001$ sehingga Kompres hangat daun sirih berpengaruh dalam menurunkan nyeri payudara akibat bendungan ASI.

Kesimpulan : Kompres Hangat Daun Sirih berpengaruh dalam menurunkan nyeri payudara akibat bendungan ASI.

Saran : Disarankan agar bidan berperan aktif dalam memberikan edukasi tentang kompres hangat daun sirih kepada ibu nifas.

Kata Kunci : Bendungan ASI, Ibu Nifas, Kompres Hangat Daun Sirih, Nyeri Payudara

ABSTRACT

Background : Breast engorgement is a common issue experienced by postpartum mothers due to suboptimal breast emptying, resulting in swelling, discomfort, and breast pain. The pain associated with engorgement can interfere with breastfeeding and impact the success of exclusive breastfeeding. Therefore, appropriate and safe management is required; one such method is a non-pharmacological approach using warm betel leaf compresses

Objective : This study aims to determine the effect of warm betel leaf compresses on the reduction of breast pain caused by breast engorgement in postpartum mothers within the working area of the Kelapa Community Health Center, West Bangka Regency, in 2026.

Methods : This study employed a quasi-experimental design using a one-group pretest-posttest approach. A total sampling technique was used, involving 31 respondents. The warm betel leaf compress therapy was administered prior to breastfeeding, particularly when the mothers experienced breast fullness or pain. Breast pain levels were measured using the Numeric Rating Scale (NRS) before and after the intervention. The findings indicate that warm betel leaf compresses have an effect on reducing breast pain caused by breast engorgement in postpartum mothers.

Result : The test yielded a p-value of 0.000 (<0.05), demonstrating that warm betel leaf compresses have a significant effect on reducing breast pain caused by breast engorgement.

Conclusion : Warm betel leaf compresses are effective in reducing breast pain caused by breast engorgement.

Suggestion : It is recommended that midwives play an active role in educating postpartum mothers about the use of warm betel leaf compresses.

Keyword : Breast Engorgement, Postpartum Mothers, Warm Betel Leaf Compress, Breast Pain

INTRODUCTION

The postpartum period is a crucial time for mothers to recover from childbirth while adapting to their new role in breastfeeding. One common issue experienced during this time is breast engorgement—a condition characterized by breast swelling due to the accumulation of milk that has not been adequately expressed. Symptoms include a sensation of fullness, as well as breasts that feel hard, taut, swollen, and painful. This condition causes discomfort, hinders the breastfeeding process, and makes it difficult for the mother to nurse her baby. If not managed properly, breast engorgement can increase the risk of developing further breastfeeding complications.

Breast engorgement is a condition characterized by swelling of the breasts resulting from suboptimal milk removal, which leads to impaired drainage within the breast tissues or ducts; the condition manifests as a sensation of fullness, hardness, and tension, accompanied by pain and potentially an elevated body temperature. If not promptly managed, this condition can disrupt the breastfeeding process and compromise breast health in the postpartum period, necessitating appropriate intervention to prevent further complications (Kusumaningsih, 2023).

Based on research conducted by (Solihah et al., 2023) shows that breast milk dams still often occur in postpartum mothers and are influenced by several factors, such as breastfeeding frequency, early breastfeeding initiation (IMD), and breast care. The research involving 58 respondents of postpartum mothers in the work area of the Cikalong Health Center, Tasikmalaya Regency, found that the frequency of breastfeeding and breast care had a significant relationship with the occurrence of breast milk dams.

In addition, research conducted by (Heryani et al., 2024) shows that breast milk dams are still a problem that is often experienced by postpartum mothers. The research involving 35 respondents of postpartum mothers found that the factors of knowledge, age, education, and breastfeeding techniques played a role in the occurrence of the breast milk dam. Most of the respondents experienced breast milk dam due to imperfect breast emptying and lack of knowledge about correct breastfeeding techniques.

This condition shows that the breast milk dam is still a problem that requires proper attention and handling to prevent the obstruction of exclusive breastfeeding and the occurrence of further complications. Considering that breastfeeding mothers must avoid the risk of transferring the active substance of the drug to the baby through breast milk, the treatment of breast pain generally prioritizes a non-pharmacological approach. This approach focuses on physical therapy and complementary therapy (Septiani et al., 2022).

