



Original Article

## Antibacterial activity and perineal wound healing of swallow's gel extracts

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### ABSTRACT

**Background:** Swallow's nest has a glycol content of proteins, carbohydrates (25.62–27.26%), and proteins (62–63%); protein is an indispensable content for the healing process of perineal wounds, protein plays the main ingredient in cell formation, and repairs damaged tissues. In previous studies, swallow's nest extract against perineal wounds in mice obtained the results of accelerated healing on days 3 and 4. However, no studies have been conducted on human perineal injuries.

**Purpose:** Knowing the effectiveness of the swallow's nest extract gel (*Aerodramus Fuciphagus*) 30% against wound healing and a decrease in the number of colonies of staphylococcus aureus bacteria in the perineal wounds of the postpartum mother.

**Methods:** This experiment study has a post-test with a control group design. The sample comprised 34 postpartum maternal respondents divided into two groups randomly (intervention and control groups). The intervention group was given gel from swallow's nest extract while the control group carried out a dry clean treatment; both were treated to the wound. Perineal wound healing based on REEDA scores was analyzed using the Friedman test, while bacteria in perineal wounds were analyzed using the Man-Whitney test.

**Results:** Based on the REEDA scale, the perineal wound healing rate in the intervention group was better, where healing had already occurred on day 5, compared to the control group that occurred on day 7 ( $p < 0.0001$ ). The number of bacteria in the perineal wounds of the intervention group was less, with an average of 0.06 CFU, compared to the control group's average control group's average of 1.11 CFU ( $p < 0.05$ ).

**Conclusion:** Swallow's nest extract is influential and beneficial in healing perineal wounds in postpartum mothers and has antibacterial activity.

### INTRODUCTION

In Indonesia, 75% of maternity mothers who give birth spontaneously experience rupture, 57% of maternity mothers who get 28% perineal sutures due to episiotomy, and 29% of maternity mothers who experience perineal rupture spontaneously.<sup>1,2</sup> The incidence of infection in postpartum mothers in Indonesia is the third cause of death in mothers, and the highest incidence is in Central Java at 15.2%; around 10% of these cases are due to a lack of perineal wound care in childbirth mothers.<sup>3,4</sup>

Perineal sores that are not treated properly and quickly can cause psychological and emotional disorders such as

insomnia, fatigue, anxiety, limited physical activity, lactation disorders, depression, postpartum blues, and infections. Treatment of perineal wounds aims to prevent the occurrence of bleeding or infection of the reproductive organs caused by microorganisms entering through the perineal wound. The conventional treatment efforts that have been carried out for perineal wounds are to encourage postpartum mothers to change their pads frequently, use clean underwear, and treat the wounds to keep them clean and left to dry.<sup>2,5</sup> Previous studies conducted by experts in the group given dry clean treatment obtained results with an average perineal wound healing time on the day, and by other studies, wound healing of the perineum occurs more than seven days.<sup>2,6,7</sup>

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Many efforts have been developed to prevent infection and accelerate the healing of perineal wounds with pharmacological therapy and non-pharmacological therapy. Pharmacological therapy, such as antibiotics, can lead to bacterial resistance, while antiseptic ingredients can irritate the wound. Besides that, the body considers the substances contained in antiseptic materials foreign objects because the components and arrangement differ from the cells.<sup>8</sup> Therefore, many researchers are looking for other safer alternatives by switching to a type of non-pharmacological drug, namely drugs with ingredients derived from the surrounding nature.<sup>9</sup>

Perineal wound care in some obstetric services still uses povidone iodine solution and dry gauze; from research that has been done obtained the results of the long process of wound healing given povidone iodine solution on average occurs on seven days, some previous studies that used natural ingredients to improve wound healing in the perineum such as betel leaf administration obtained (effect size 0.5), Black cumin ointment (effect size 0.01), breast milk (effect size 0.001) with it can be seen that the level of influence of the study is still relatively low.<sup>10-12</sup>

In previous studies, some used swallow's nest as an alternative natural treatment for perineal wound healing and obtained wound healing results in the perineum on days 3-4. Other studies that used swallow's nest extract in gel form provided burn healing with a percentage of wound healing up to 75% on day 21, but the study was only done on mice.<sup>13,14</sup> While research using gel and swallow's nest extract in humans has never been conducted, this study aimed to see the effectiveness of swallow's nest extract in gel dosage form against antibacterial and wound healing in the perineum in postpartum mothers.

