



Original Article

# Potential of turmeric (*Curcuma Longa* Linn.) extract gel in the healing of perineal lacerations

Nurul Hidayah <sup>1✉</sup>, Supriyana <sup>1</sup>, Donny Kristanto Mulyantoro <sup>2</sup>

<sup>1</sup> Postgraduate Program in Applied Health, Poltekkes Kemenkes Semarang, Central Java, Indonesia

<sup>2</sup> National Research and Innovation Agency, Central Java, Indonesia

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## CORRESPONDENCE

Phone: +6285722291118  
 E-mail: nurulh.nh19@gmail.com

## ABSTRACT

**Background:** A perineal tear affects around 85% of women who give birth vaginally. Previous animal research has demonstrated the beneficial effects of turmeric extract gel on wound healing, which speeds up the process of repairing wounded tissue. However, since this research is only in vivo, more studies and clinical trials are required to evaluate the efficacy of using turmeric extract gel to treat perineal lacerations.

**Purpose:** To analyze the potential of turmeric extract gel (*Curcuma Longa* Linn.) in reducing REEDA score and IL-6 levels in postpartum women.

**Method:** This is a quasi-experiment study with pretest–posttest with control group design. The study respondents comprised 20 people in the intervention group who were given turmeric extract gel and amoxicillin and 20 in the control group who were given amoxicillin for seven days. Measurement of wound healing using the REEDA score while IL-6 levels using ELISA. Data analysis of used Friedman and Wilcoxon tests.

**Results:** There was a significant decrease in the intervention group's REEDA score and IL-6 levels ( $p < 0.05$ ). There was a significant difference in the average decrease in REEDA score and IL-6 levels between the two groups ( $p < 0.05$ ). The administration of turmeric extract gel led to faster wound healing for two days compared to the control group, which was only given standard treatment.

**Conclusion:** Turmeric extract gel can reduce REEDA score and IL-6 levels.

## INTRODUCTION

More than 85% of women who give birth vaginally will experience some perineal tear.<sup>1</sup> Perineal tears, especially severe ones, are a significant cause of morbidity.<sup>2,3</sup> Globally, there were 2.7 million cases of perineal rupture in 2020; this number is projected to rise to 6.3 million cases by 2050.<sup>4</sup> In 2020, 83% of vaginally delivering women in Indonesia experienced a perineal rupture; 63% of these cases were the result of an episiotomy, and 38% were the result of spontaneous tearing.<sup>5</sup>

The presence of perineal lacerations in the mother can cause infection, pain, and discomfort for the mother during the puerperium.<sup>6</sup> Poor perineal laceration wound care can slow wound healing and cause complications during the puerperium.<sup>7</sup> Long-term physical and psychological issues such as fecal incontinence, dyspareunia or urinary issues,

and persistent perineal pain can result from perineal trauma.<sup>1</sup>

Various cells, cytokines, and factors control wound healing.<sup>8</sup> Interleukin-6 in wound healing is a pleiotropic cytokine involved in the growth and differentiation of various cell types. Low IL-6 levels have a significant effect in shortening the duration of the inflammatory process, thereby accelerating wound healing.<sup>9</sup> A previous study stated that superficial skin wounds treated with wound ointments showed a significant increase in wound healing with earlier onset of re-epithelialization, faster wound closure, and better cosmetic results.<sup>10</sup> If the wound is kept hydrated with a moisture-holding dressing, it can increase the migration of epidermal cells, promote epithelialization, and reduce scarring.<sup>11</sup>

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Several non-pharmacological treatments using herbal plants have been carried out, including the use of decoction of binahong leaves with the result that healing occurs on days 6-7, the use of aloe vera gel with the results of research on wound healing occurring on day seven and complete healing on day 10, the use of turmeric infusion with the results of research on wound healing occurred on the fifth day.<sup>12-14</sup>

Based on several previous studies, the fastest healing of perineal lacerations occurred on day five using turmeric compared to binahong leaves and aloe vera.<sup>12-14</sup> Researchers want to develop turmeric to heal perineal wounds in postpartum mothers. Since curcumin functions in multiple healing phases, including inflammation, proliferation, and maturation phases, it is known to have an influential role in wound healing when applied topically. This enhances the wound-healing process overall.<sup>15</sup> Molecule curcumin found in turmeric rhizome has been shown in a previous study to have anti-inflammatory and antioxidant properties.<sup>16</sup>

Turmeric extract gel showed a significant difference between groups of rats treated with turmeric extract gel compared to controls on wound healing ( $p < 0.05$ ).<sup>17</sup> Another study found that, on average, wound healing took 6.25 days in the group of postpartum who were given turmeric and tamarind drinks, compared to 8.57 days in the control group ( $p < 0.05$ ).<sup>18</sup> There has been no research on the effects of turmeric extract gel on the healing of perineal wounds during the postpartum period, according to the findings of various earlier studies on turmeric extract gel formulations conducted on experimental animals. This study analyzes the potential of turmeric extract gel in reducing REEDA score and IL-6 levels in postpartum women.