One of the non-pharmacological approaches in overcoming breast swelling in postpartum mothers is the use of herbal compresses. Plants that are often used are betel leaves because they contain bioactive compounds such as flavonoids, polyphenols, saponins, tannins, and essential oils that act as anti-inflammatory, antibacterial, and help reduce breast pain and swelling. The administration of betel leaf compresses has been proven to have a positive effect in reducing the level of breast swelling in postpartum mothers gradually and significantly (Rihani et al., 2025).

Previous research has proven this potential such as (Jamilah et al., 2024) showing that green betel leaf compresses are effective in reducing swelling and moderate breast pain intensity in breastfeeding mothers. In addition, (Karina, 2021) also shows the effect of red betel leaf on swelling reduction, even comparative research (Rofi'ah et al., 2021) that compares red betel nut and cabbage, although giving varied results, still emphasizes the role of betel leaf as a valid complementary therapy. Thus, the management of breast pain using non-pharmacological therapy is important to know because this condition can affect the success of breastfeeding.

The World Health Organization (WHO) recommends giving exclusive Mother's Milk (ASI) for the first six months of a baby's life. This recommendation is supported by strong evidence of its benefits for reducing infant morbidity and mortality. The practice of exclusive breast milk is still facing major challenges, although awareness

of the importance of breast milk increases, many mothers stop breastfeeding prematurely. One of the main physiological obstacles that is often reported is breast problems, especially pain and swelling (World Health Organization, 2024).

Breastfeeding problems and breast pain in postpartum mothers are still an important concern in efforts to improve the health of mothers and children. Globally, from around 130 million babies born every year, but in 2024 only 44% or around 57 million babies aged 0-6 months receive exclusive breast milk, far below the 2030 target with a figure of 80% and a minimum of 70%. This figure has the potential to prevent more than 820,000 child deaths per year if achieved, which also makes exclusive breast milk the top priority of WHO and UNICEF (World Health Organization, 2024).

Based on the 2024 Indonesian Mother and Child Health Profile published by (Central Statistics Agency, 2024), it is recorded that the percentage of babies aged 0–5 months who receive exclusive breast milk reaches 74,73%, experiencing an increase from 2023 by 73,97%. However, there are still about a quarter of babies in Indonesia who do not receive exclusive breast milk according to the recommendations of WHO (Central Statistics Agency, 2024).

According to data from the Bangka Belitung Islands Provincial Health Office (2024) regarding the scope of exclusive breastfeeding in the Bangka Belitung Islands, which reached (69,2%), there was an increase compared to 2023 (66,20%), but the number was still below the target (80%). Meanwhile, the highest exclusive breastfeeding coverage in Bangka Belitung Province is in Bangka Regency (83,2%), while the lowest exclusive breastfeeding coverage is in West Bangka Regency (64,5%) (Bangka Belitung Health Profile, 2024)

Based on data from the West Bangka Regency Health Office in (2025) Kelapa District is one of the areas with the lowest exclusive breast milk coverage which is only (62,14%). The low coverage of exclusive breast milk shows that there are still problems in the breastfeeding process in postpartum mothers in Kelapa District such as the production of milk that is not smooth, breast milk dams, and breast pain can affect the success of exclusive breastfeeding.

Based on a preliminary study conducted by researchers at the Kelapa Health Center at 09.00 Western Indonesia Time on January 5, 2026 showed that there were 13 postpartum mothers who did not experience smooth breast milk and 8 of them experienced breast milk dams and did not know the benefits of warm compressing betel leaves as one of the treatments for breast milk dams. Based on the urgency of the problem of breast pain in postpartum mothers and the great potential of warm thermotherapy synergy with analgesic-anti-inflammatory effects from betel leaves, therefore this research needs to be carried out with the title "The Effect of Sirih Leaf Warm Compress on Breast Pain Due to Breast Milk Dams in Mothers in Pastoral at Kelapa Puskesmas Puskesmas Barat Bangka Regency"

RESEARCH METHODS

This research is a quantitative study with a quasi experimental design using one group pretest-posttest design which was carried out in the working area of the Kelapa Health Center, West Bangka Regency in 2026. The research aims to find out the effect of warm compresses of betel leaves on the reduction of breast pain due to breast milk dams in postpartum mothers. The independent variable in this study is a warm compress of betel leaf, while the dependent variable is the level of breast pain due to breast milk dam.