## METHOD

### *Study Design*

This experiment study has a post-test only with a control group design.<sup>15</sup>

### *Setting and Respondents*

The research was conducted in the work area of the Semarang City Health Office, which began in March and continued to May 2022. The population in this study was all maternity mothers with perineal lesions. The total sample in this study of 34 respondents who were divided into two groups using a simple random sampling technique with inclusion criteria is a puerperal mother with second-degree perineal injury, aged 20-35 years, and without diabetes. Mothers with complications and infections in the puerperium are excluded from the study.<sup>16</sup>

### *Making a Swallow's Nest Extract Gel*

Swallow's nest extraction: The extraction process uses

nanotechnology 100 gr of swallow's nest + 833 ml of water then extracted with NaOH 1 M 200 ml in add 600 ml, after filtration then rinsed with water about 670 ml and filtration again, then dried. After being allowed to stand for one night, the pulp of the NaOH 1 M extraction nest was swallowed again, melted, and then combined with the previous liquid extract.<sup>14</sup>

Making gel base: Carbopol is developed in hot water 20 times and then ground until a gelling period is formed; Triethanolamine and Propilenglikol are added and ground until homogeneous. Nopagin is dissolved in hot water by 3ml.<sup>14</sup> The formula for making swallow's nest extract gel: 30% swallow's nest extract is then mixed with 70% gel base material until homogeneous.

### *Experimental procedure*

The intervention group in this study is given swallow extract gel for seven days by applying it three times in 1 day (morning, afternoon, and night); the wound is first cleaned using plain water and dried, then swallow's nest extract gel to the wound so that all wounds in the perineum are covered by gel. The control group only used conventional treatment, where the wound was treated by cleaning it with clean water and then dried; this was done for seven days.

### *The Variable, Instrument, and Measurement*

The variables measured were wound healing, observation of perineal rupture wound development using the REEDA scale carried out on days 3, 5, and 7, and vaginal wound swab collection on day 7 to determine the number of staphylococcus aureus bacteria in perineal wounds. The assessment indicators are Redness, Oedema, Ecchymosis, Discharge, and Approximation, with each indicator scoring 0-3. The values range from 0-15, with 0 = good wound healing, 1-5 = poor wound healing, and 6-15 impaired wound healing.<sup>17</sup>

### *Data Analysis*

Data analysis was carried out using the Friedman test for wound healing based on REEDA scores. In contrast, the analysis of decreasing the number of staphylococcus aureus bacteria used the Man-Whitney test.

### *Ethical Consideration*

The Ethics Commission of the Poltekkes of the Ministry of Health Semarang registered the research protocol with registration number No.0155/EA/KEPK/2022.

## RESULTS

Figure 1 shows a swallow's nest extract gel product. Every 10ml consists of 30% swallow's nest extract and 70% gel. Table 1 shows that respondents in this study are in the productive age range of 20-35 years, with secondary education, healthy weight, and normal hemoglobin levels.



Figure 1. A Swallow's Nest Extract Gel Product

Table 1. Characteristics of Respondents (n=34)

Characteristics	Result
<b>Age, yrs</b>	
20-25	17 (50%)
26-35	17 (50%)
<b>Education</b>	
Middle Education	5 (14.7%)
Secondary Education	21 (61%)
Vocational/ Tertiary Education	8 (23,5%)
<b>BMI</b>	
Underweight	0 (0%)
Healthy Weight	34 (100%)
Overweight/Obesity	0 (0%)
<b>Hb Levels</b>	
Normal value	34 (100%)
Anemia	0 (0%)

Table 2. Differences in The Average of Staphylococcus Aureus Bacteria in Perineal Wounds

Variable	Intervention	Control	p-value
staphylococcus aureus bacteria (CFU)	0.06±0.0243	1.11±1.363	0.006*

\*Mann-Whitney Test; Colony Forming Units (CFU)

Figure 2 shows a decrease in REEDA scores in perineal wounds, measured on the third and fifth day and the seventh day after treatment. The intervention group has decreased more rapidly than the control group. In the intervention group, on the fifth day, the REEDA score averaged 1.18, already close to 0, which means that the average wound had healed well, while the control group had an average REEDA score of 3.37. Figure 2 compares wound healing based on the decrease in the REEDA score to the best value of 0.12. The results of the statistical test showed significant differences between the intervention and control groups on the measurements of the third day

( $p=0.000$ ), the fourth day ( $p=0.000$ ), and the seventh day ( $p=0.035$ ). Table 2 showed a difference in the average number of staphylococcus aureus bacteria in the intervention group was 0.06 smaller than that of the control group with an average of 1.11 ( $p<0.05$ ).

