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Consumption of Black Honey Accelerates Perineal Wound Healing in Postpartum Mothers

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Abstract: Perineal wound suturing is a common procedure during childbirth, affecting approximately 350,000 women annually in the UK and millions worldwide. Effective management of puerperal care with perineal sutures is critical to prevent infection and promote healing. This study examines the effect of black honey consumption as a complementary therapy to accelerate healing of grade II perineal wounds. Black honey's antibacterial properties and cell regeneration capabilities support the wound healing process. The research was conducted at Mutiara Medika Clinic-Rangkasbitung in 2022 using a Control Group Posttest-Only design. A total of 38 postpartum mothers meeting the inclusion criteria were divided into intervention (n = 19) and control groups (n = 19). The intervention group consumed black honey in addition to standard puerperal care. Wound healing scores were assessed on days 3, 5, and 7. Statistical analysis revealed a significant improvement in wound healing for the intervention group compared to the control group (p = 0.003 and 0.000, respectively). The findings suggest that black honey consumption can serve as an effective complementary therapy to accelerate grade II perineal wound healing and reduce infection risk during the puerperium.

Keywords: Black honey; Complementary therapy; Grade II perineal sutures; Perineal wound healing; Postpartum care

Introduction

Maternal mortality in Indonesia, according to WHO, reaches 228 per 100,000 live births. This figure is significantly higher compared to Vietnam (59 per 100,000) and China (37 per 100,000), placing Indonesia third highest in maternal mortality among ASEAN countries. One of the primary causes is postpartum infection, characterized by inflammation due to bacterial entry into the genital organs during childbirth and the puerperium, indicated by a rise in body temperature up to 38°C for two days within the first ten days postpartum. Birth canal infections account for 25-55% of these infections (Rumini & Julita, 2020).

Annually, approximately 350,000 women in the UK and millions worldwide undergo perineal suturing during childbirth. Continuous and subcuticular suturing techniques are preferred for grade II perineal wounds due to their efficiency, cost-effectiveness, and reduced pain, leading to faster healing as recommended by researchers for over 70 (Kettle et al., 2007; Dudley et al., 2013; Kindberg et al., 2008). Effective perineal wound care is crucial to prevent infection and morbidity during the puerperium. Current care includes antibiotics, good personal hygiene, balanced nutrition, and mobility during the puerperium.

Complementary therapies, such as black honey consumption, are gaining attention for their potential to accelerate wound healing. Black honey has shown superior antibacterial activity compared to other honey types, effectively inhibiting bacteria such as *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas*

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aeruginosa at concentrations ranging from 10 to 100% (Matzen et al., 2018; Mandal & Mandal, 2011). This antibacterial effect is attributed to factors like hydrogen peroxide (H_2O_2), acidity (pH), and osmotic pressure. Hydrogen peroxide denatures proteins and inhibits bacterial nucleic acid synthesis, while the high acidity of honey (pH 3.2-4.5) impedes bacterial growth by disrupting ionic bonds within bacterial cells, impairing nutrient transport and energy renewal, leading to bacterial death (Albaridi, 2019; Bizerra et al., 2012).

Beyond its antibacterial properties, black honey also promotes cell regeneration. Hydrogen peroxide produced upon contact with wound exudate stimulates fibroblast, epithelial cell, and capillary growth, facilitating faster wound healing (Bastias-Montes et al., 2020).

This study introduces the novelty of utilizing black honey as a complementary therapy specifically for accelerating grade II perineal wound healing, highlighting its dual antibacterial and cell regeneration properties. Unlike previous research that broadly explores honey's general benefits, this study provides focused evidence on black honey's effectiveness in postpartum wound care, offering an innovative approach to maternal health interventions.

Method

This study employs an experimental design with a Control Group Posttest-Only approach. The sample size is 38 participants, divided into an experimental group (19 participants) and a control group (19 participants). The groups were formed randomly by one of the authors at Mutiara Medika Clinic, Rangkasbitung. The inclusion criteria included postpartum mothers with physiological grade II perineal sutures (sutured wounds involving the vaginal mucosa, posterior commissure, muscle, and perineal skin). Exclusion criteria included postpartum mothers with sexually transmitted diseases, genital malignancies, or Diabetes Mellitus.