The study population consisted of all postpartum mothers experiencing breast engorgement due to milk stasis within the working area of the Kelapa Community Health Center (Puskesmas), West Bangka Regency, between July 18 and August 20, 2026, totaling 31 respondents. The sample comprised these 31 respondents, selected using a total sampling technique based on specific inclusion and exclusion criteria. The respondents were mothers experiencing milk stasis who consented to participate and signed an informed consent form. The study utilized primary data obtained through observation and the use of a Numeric Rating Scale (NRS). Breast pain levels were measured before (pre-test) and after (post-test) the administration of a warm betel leaf compress intervention. The warm betel leaf compress therapy was applied prior to breastfeeding and whenever the breasts felt full or painful, using a temperature of 43–46°C for 3 minutes before breastfeeding, repeated three times daily for two days.

Data analysis is carried out univariately and bivariately. Bivariate analysis using the Wilcoxon Signed-Rank Test because the pain level data is ordinal and carried out in two pairs of measurements, namely before and after the intervention. The meaning level used is 95% ($\alpha = 0,05$). If the p value is ≤ 0.05 , then there is an effect of a warm compress of betel leaf on the reduction of breast pain due to breast milk dams in postpartum mothers.

Ethic and Participant Protection

Ethical approval was obtained from the Health Research Ethics Committee of Citra Internasional Institute, Bangka Belitung, Indonesia, No. 010/KEPK/ICI/XIII/2026, dated July 18, 2026. Participant recruitment and data collection commenced only after ethical approval had been issued and continued through July 2026. Before enrollment, each participant received an explanation of the study purpose, procedures, potential benefits, voluntary participant, confidentiality, and the right to withdraw. Written informed consent was obtained from all participants before participation.

RESEARCH RESULTS

Univariable

Table 1

Frequency Distribution of the Age of Mothers in Labour in the Work Area of Kelapa Health Centre Bangka Regency West Year 2026

Age	Frequency	Percentage (%)
18 – 23 Years old	7	22,6
24 – 29 Years old	13	41,9
30 – 35 Years old	8	25,8
36 – 41 Years old	3	9,7

Based on Table 1, it is known that most postpartum mothers are in the age group of 24–29 years, which is as many as 13 people (41,9%). Furthermore, the age group of 30–35 years old totalled 8 people (25,8%), followed by the age group of 18–23 years old as many as 7 people (22,6%). Meanwhile, the least number of respondents was in the age group of 36–41 years old, which was 3 people (9,7%). The results show that the majority of postpartum mothers who were respondents in this study were in the age range of 24–29 years.

Table 2

Frequency Distribution of Education of Mothers in the Work Area of Kelapa Health Centre West Bangka Regency Year 2026

Education	Frequency	Percentage (%)
Elementary school	4	12,9
Junior High school	10	32,3
Senior High school	13	41,9
S1	4	12,9

Based on Table 2, it is known that most postpartum mothers have a high school education level, which is as many as 13 people (41,9%). Furthermore, there are 10 postpartum mothers with junior high school education (32,3%), while elementary and undergraduate education is 4 people (12,9%) respectively. The results show that the majority of respondents in this study have a high school education level, while the proportion of respondents with elementary and undergraduate education is the least.

Table 3

Frequency Distribution of Work of Mrs. Nifas in the Working Area of Kelapa Health Centre, West Bangka Regency in 2026

Work	Frequency	Percentage (%)
IRT	17	54,8
Farmer	10	32,3
Honorary	2	6,5
Civil Servants	2	6,5

Based on Table 3, it is known that most postpartum mothers work as Housewives (IRT), which is as many as 17 people (54,8%). Furthermore, the respondents who work as farmers totalled 10 people (32,3%), while the

respondents who worked as honours and Civil Servants (PNS) each totalled 2 people (6.5%). The results show that the majority of mothers in this study work as Housewives (IRT), while the number of respondents who work as honorary and civil servants is the least.

