MEDISAINS
Jurnal Ilmiah Ilmu - Ilmu Kesehatan

Original Article

Topical *Jatropha multifida* L. ointment improves perineal wound healing in postpartum mothers: a randomized controlled trial

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ARTICLE INFORMATION

Received: June 11, 2025
Revised: March 13, 2026
Accepted: March 26, 2026

KEYWORDS

Coral Plant; Plant Extracts; Postpartum Period; Wound Healing

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A B S T R A C T

Background: Postpartum perineal wound care may lead to infection if not managed properly. *Jatropha multifida* L. contains various secondary metabolites that may accelerate wound healing; however, clinical evidence remains limited.

Objective: This study aimed to evaluate the effectiveness of *Jatropha multifida* L. extract ointment compared with standard clean and dry wound care in promoting perineal wound healing.

Methods: This was a true experimental study with a pre–posttest control group design. A total of 60 postpartum mothers with second-degree perineal lacerations were randomly assigned into three groups: control, 15% extract, and 20% extract. The interventions were applied twice daily for 7 days. Wound healing was assessed on days 3, 5, and 7 using the REEDA (Redness, Edema, Ecchymosis, Discharge, Approximation) score.

Results: The Friedman test showed a significant reduction in REEDA scores across all groups ($p < 0.001$). The greatest decrease was observed in the 15% concentration group (mean = 0.4). Cohen's d indicated a very large effect size ($d = 1.835$).

Conclusions: *Jatropha multifida* L. extract ointment at a 15% concentration was effective in improving perineal wound healing in postpartum mothers.

INTRODUCTION

The postpartum period is defined as the phase beginning after the expulsion of the placenta and continuing until the reproductive organs return to their pre-pregnancy condition.[1] During this period, perineal lacerations are among the most common complications following vaginal delivery. Global epidemiological estimates indicate that approximately 2.7 million cases of perineal trauma occur annually, with Indonesia reporting a 5% incidence of suture wound infection.[2] These infections contribute substantially to maternal morbidity and have been associated with at least 86 maternal deaths.[3]

At the regional level, infection-related maternal mortality in Central Java accounts for 5.5% of cases, with reports from Semarang documenting perineal wound infections in 2023.[4] Local data from a preliminary study conducted at Gunungpati Health Center (June 2024) identified one maternal death attributed to perineal wound infection and 12 cases of delayed wound healing characterized by persistent moisture and prolonged recovery duration. These findings highlight ongoing challenges in postpartum wound management and underscore the importance of timely and effective healing to prevent complications and improve maternal outcomes.

Perineal laceration refers to a tear involving the skin and underlying muscle between the vaginal introitus and the anus, typically resulting from childbirth trauma.[5] Standard management of second-degree perineal wounds involves clean and dry wound care combined with education on personal hygiene practices. However, conventional approaches may not always provide optimal healing outcomes, necessitating the exploration of complementary therapeutic strategies.[6]

n recent years, plant-based therapies have gained attention as potential alternatives or adjuncts in wound management. Several medicinal plants, including binahong, green betel (*Piper betle*), and renggak leaves, have been investigated for their wound-healing properties. However, some limitations have been reported. For example, green betel leaf extract combined with antibiotics demonstrated smaller inhibition zones compared to antibiotics alone.[7] These

https://doi.org/10.30595/medisains.v24i1.26811

findings suggest that not all herbal interventions provide synergistic antimicrobial effects when used alongside standard treatments.

One plant with promising therapeutic potential is Jatropha multifida L., commonly known as the coral plant, a member of the Euphorbiaceae family. Experimental studies have demonstrated its efficacy in accelerating wound healing. A 15% coral plant extract cream significantly improved wound closure in animal models within nine days,[8] and a 15% gel formulation was reported to be more effective than 5% and 10% concentrations.[9] However, current evidence remains largely confined to animal studies and non-ointment formulations.

Importantly, clinical evidence evaluating the effectiveness of *Jatropha multifida* L. extract in human subjects, particularly for postpartum perineal wound healing, remains limited. Moreover, ointment-based formulations—which may provide prolonged skin contact and enhanced absorption—have not been adequately investigated. Therefore, this study aimed to evaluate the effectiveness of 15% and 20% Jatropha multifida leaf and stem extract ointment in promoting perineal wound healing in postpartum mothers.

METHOD

Study Design

This study employed a true experimental design with a pre–posttest control group approach.[10]

Setting and Respondent

The study was conducted at Gunungpati and Mijen Health Centers, Semarang, over a two-month period (December 2024 to January 2025). The study population consisted of postpartum mothers with second-degree perineal lacerations who had undergone suturing. A total of 60 participants were randomly assigned into three groups: 15% extract, 20% extract, and control (n = 20 per group). Inclusion criteria included postpartum mothers with spontaneous vaginal delivery and second-degree perineal lacerations (including episiotomy) across all parity levels. Exclusion criteria included mothers with delivery complications or postpartum complications. Participants were selected using simple random sampling.