## METHOD

### *Study Desain*

This is a quasi-experimental study with a pre-post control group design.<sup>19</sup>

### *Setting and Respondent*

This research was conducted at the Rajagaluh Health Center, Leuwimunding Health Center, and Sindangwangi Health Center in May 2023. The population in this study were postpartum women with second-degree perineal lacerations. The number of samples in the study was 40 people divided into two groups, namely 20 samples from the intervention group and 20 samples from the control group randomly.<sup>20,21</sup> The inclusion criteria were postpartum mothers aged 20-35 years, mothers with hemoglobin levels of 11-15 g/dL, and mothers with a BMI of 18.5-25.0. Exclusion criteria were postpartum women with a history of complications and severe or accompanying diseases

such as hypertension, anemia, infection, diabetes mellitus, heart, kidney, and tuberculosis.

### *Making Turmeric Extract Gel*

The formulation for turmeric gel is based on previous research.<sup>22</sup> The manufacture and testing of turmeric extract gel was carried out at the Cendekia Nanotech Hutama (CNH) Laboratory Semarang with the assistance of a pharmacist. The initial stage of making turmeric extract gel is simplicia extraction using the maceration method. Turmeric simplicia powder is put into a glass jar, and 96% ethanol is added. In the maceration process, turmeric is soaked in 96% ethanol at room temperature for three days, stirring every day for 5 minutes. Then, it was filtered using filter paper no. 60. The filtered filtrate was concentrated using a vacuum rotary evaporator at a temperature of 45-50°C with a pressure of 0.08 MPa until it was constant and thickened.<sup>22</sup>

The process of making a gel, namely aquadest, is heated to a temperature of 40-50°C for 3-5 minutes, then added to a gelling agent (Na. CMC) until it expands to form a gel, added DMDM Hydantoin 0.1% as a preservative then stirred until homogeneous, added 5% glycerin and 5% propylene glycol was then stirred again until homogeneous, then homogenized using a homogenizer to form a homogeneous gel base. A turmeric extract concentration of 5% was added to the gel base that had been prepared and then homogenized. The gel that has been made is put in a closed container.<sup>22</sup>

Before being given to the respondents, several quality tests of the turmeric extract gel preparation were carried out. Evaluation included descriptive phytochemical tests, curcumin tests, viscosity tests, pH analysis, organoleptic, homogeneity, spreadability, adhesion, and irritation tests.<sup>23</sup> Based on several evaluations that have been carried out, turmeric extract gel has good gel physical parameters, so it is safe to use by research respondents. Furthermore, 20 tubes containing 25 grams of 5% turmeric extract gel were packed.

### *Experimental Procedure*

The intervention group was given turmeric extract gel covering the perineal suture wound area three times a day and standard care. In comparison, the control group was only given standard care (antibiotics three times a day for seven days and treatment of perineal laceration wounds with vulva hygiene).

### *Variables, Instruments, and Measurements*

The variables measured in this study were REEDA score at the pretest (day 1) before getting the intervention and posttest (day 3, 5, and 7), and Interleukin-6 was measured using an ELISA at the pretest (day 1) first before getting intervention and posttest (day 7).

**Data Analysis**

The Friedman, Mann Whitney, and Wilcoxon test were used to see the difference in REEDA score and Interleukin-6 between the intervention and control groups.<sup>24</sup>

**Ethical Consideration**

This research has passed the ethical test conducted by the Semarang Ministry of Health Poltekkes Ethics Commission with number No.0495/EA/KEPK/2023.

**RESULTS**

Figure 1 is an example of a 5% turmeric extract gel packaging containing 25 grams. Based on the test results, there was 19.290 mg/g of curcumin. Table 1 shows that there was a significant reduction in the healing rate of perineal lacerations ( $p < 0.05$ ) at the 4 measurement times between the intervention group and the control group. The intervention group lowered the REEDA Score more with a decrease of 11.80 compared to the control group which reduced the REEDA Score by 7.30. Table 2 shows the difference in average IL-6 levels between the intervention and control groups ( $p < 0.05$ ). After giving the treatment, the measurement results on the seventh day showed a significant decrease in the intervention group (5.58 pg/mL), which was lower than the control group (9.06 pg/mL).