Table 4
Frequency Distribution of Breast Pain Due to Breast Milk Dam Before Giving Warm Compress of Betel Leaf (Pre-Test)

Pain Level Category	Frequency	Percentage (%)
No pain(0)	0	0
Mild pain (1-3)	7	22,6
Moderate pain (4-6)	23	74,2
Severe pain (7-10)	1	3,2

Based on Table 4, it is known that before being given a warm compress of betel leaf (pre-test), most postpartum mothers experienced moderate pain, namely as many as 23 people (74,2%). Furthermore, as many as 7 people (22,6%) experienced mild pain, while 1 person (3,2%) experienced severe pain. There are no respondents who are in the painless category (0%). The results show that before the intervention, the majority of postpartum mothers experience breast pain due to breast milk dams with a moderate level of pain.

Table 5
Frequency Distribution of Breast Pain Due to Breast Milk Dam After Administration Warm Compress of Betel Leaf (Post-Test)

Pain Level Category	Frequency	Percentage (%)
No pain (0)	24	77,4
Mild pain (1-3)	7	22,6
Moderate pain (4-6)	0	0
Severe pain (7-10)	0	0

Based on Table 5, it is known that after being given a warm compress of betel leaf (post-test), most postpartum mothers are in the painless category, which is as many as 24 people (77,4%). Meanwhile, as many as 7 people (22,6%) still experienced mild pain, and there were no respondents who experienced moderate or severe pain (0%). The results showed that after giving a warm compress of betel leaf, there was a decrease in breast pain due to breast milk dams, which was characterised by the majority of respondents being in the painless category and no more respondents experienced moderate or severe pain.

Bivariate Analysis

Table 6

	Statistic	Df	sig
Breast pain level before (pre-test)	0,906	31	0,010
Breast pain level after (post-test)	0,519	31	0,000

Shapiro-Wilk Data Normality Test

Based on Table 6, the results of the normality test using Shapiro-Wilk show that the p-value (Sig.) in the pre-test data is $0.010 < 0.05$ and the post-test value is $0.000 < 0.05$. Thus it can be concluded that pre-test and post-test data are not normally distributed. Therefore, bivariate analysis in this study uses a nonparametric test, namely the Wilcoxon Signed Rank Test.

Analysis of Wilcoxon Signed Rank Test data using significance level (α) 0.05. The basis for decision making in this study is that if a value is obtained, then it is rejected and accepted, which shows that there is an effect of giving a betel leaf warm compress on the reduction of breast pain due to breast milk dams in postpartum mothers. On the other hand, if the value is , then it is accepted and rejected, which means that there is no effect of giving a warm compress of betel leaf on the reduction of breast pain due to breast milk dams in postpartum mothers. The results of bivariate analysis are presented in the following table.

Table 7
Wilcoxon Signed Rank Test Hypothesis Test

	Posttest-Pretest
N	31
Positive Ranks	0
Ties	0
Negative Ranks	31
Z	-4,984
Nilai P-Value	0,000

Based on Table 7, the results of the Wilcoxon Signed Rank Test showed that the negative ranks were 31, which means that all respondents experienced a decrease in breast pain levels after giving a warm compress of betel leaf. Meanwhile, the positive ranks are 0, which indicates that there are no respondents who experience an increase in pain levels, and ties are also 0, which means that there are no respondents with fixed pain levels before and after the intervention. The result of the statistical test obtained a value of $Z = -4,984$ with $p\text{-value} = 0.000$. Because of the value, it is rejected and accepted, so it can be concluded that there is an effect of giving a warm compress of betel leaf on the reduction of breast pain due to breast milk dams in postpartum mothers in the work area of the Kelapa Health Center, West Bangka Regency in 2026.

DISCUSSION

Based on the research results, it is known that the majority of postpartum mothers in the Kelapa Puskesmas Work Area of West Bangka Regency in 2026 are in the age group of 24–29 years, namely 13 respondents (41,9%). The age group includes a healthy reproductive age so that physiologically the reproductive organs and lactation function have developed optimally. However, breast milk dam can still occur if breast milk is not released optimally, the frequency of breastfeeding is less, or the baby's attachment is not right. This is in accordance with the opinion (Kardini et al., 2025; I. Oktaviani et al., 2022) who stated that the breast milk dam is more influenced by the process of emptying the breast and the success of breastfeeding than the mother's age. Thus, age is not the main factor in the occurrence of the breast milk dam.