Outcome Measures

Perineal wound healing was assessed as the primary outcome using the REEDA (Redness, Edema, Ecchymosis, Discharge, Approximation) scoring system. A standardized REEDA score sheet was used to evaluate wound healing status. Assessments were conducted on days 1, 3, 5, and 7 postpartum. A score of 0 indicated optimal wound healing, scores of 1–5 indicated mild impairment, and scores >5 indicated poor wound healing.

Experimental Procedure

Participants in the 15% and 20% extract groups applied *Jatropha multifida* L. ointment twice daily for 7 consecutive days following morning and evening hygiene routines. The control group received standard care consisting of clean and dry wound management.

Preparation of Extract and Ointment

Extraction of Plant Material

Extraction was performed using the maceration method. A total of 2000 g of fresh leaves and stems were washed under running water, air-dried, cut into small pieces, and oven-dried at 60°C for 24 hours. The dried material had a moisture content of 1.2% (<10%) and yielded 520 g, which was then powdered. Subsequently, 500 g of the powder was macerated in 5 L of 70% ethanol, stirred for 10 minutes, and left for 72 hours. The mixture was then filtered, and the filtrate was concentrated using a rotary evaporator to obtain the extract.

Ointment Formulation

All materials were prepared prior to formulation to ensure consistency. *Jatropha multifida* L. extract (leaves and stems) was used at 37.5 g (15%) and 50 g (20%), combined with white petrolatum (Vaseline album; 212 g and 199.5 g, respectively) and Nipasol (0.5 g) as a preservative in both formulations. All ingredients except Nipasol were mixed in a mortar until homogeneous. Nipasol was dissolved in a small amount of heated white petrolatum, then incorporated into the mixture, and further mixed until uniform. The ointment containers were washed, dried, and sterilized with alcohol before filling. The formulated ointments were evaluated for quality, including organoleptic properties, pH, homogeneity, viscosity, adhesion, spreadability, and irritation.

Data Analysis

The Friedman test was used to assess changes in wound healing across days 1, 3, 5, and 7. Differences between groups were analyzed using the Kruskal–Wallis test. Pairwise comparisons were performed to identify specific group differences. Effect size was calculated using Cohen's d.

Ethical Consideration

This study was approved by the Ethics Committee of Poltekkes Kemenkes Semarang (No. 1346/EA/F.XXIII.38/2024).

RESULTS

Figure 1 shows the formulation of Jatropha multifida L. extract ointment. Each container had a net weight of 10 g and contained either 15% or 20% extract of Jatropha multifida leaves and stems.

Table 1. Differences in REEDA Scores Across Observation Days

Observation	15% Concentration	20% Concentration	Control	*p-value*[b]
Day 1	10.50 ± 1.395	10.80 ± 1.795	10.65 ± 1.348	<0.001
Day 3	5.50 ± 1.504	6.15 ± 1.182	7.90 ± 1.210	
Day 5	2.25 ± 1.118	2.85 ± 1.089	3.80 ± 1.322	
Day 7	0.40 ± 0.503	0.80 ± 0.951	2.10 ± 1.210	
p-value[a]	<0.001	<0.001	<0.001	