**Figure 1.** Turmeric Extract Gel

**Table 1.** The Differences in REEDA Score (n=40)

Observation	Intervention Group	Control Group	p-value
Day 1	12.0±1.252	11.40±1.63	0.117 <sup>b</sup>
Day 3	5.60±2.01	8.95±1.63	0.000 <sup>b</sup>
Day 5	2.35±1.49	6.50±2.14	0.000 <sup>b</sup>
Day 7	0.35±0.58	4.10±1.44	0.000 <sup>b</sup>
Δ	11.80±1.05	7.30±2.20	0.000 <sup>b</sup>
p-value	0.000 <sup>a</sup>	0.000 <sup>a</sup>	

<sup>a</sup>Friedman Test; <sup>b</sup>Mann-Whitney Test

**Table 2.** The Differences in Interleukin-6 Levels (n=40)

Observation	Intervention Group	Control Group	p-value
Day 1	24.81±21.30	10.10±6.95	0.008 <sup>b</sup>
Day 7	5.58±6.14	9.06±10.10	0.323 <sup>b</sup>
Δ	19.23±21.53	1.04±8.96	0.001 <sup>b</sup>
p-value	0.000 <sup>a</sup>	0.469 <sup>a</sup>	

<sup>a</sup>Wilcoxon Test; <sup>b</sup>Mann-Whitney Test

**DISCUSSION**

The results of this study indicate that the administration of turmeric extract gel can improve wound healing marked by a decrease in the REEDA score and interleukin-6 levels after seven days of treatment. There was a sharp decrease in IL-6 levels in the intervention group because the administration of turmeric extract gel was able to increase the effectiveness of pharmacological drugs by achieving the target of healing in the inflammatory process more quickly due to the synergistic effect of the pharmacological drug amoxicillin, so the REEDA score on day 3 showed there is a difference in the mean score of REEDA. Curcumin exerts anti-inflammatory effects by regulating inflammatory signaling pathways and inhibiting the production of inflammatory mediators. Curcumin bonds with Toll-like receptors (TLRs) and set Nuclear Factor Kappa-B (NF-κB) and other signaling pathways.<sup>25-27</sup>

IL-6 on the first day can be detected because IL-6 is an inflammatory mediator that consistently appears after surgery, acute trauma, and infection; it only takes a few hours after the wound that several growth factors and proinflammatory cytokines are released into the wound area such as IL-6, TNF-α, and IL-6 to activate neutrophils to migrate through the endothelial cells into the blood capillary walls towards the wound area, resulting in a deposit of fibrin matrix as the beginning of the wound closure process. The presence of IL-6 on day 7 in the wound healing process is due to the proliferative phase on days 7-14, which is a phase that still requires IL-6 as a receptor to stimulate keratinocytes, which play a role in wound healing.<sup>28,29</sup>

Production interleukin-6 and tumor necrosis factor-alpha are two essential cytokines produced by monocytes and macrophages that regulate the inflammatory response, which can be decreased by curcumin. The capacity of curcumin to block the activity of NF-κB (nuclear factor kappa-activated B-cell light chain enhancer), a transcription factor involved in the initiation of inflammatory reactions, was also significant. Curcumin modulates various pathways associated with NF-κB, PI3K, and IKK activation.<sup>30</sup>

Curcumin may directly inhibit the assembly of NLRP3 inflammasome or inhibit activation of NLRP3 inflammasome by inhibition of NF-κB pathway, which is one of the mechanisms curcumin for anti-inflammatory.<sup>31,32</sup> In inflamma-

tory cell and animal studies, curcumin lower levels of pro-inflammatory mediators such as Interleukin-1 (IL-1), IL-1 $\beta$ , IL-6, IL-8, IL-17, IL-27, and Tumor Necrosis Factor- $\alpha$  (TNF- $\alpha$ ). The regulatory effect of curcumin on immune cells helps treat inflammation.<sup>33,34</sup>

Curcumin works at each overlapping wound healing stage in previous research. Lymphocytes, monocytes, mast cells, neutrophils, and macrophages, as well as other physiological and molecular cells involved in inflammatory processes, can be modulated by curcumin. Besides promoting collagen production, fibroblast migration, and differentiation, curcumin contains anti-inflammatory and antioxidant characteristics that can reduce the expression of proinflammatory cytokines and shorten the inflammatory phase.<sup>35,36</sup>

Giving curcumin can accelerate the wound-healing process by encouraging the formation of neovascularization and the deposition of connective tissue made of collagen. Giving curcumin can increase the growth of fibroblast cells in vitro. In addition, curcumin can reduce IL-6 production.<sup>37</sup> The result in this study, in line with previous research, stated that there was a significant decrease in IL-6 levels with  $p < 0.05$  after being given turmeric extract compared to the control group, where the decrease in IL-6 levels was the most in the group given turmeric extract combined with amoxicillin.<sup>38</sup>

Before the turmeric extract gel was applied to the wound, the researcher ensured that the mother was able to perform perineal laceration wound care according to the standard operational procedure for perineal laceration wound care described by the researcher and understood the procedure for using turmeric extract gel which contained that the perineal laceration wound must be in good condition. Clean and dry. Pads must be changed in a clean condition before applying turmeric extract gel.

## CONCLUSIONS AND RECOMMENDATION

Administration of turmeric extract gel and amoxicillin proved to be effective in increasing perineal laceration wound healing compared to the control group, which was only given standard care, as evidenced by the difference in the mean difference in the REEDA score and IL-6 levels after being given treatment for seven days. Administering turmeric extract gel can be an alternative for optimizing wound healing and providing comprehensive midwifery care for postpartum women's health services.

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