Based on education level, most of the respondents have a high school education as many as 13 respondents (41,9%). Education level plays a role in making it easier for someone to receive and understand health information, including breastfeeding techniques, breast care, and breast milk dam prevention. According to (Anjalina & Kasanah, 2024), mothers with higher education tend to be more likely to receive health education, but breast milk dams can still occur if lactation management has not been carried out optimally. Therefore, education about the correct breastfeeding techniques needs to be given to all mothers in parter regardless of education level.

Based on work, most of the respondents are housewives as many as 17 respondents (54,8%). As a housewife, respondents have more opportunities to breastfeed directly. However, breast milk dam can still occur if the baby does not breastfeed effectively, the frequency of breastfeeding is less, or the breast is not completely emptied. This shows that work is not the main factor in the cause of breast milk dams, but is influenced by breastfeeding practices and lactation management carried out by mothers.

The research results showed that before being given a warm compress of betel leaf (pre-test), most of the respondents experienced moderate pain as many as 23 respondents (74,2%), while 7 respondents (22,6%) experienced mild pain and 1 respondent (3,2%) experienced severe pain. The high level of pain before the intervention shows that the breast milk dam causes the accumulation of milk in the breast so that the breast becomes swollen, hard, tense, and painful. This condition is in accordance with the theory put forward by (Suryanti et al., 2022), which states that the breast milk dam occurs due to the accumulation of breast milk that is not immediately released so that it increases the pressure on the breast tissue and causes pain.

After being given a warm compress of betel leaf (post-test), there is a significant change in the level of pain. Most of the respondents are in the painless category as many as 24 respondents (77,4%), while 7 respondents (22,6%) are in the mild pain category. There are no more respondents who experience moderate or severe pain. The results show that giving a warm compress of betel leaf can reduce the intensity of breast pain caused by breast milk dams in postpartum mothers.

Based on the Wilcoxon Signed Rank Test results, the value of $Z = -4,984$ with $p\text{-value} = 0,000 < 0,05$ was obtained. In addition, negative ranks were obtained as many as 31 respondents, positive ranks as many as 0 respondents, and ties as many as 0 respondents. This shows that all respondents experienced a decrease in pain levels after being given a warm compress of betel leaf, there were no respondents who experienced an increase in pain or did not experience any change. Thus, it was rejected and accepted so that it can be concluded that there is an effect of warm compresses of betel leaf on the reduction of breast pain due to breast milk dams in postpartum mothers in the Kelapa Health Center Work Area of West Bangka Regency in 2026.

The results of this study are in line with the research (Maulani & Nababan, 2022) which shows that the administration of green betel leaf compresses (*Piper betle* L.) combined with breast care is more effective in reducing breast swelling compared to breast care alone. The content of essential oils, flavonoids, and active compounds in betel leaf plays an anti-inflammatory role that helps reduce swelling, smoothes blood circulation, and increases mother's comfort during breastfeeding. The findings support the results of this study that a warm compress of betel leaf is effective in reducing complaints caused by breast milk dams, including reducing breast pain.

The results of this study are also in line with the study (Dewi et al., 2025) which shows that the administration of red betel leaf compresses has a significant effect on the reduction of breast milk dams with $p\text{-value} = 0,000$. After the intervention, most of the respondents no longer experienced symptoms of breast milk dam so red betel leaf compresses were recommended as non-pharmacological therapy. Research (Rihani et al., 2025). also proves that red betel leaf compresses have a significant effect in reducing breast swelling due to breast milk dams in postpartum mothers. The study indicates that betel leaf compresses are effective in reducing swelling and increasing the smooth delivery of breast milk so that breast milk dam complaints gradually decrease. The results of these studies strengthen the findings of this study that a warm compress of betel leaf is effective as a non-pharmacological therapy to reduce pain caused by breast milk dams.