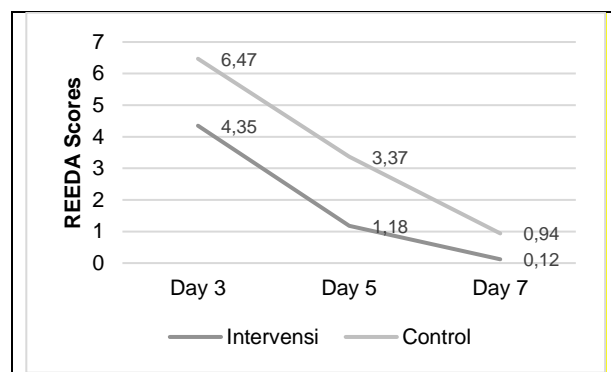


Figure 2. Difference in REEDA Scores in Perineal Wounds

## DISCUSSION

In this study, wound healing was faster in the group given the swallow's nest extract gel treatment than in the group given standard treatment. The swallow's nest extract contains sialic acid and glucosamine compounds. Sialic acid and glucosamine compounds play a role in helping the wound healing process so that it lasts longer because the function of sialic acid and glucosamine is to enhance the immune system, improve cell growth processes, and stimulate formation.<sup>18</sup>

New epithelial cells thus support the Re-epithelialization process that accelerates wound healing and blood vessel formation.<sup>18</sup> Swallow's nest extract has a very high protein content; this protein is composed of amino acids that provide the main structure in the body, including collagen, to accelerate the wound healing process.<sup>19</sup> Protein has a vital role in every wound healing process; lymphocytes, leucocytes, phagocytes, monocytes, and macrophage immune system cells are in urgent need of proteins, especially inflammatory responses in the healing process.

The role of proteins functions as an immune response to phagocytosis, angiogenesis, fibroblast proliferation, synthetic collagen, and recovery; one of the protein constituents in the swallow's nest is an amino acid in the form of glycine. Glycine serves to optimize several protective effects, including inflammatory modulators and cytoprotective action; glycine acts on inflammatory cells such as macrophages to suppress the activation of transcription factors and the formation of free radicals as well as inflammatory cytokines.<sup>20,21</sup>

Protein synthesis occurs throughout the cells and tissues of the body, essential and non-essential amino acids.

When non-essential amino acids are not provided from the amino acid group in the liver, the body's cells make them by a transmission process that transfers the amino group into a substance that does not contain nitrogen to convert them into amino acids. This process is controlled by a transaminase enzyme and the pyridoxal-5 phosphate (PLP) coenzyme derived from vitamin B6. Such synthesis proceeds very quickly; amino acids are well-regulated into proteins through DNA and RNA compounds.<sup>22</sup>

In line with previous studies on nonpharmacological therapy of swallow's nest extract against perineal wounds conducted for six days, with the results obtained, wound healing occurred on days 3-4 days, and the condition of the wound closed.<sup>13</sup> Other studies also stated that 20% swallow's nest extract could accelerate the healing and closure of cuts in animals on day 5.<sup>23</sup>

The nutritional status and Hb level were controlled in this study. Lack of nutrition can lead to inhibited collagen fiber formation and catalyst development and reduce the supply of amino acids for tissue repair.<sup>24,25</sup> While anemia can reduce oxygen supply, this is also one of the factors inhibiting wound healing in tissue oxygenation; in this case, oxygen has a vital role in the formation of granulation and stimulates the growth of new blood vessels for the closure of the wound area.<sup>26</sup>

Differences in the average number of staphylococcus aureus bacteria in the intervention group showed smaller staphylococcus aureus bacterial colonies than in the control group. It can be concluded that swallow's nest extract has a better effect on wound healing compared to dry clean treatment only; swallow nest extract has a mitogenic that resembles Epidermal Growth Factor (EGF) so that it can increase and accelerate wound density, with a mechanism of action through vascular endothelial growth factor. EGF plays an important role in reducing wound healing, including activating fibroblasts and macrophages and stimulating the proliferation of various glial cells, fibroblasts, and epithelial cells, namely keratinocytes.<sup>21,27</sup>

Keratinocyte cells will begin to propagate, immigrate, and differentiate from the neo epithelium to the multi-layered epidermal cells, and new blood vessels will be formed to support the new granulation tissue; the wound is said to heal if the wound surface can be reunited and the strength of the tissue reaches normal when the wound leads to the recovery of the thickness of the epidermis will return. The wound is closed, so bacteria, especially staphylococcus aureus, are undetected.<sup>18,27,28</sup>

The perineum is a moist area, being a fertile place for the development of aerobic bacteria that live without oxygen supply; in the intervention group, the swallow's nest extract has antibacterial and anti-inflammatory,<sup>29,30</sup> which helps accelerate wound healing so that the bacteria detected on

day 7 are only a few. In the control group, dry clean wound treatment is carried out to prevent contamination from the rectum or the entry of microorganisms into the mucous membrane and clean all outputs that can be a source of bacteria. Although respondents have done dry clean treatments correctly, bacterial growth can also be influenced by the respondent's hygiene; where if wound hygiene is not maintained, this can trigger the development of bacteria, especially staphylococcus aureus bacteria, which can slow down the healing of perineal wounds in postpartum mothers.<sup>31</sup>

## CONCLUSIONS AND RECOMMENDATION

Giving swallow's nest extract gel in perineal wounds was much more effective in wound healing than standard treatment. This treatment can also reduce the number of Staphylococcus aureus, preventing perineal wound infections. It is recommended that this will be one alternative treatment to perineum wounds in postpartum mothers.

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