



The hydrogel of Mangosteen Peel (*Garcinia Mangostana* L.) To Improve Wound in Perineal among Postpartum

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Abstract. One of the healing processes for the puerperium is the perineal wound healing. The study aimed to examine the effect of mangosteen peel hydrogel on the wound healing process of perineal among postpartum women. A quasi-experimental study design, pre-test and post-test with the non-control group was applied in this study. The results showed that the mean score in the experimental group was 2.63, and the control group was 2.13. Mangosteen peel extract was equivalent to 10% of povidone-iodine for perineal wound care.

Keyword: mangosteen peel hydrogel, wound healing, perineal, postpartum women



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INTRODUCTION

The puerperium is a period of recovery physiological and psychological conditions from childbirth to conditions before pregnancy. Postpartum infections include endometritis, urinary tract infections, and stitching wound infections (1). The number of deaths caused by puerperium infections is 30% with risk factors for labor, birth history, and socioeconomic status (2). During the puerperium is a period that is vulnerable to bacterial infection through the torn birth canal (3). Perineal injury is infected because the genital tract is adjacent to the anus disposal site feces so that it becomes a place for the development of bacteria in the perineum such as the gram-positive group of the coccus group or other vaginosis bacteria. The condition of perineal wounds that are moist due to the removal of lochia during the puerperium can be a trigger for infection and slow healing (4). The development of pathogenic bacteria can increase the risk of perineal wound infections such as from the coccus

group namely *Staphylococcus epidermis*, *Staphylococcus aureus*, *Enterococcus* (*Streptococcus* group D), *Streptococcus* group B (5-6)

Previous studies of perineal wounds using povidone-iodine control of 10% and complementary interventions were clinically significant such as binahong leaf extract, swallow ointment, black cumin ointment, aloe vera and topical administration of breast milk to the perineal wound. The research is clinically meaningful. It means that it has an influence on the process of perineal wound healing, but there has been no analysis of its effect on bacteria in the process of wound healing through laboratory tests with gram staining (3,7-9).

The mechanism of topical action preparations is passive diffusion which can penetrate the skin layer and consists of a carrier and an active substance. How to use the topical medication by applying it to the surface of the skin or by adding other methods such as pressing, rubbing, compressing, or occlusion (10). Absorption of topical drugs or cutaneous from the outer layer of the skin is diffusion through the skin barrier.

The use of hydrogels can be used as a medium for infection prevention by adding herbal extracts as anti-bacterial (11-13) Preventive efforts to reduce the use of antibiotics and povidone-iodine by 10% which causes resistance if used for long periods. One of the herbal plants that have destructive and disrupting bacterial growth is the mangosteen plant (*Garcinia mangostana* L.) (14). Contents contained in the mangosteen plant are Xanthones, saponins, flavonoids, and alpha mangosteen (14-18). Test extracts in vitro namely testing by giving mangosteen peel extract to a petri dish containing bacteria proves that the activity of mangosteen peel extract has a high inhibitory zone to the growth of *Staphylococcus aureus* bacteria (19)

Mangosteen rind (*Garcinia mangostana* L.) contains flavonoids, anthocyanins, xanthones, tannins, saponins and phenolic acids as anti-cancer, anti-bacterial, anti-aging, anti-fungi and anti-plasmodial (15-17). The content of Xanthones in mangosteen is a natural substance chemical that are classified as polyphenolic phytonutrient compounds are bioflavonoids and have anti-oxidant properties. The mechanism of action of bioflavonoids as anti-bacteria by poisoning the protoplasm, penetrating cell walls, and damaging cells by depositing bacterial cell proteins (16,20).

Based on this background, researchers are interested in testing the effect of hydrogel containing mangosteen (*Garcinia mangostana* L.) peel extract on the healing of perineal wounds in postpartum women in the Semarang Health Center, Central Java.

OBJECTIVE

The study aimed to examine the effect of mangosteen peel hydrogel on the wound healing process of perineal among postpartum women.

METHOD

A quasi-experimental study design, pre-test, and post-test with the non-equivalent control group were applied in this study. The experimental group received the alternative therapy from mangosteen peel extract after 2 hours postpartum until seven days postpartum, while the control group received povidone-iodine 10% twice a day. Purposive sampling was used to select the samples based on the inclusion criteria. The inclusion criteria included: 1) postpartum women with second degree perineal of the wound, 2) without complications during and post of the birth process, 3) willingness to participate in this study.