This research is also supported by (Shoulhuna et al., 2025) which states that warm compresses are non-pharmacological therapies that are effective in overcoming breast milk dams. The effect of heat given can cause vasodilation of blood vessels, increase blood circulation, stimulate the let-down reflex, facilitate the production of breast milk, and reduce swelling and pain in the breasts. Thus, giving a warm compress can increase the mother's comfort during the breastfeeding process. The findings are in line with the results of this study which shows a decrease in breast pain after giving a warm compress of betel leaf.

In addition, research (Winarya et al., 2025) shows that warm compresses are effective in reducing pain caused by breast milk dams in postpartum mothers. The study explains that warm compresses can reduce the pain scale and increase the comfort of the mother during the postpartum period. These results further reinforce that heat therapy is one of the effective nonpharmacological interventions in overcoming the breast milk dam.

Based on the results of research, theory, and previous research, researchers argue that a warm compress of betel leaf is an effective, safe, easy, and economical non-pharmacological intervention to reduce breast pain caused by breast milk dams in postpartum mothers. The heat effect of the compress helps increase blood flow, stimulates the reflex of breast milk output, and reduces breast tissue tension, while the bioactive content of betel leaves such as essential oils, flavonoids, and tannins act as anti-inflammatory and natural analgesics that help reduce swelling and pain. Therefore, a warm compress of betel leaf can be recommended as one of the accompanying therapies that can be applied independently by postpartum mothers to help overcome breast milk dams and increase comfort during breastfeeding.

A limitation of this study is the absence of a comparison or control group, as a one-group pretest-posttest design was employed. Consequently, the reduction in breast pain levels following the application of warm betel leaf compresses could only be assessed by comparing the respondents' conditions before and after the intervention. It cannot be definitively concluded that the observed changes in pain levels were solely attributable to the warm betel leaf compresses, as other factors—such as the natural resolution of breast engorgement, breastfeeding frequency, and individual respondent characteristics—may have played a role. Therefore, the findings must be interpreted with caution and cannot be directly compared against a group that did not receive the intervention. Future studies should incorporate a control or comparison group to provide more robust evidence regarding the intervention's effects.

CONCLUSION

The study results indicate that warm betel leaf compresses bring about a change in the level of breast pain caused by breast engorgement in postpartum mothers. Prior to the intervention, the majority of respondents (23 individuals or 74.2%) experienced moderate pain, whereas following the intervention, the majority (24 individuals

or 77.4%) fell into the "no pain" category. Wilcoxon test results showed that all respondents experienced a reduction in pain levels after the intervention, with a Z-value of -4.984 and a p-value of 0.000. These findings support previous research indicating that warm compresses and the use of betel leaves can help alleviate symptoms of breast engorgement and breast pain in postpartum mothers.

SUGGESTION

It is recommended that midwives provide education, especially postpartum mothers can take advantage of Warm compress of betel leaf as one of the alternative therapies Nonpharmacological that is easy, safe, and economical to help Reduce breast pain due to breast milk dam. In addition, the community Expected to increase knowledge and skills regarding How to handle the breast milk dam so that the breastfeeding process can Take place more comfortably and support success Exclusive breastfeeding.

DECLARATIONS

Ethics Approval and Informed Consent

Ethical approval was obtained from the Health Research Ethics Committee of Citra Internasional Institute, Bangka Belitung, Indonesia, No. 010/KEPK/ICI/XIII/2026, dated July 18, 2026. Participant recruitment and data collection commenced only after ethical approval had been issued and continued through July 2026. Before enrollment, each participant received an explanation of the study purpose, procedures, potential benefits, voluntary participant, confidentiality, and the right to withdraw. Written informed consent was obtained from all participants before participation.

Author Contributions

Nesi Fattika contributed to conceptualization, methodology, data collection, data analysis, interpretation of the findings, and preparation of the original manuscript. Marleni contributed to supervision, methodological guidance, interpretation of the findings, and critical manuscript review. All authors read and approved the final version of the manuscript.

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Conflict of Interest

The authors declare that there is no conflict of interest related to this study.

Artificial Intelligence Declaration

Generative artificial intelligence (OpenAI ChatGPT) was used solely to support English-language editing, consistency checking, structural organization, and manuscript formatting during the revision process. All AI-assisted outputs were reviewed and verified by the authors. The authors remain fully responsible for the accuracy, originality, integrity, and final content of the manuscript.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to applicable ethical, privacy, and confidentiality requirements.

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