[a] Friedman test; [b] Kruskal–Wallis tes

Figure 1. *Jatropha multifida* L. Extract Ointment

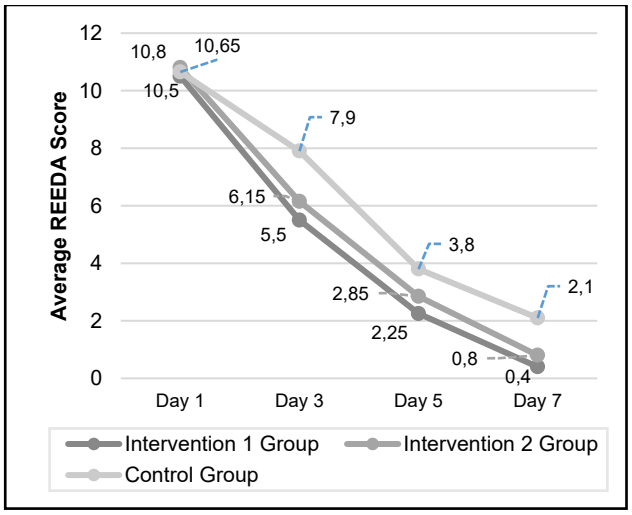

Figure 2. Average Of Wound Healing Stage Based on REEDA Score

Changes in REEDA Scores Over Time

Table 1 presents the comparison of REEDA scores across the three groups over the observation period. At baseline (day 1), the mean REEDA scores were comparable among the groups. Over time, all groups demonstrated a progressive decrease in REEDA scores. However, the reduction was more pronounced in the 15% concentration group, followed by the 20% concentration group, while the control group showed a slower rate of improvement. Figure 2 illustrates the trend of perineal wound healing based on REEDA scores across the three groups over time. A consistent downward pattern is observed across all groups, with a steeper decline in the 15% concentration group than in the 20% concentration and control groups.

Effect Size of the Intervention

Table 2 shows the comparison of final REEDA scores and effect sizes across groups. The 15% concentration group had the lowest mean REEDA score, indicating better wound-healing outcomes than the 20% concentration and control groups. Based on Cohen's d analysis, both intervention groups showed large effect sizes, with the 15% concentration demonstrating a very large effect (d = 1.835), indicating a substantial clinical impact.

Table 2. REEDA Score Comparison and Effect Size Across Groups

Groups	Mean ± SD	Cohen's d
15% concentration	0.40 ± 0.503	1.835
20% concentration	0.80 ± 0.951	1.195
Control	2.10 ± 1.210	–

DISCUSSION

This study demonstrated that Jatropha multifida L. extract ointment at concentrations of 15% and 20% was effective in promoting perineal wound healing in postpartum mothers, with the 15% concentration showing superior effectiveness. Higher concentrations were not necessarily associated with better outcomes, as excessive levels may disrupt the balance between active compounds and the ointment base, thereby affecting formulation stability and therapeutic efficacy.[11-14]

These findings are consistent with previous studies indicating that a 15% extract provides optimal wound healing compared to higher concentrations and standard treatments, while higher concentrations may increase the risk of irritation, such as redness.[15-17] In the present study, the 15% formulation also demonstrated better physical stability, whereas the 20% ointment tended to melt more easily, potentially reducing its effectiveness.

The observed effectiveness of the intervention compared to standard clean-and-dry wound care aligns with previous findings that a 15% extract gel significantly improved wound healing compared to lower concentrations. Other studies have also reported that topical formulations of *Jatropha multifida* extract accelerate wound closure.[18] The therapeutic effects of this extract are attributed to its bioactive compounds, including alkaloids, flavonoids, tannins, saponins, phenolics, and glycosides, which exhibit antimicrobial and anti-inflammatory properties.[19]

Supporting evidence indicates that the extract exerts anti-inflammatory effects, as demonstrated by reduced leukocyte and monocyte levels comparable to hydrocortisone treatment. Furthermore, it has been shown to reduce fibrin formation and enhance collagen synthesis, both of which are essential for wound repair.[20] Antioxidant activity also contributes to reducing oxidative stress and promoting tissue regeneration.[21] In addition, specific active

compounds exhibit antibacterial activity through interactions with microbial targets, supporting their role in infection control during wound healing.[22]

The reduction in REEDA scores observed in the intervention groups reflects improved wound healing and can be explained by the physiological phases of tissue repair. During the inflammatory phase, bioactive compounds help suppress excessive inflammation. In the proliferative phase, they promote angiogenesis, fibroblast proliferation, and epithelialization. In the maturation phase, they support collagen remodeling and tissue strengthening, thereby enhancing overall healing outcomes.[23,24]

The use of an ointment formulation with a hydrocarbon base may also have contributed to the effectiveness of the intervention. Such formulations enhance drug absorption, maintain adequate wound hydration, and prolong contact time between active compounds and tissue.[25,26] This optimal wound environment facilitates granulation, epithelialization, and tissue repair, while reducing the risk of infection and excessive scar formation.

This study has several limitations. Quantitative analysis of metabolite content was not performed, and stability testing to determine shelf life was not conducted. Additionally, nutritional status, which may influence wound healing, was not assessed. Future studies are recommended to address these limitations, optimize formulation stability, and further investigate the clinical efficacy and safety of *Jatropha multifida* L. ointment.

CONCLUSIONS AND RECOMMENDATION

Jatropha multifida L. extract ointment at concentrations of 15% and 20%, applied twice daily for 7 days, was effective in promoting perineal wound healing compared to standard clean and dry wound care. The 15% concentration demonstrated greater effectiveness. Further studies are recommended to optimize the formulation, particularly to improve extract quality and product stability, and to evaluate additional aspects such as antimicrobial activity and hypoallergenic potential. Future research should also consider controlling confounding factors that may influence wound healing outcomes.

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