Samples were calculated by using the Lemeshow formula and found 17 per group. We add 10% to avoid the drop-out of samples of each group, and finally, 17 samples obtained per

group. The researchers used the REEDA (Redness, Oedema, Ecchymosis, Discharge, and Approximately) scale to measure perineal wound healing before and after implementation.

This study was approved by the Health Research Ethics Commission of Dr. Moewardi Regional Hospital, Sebelas Maret University Medical School, number: 326/III/ HREC /2019.

RESULTS

Comparison of respondents' characteristics based on age and BMI level

Table 1 showed the comparison of respondents' characteristics based on age and BMI levels. The average age of respondents among the intervention group was 25.7 years old, while the control group was 26.2 years old. Regarding the comparison of BMI level, the experimental group showed the BMI was 25.5, and the control group was 28.4 with p-value was <0.05. It was indicated that there are significant differences between the experimental group and the control group in terms of age and BMI level. Details were summarized in table 1.

Table 1: Comparison of respondents' characteristics based on age and BMI level

| Characteristics | Intervention (n=19) | Control (n=19) | <i>p-value</i> |
|-----------------|---------------------|-----------------|----------------|
| | Mean \pm SD | Mean \pm SD | |
| Age | 25.7 \pm 2.95 | 26.2 \pm 6,58 | 0.00 |
| BMI | 25.5 \pm 1.7 | 28.4 \pm 3,10 | 0.014 |

Comparison of REEDA scores at 5th and 7th-day intervention among the experimental group and the control groups

Table 2 showed the comparison of REEDA scores at 5th and 7th-day intervention among the experimental group and the control groups. The findings described the REEDA scores of the experimental group at 5th was 3.47, while the control group was 3.57. The mean scores of REEDA scores at 7th-day intervention among the experimental group were 0.84, while the control group was 1.26. P-value was <0.05 which indicated that there were significantly different between the experimental group and the control group on REEDA scores at 5th and 7th-day intervention.

Table 2: Comparison of REEDA scores at 5th and 7th-day intervention among the experimental group and the control groups

Table 1: Comparison of respondents' characteristics based on age and BMI level

| REEDA scores | Intervention (n=19) | Control (n=19) | <i>p-value</i> |
|---------------------|---------------------|-----------------|----------------|
| | Mean \pm SD | Mean \pm SD | |
| 5 th day | 3.47 \pm 0.69 | 3.57 \pm 0.50 | 0.00 |
| 7 th day | 0.84 \pm 0.69 | 1.26 \pm 0.73 | 0.00 |

Mean scores different between the experimental group and the control group after receiving the intervention

Table 3 showed the Mean scores different between the experimental group and the control group after receiving the intervention. The findings described there were significant differences of REEDA scores on perineum wound scores between the experimental group and the control group after receiving the intervention (p-value >0.192). Details were summarized in table 3

Table 3: Mean scores different between the experimental group and the control group after receiving the intervention

| REEDA scores | Mean \pm SD | <i>p-value</i> |
|--------------------|-----------------|----------------|
| Intervention Group | 2.63 \pm 0.59 | 0.192 |
| Control Group | 2.3 \pm 0.94 | |

Relationship between the policy of the government with psychosocial adaptation after retirement among Elderly in Jombang Regency

Table 4 showed the relationship between the policy of the government with psychosocial adaptation after retirement among the Elderly. Most of the patients were moderate psychosocial adaptation (63.7%). About 53.8% of the elderly were good in psychosocial adaptation after retirement. The findings described there was a relationship between the policy of the government with psychosocial adaptation after retirement among the Elderly in Jombang Regency. Details were summarized in table 4

Table 4. Relationship between the policy of the government with psychosocial adaptation after retirement among Elderly

| Government Policy | Psychosocial Adaptation | | | Total | P |
|-------------------|-------------------------|-------------|-----------|------------|-------|
| | Good | Enough | Less | | |
| Good | 12 (54.5%) | 10 (45.5%) | 0 (0%) | 22 (100%) | 0.045 |
| Enough | 48 (35.6%) | 86 (63.7%) | 1 (2.9%) | 135 (100%) | |
| Less | 7 (53.8%) | 5 (38.5%) | 3 (50%) | 13 (100%) | |
| Total | 67 (39.4%) | 101 (59.4%) | 11 (9.2%) | 170 (100%) | |

Relationship between retirement stigma with psychosocial adaptation after retirement among elderly

Table 5 showed the relationship between the policy of the government with psychosocial adaptation after retirement among the Elderly. The findings described there was a relationship between retirement stigma with psychosocial adaptation after retirement among the elderly. Details were summarized in table 5

Table 5. Relationship between retirement stigma with psychosocial adaptation after retirement among elderly in Jombang Regency

| Retirement Stigma | Psychosocial Adaptation | | | Total | P-Value |
|-------------------|-------------------------|-------------|----------|------------|---------|
| | Good | Enough | Less | | |
| Good | 46 (63.0%) | 26 (35.6%) | 1 (1.4%) | 73 (100%) | 0.000 |
| Enough | 21 (11.3%) | 72 (76.6%) | 1 (1.1%) | 94 (100%) | |
| Less | 0 (0%) | 3 (100%) | 0 (0%) | 3 (100%) | |
| Total | 67 (39.4%) | 101 (59.4%) | 2 (1.2%) | 170 (100%) | |

DISCUSSION

The results of research on the comparison of the use of mangosteen peel hydrogel and povidone-iodine 10% showed that there were no significant differences. Still, there was a greater decrease in the intervention group compared to the control group. The decrease in the average value of the REEDA score in the intervention group was 2.63, and the control group was 2.3 proving that the intervention group had a higher value in perineal wound healing through the REEDA score.

Measurements were made on days 5 and 7 based on the process of dehiscence and evisceration, namely wound opening occurs on day five, and the risk of infection occurs on day 7.49. This is proven by research, which states that these compounds can help reduce the number of polymorphonuclear (PMN) consisting of neutrophils, basophils, and eosinophils. The presence of neutrophils plays an essential role in the immune system because it is the whitest blood type (40 - 75%) in the human body.

Age of neutrophils ranges from 4-5 days, but if it has moved to the network, its age will be 1-2 days, thus minimizing the spread of pathogenic microorganisms and tissue damage during inflammation (21-23).

After the age of PMN dies, it will be replaced with macrophages as the main cells in wound healing because it plays a role in the process of bacterial phagocytosis and repair damaged tissue. Unlike short-lived neutrophils, the presence of macrophages in the tissue can last for several months. Metabolic activity that occurs in the process of reepithelialization will lead to an increase in oxygen demand in the injured tissue. The use of hydrogels is a topical drug that can minimize the loss of oxygen and fluid in the tissue so that it can release proteases to the maximum (23-25).

The content of flavonoids in mangosteen peel can increase hydroxyproline as the main amino acid of collagen in the process of wound healing. The skin is an arrangement of protein networks composed of proteins. The collagen found in the skin is white, fibrous, and surrounded by mucopolysaccharide and other proteins. The presence of collagen is related to the physical strength of the skin and influences the tanning process, which consists of hydroxyproline (27-28).

Previous research on xanthone compounds, saponins and flavonoids have proven its influence in the process of wound healing, and the results of this study can strengthen previous research with the preparation of mangosteen skin hydrogels on puerperal perineal wounds.

The control group using povidone-iodine 10% showed the same results with the use of mangosteen skin hydrogel because the content of iodine can prevent inflammation by killing the growth of bacteria found in the wound. The wound healing process carried out by povidone-iodine and mangosteen skin hydrogel has the same mechanism.

Respondent characteristics measured in this study were maternal age and Body Mass Index (BMI), indicating that heterogeneous maternal characteristics mean different characteristics. The average age of the intervention group was 25.7 years, and the control group 26.2 years. The maternal body mass index (BMI) of the intervention group was 25.5, and the control group was 28.4. Characteristics of respondents have differences so that a regression test is performed to determine its effect on the REEDA score of the perineal wound. Obtained a p-value of 0.132 intervention group and 0.917 control group, there was no influence on the REEDA score assessment in both groups.

CONCLUSION

Mangosteen peel extract (*Garcinia mangostana* L.) in hydrogel preparations as a topical drug has the ability and effect equivalent to povidone-iodine 10% on perineal wound healing using REEDA scores but has not been proven to be better than povidone-iodine 10%.

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