The experimental group received black honey at a dose of 3x15 ml for 7 days postpartum. Both groups were administered oral iron tablets at a dose of 1x60 mg. The dependent variable was measured and compared between the two groups on the 3rd, 5th, and 7th days postpartum. Wound measurements were taken using a disposable paper tape (4 cm long with 0.25 cm markings). In the sims position (lying on the left or right side), the paper tape was placed perpendicular to the perineal wound to record the size in centimeters. The REEDA scale was used to assess wound healing, including: redness (indicated by a red appearance at the suture site), edema (presence of abnormal fluid in the intracellular tissue, limited by venous or lymphatic obstruction, or increased vascular permeability), ecchymosis (small hemorrhagic spots, larger than petechiae, forming blue or purple patches on the perineal skin), discharge (excretion or discharge from the perineal wound area), and approximation (the closeness of the sutured tissue).

The REEDA scale for evaluating postpartum healing of the perineum is as follows.

Table 1. Evaluating postpartum healing of the perineum

Value	Redness	Edema	Ecchymosis	Discharge	Approximation
1	Less than 0.25 cm on both sides of laceration	On perineum, < 1 cm from laceration	Less than 0.25 cm on both sides or 0.5 cm on one side	Serum	Skin distance of 3 mm or less
2	Less than 0.5 cm on both sides of laceration	On perineum and/or vulva, 1–2 cm from laceration	0.25–1 cm on both sides or 0.5–2 cm on one side	Serous, sanguineous	Distance between skin and subcutaneous fa
3	More than 0.5 cm on both sides of laceration	On perineum and/or vulva, > 2 cm from laceration	More than 1 cm on both sides or > 2 cm on one side	Bloody, purulent	Distance between skin, subcutaneous fat, and fascia

Informed consent was obtained from all potential study participants without any coercion. Participants were free to withdraw from the study at any time. The study received ethical clearance from the Health Research Ethics Committee of Poltekkes Kemenkes Semarang.

Result and Discussion

Analysis of Table 2 Perineal Wound Healing Scores on Day 3 in Postpartum Mothers at Mutiara Medika Clinic, Rangkasbitung, 2022.

Tabel 2. Analysis of perineal wound healing scores on day 3 in postpartum

Group	Mean	p-value (F Test)	p-value (t Test)
Control	7.32	0.291	0.003
Intervensi	5.53		

Table 2 shows a descriptive difference in wound healing scores between the groups of about 1.79. The F test results in a p-value of 0.291 ($p > \alpha$), indicating that the control and intervention groups have the same variance. The p-value obtained from the t-test is 0.003 ($p < \alpha$), indicating a significant difference in the mean

wound healing scores between the groups on day 3, with the intervention group having a lower score (faster healing) compared to the control group.

Analysis of Table 3 Perineal Wound Healing Scores on Day 5 in Postpartum Mothers at Mutiara Medika Clinic, Rangkasbitung, 2022.

Table 3. Perineal wound healing scores on day 5 in postpartum mothers

Group	Mean	p-value*
Control	6.37	0.000
Intervensi	1.32	

n per Group = 19
*) Mann_Whitney test

Table 3 shows that the mean wound healing score of the intervention group is much lower (1.32) compared to the control group. This indicates that by the fifth day of treatment, the intervention group is much closer to healing than the control group. The bivariate analysis yields a p-value of 0.000 ($p < \alpha$), indicating a significant difference in the mean wound healing scores between the two groups.

Analysis of Tabel 4. Perineal Wound Healing Scores on Day 7 in Postpartum Mothers at Mutiara Medika Clinic, Rangkasbitung, 2022.

Tabel 4. Perineal wound healing scores on day 7 in postpartum mothers

Group	Mean	p-value*
Control	2.89	0.000
Intervensi	0.21	

n per group = 19
*)Mann_Whitney test

Table 4 shows that the mean wound healing score of the intervention group is almost 0 (0.21), indicating that the wounds in the intervention group are almost completely healed, while the control group still has a mean score of 2.89. The bivariate analysis yields a p-value of 0.000 ($p < \alpha$), indicating a significant difference in the mean wound healing scores between the two groups.

Special perineal care for women after childbirth aims to reduce discomfort, maintain cleanliness, prevent infection, and enhance healing according to standard procedures. Perineal care focuses on preventing infections of reproductive organs caused by microorganisms entering through the open vulva or by the proliferation of bacteria on sanitary pads used to absorb lochia (Kaligis et al., 2020).

Perineal care should be performed during bathing when postpartum mothers change their sanitary pads, as there is a risk of bacterial contamination from the fluid absorbed by the pads. After urination, there is a high chance of urine contaminating the rectum, which can promote bacterial growth in the perineal area, necessitating perineal cleansing. Similarly, after defecation, it is crucial to clean residual feces around the anus to prevent bacterial contamination from the anus to the perineum, which are adjacent. Therefore, thorough cleansing of the anus and perineum is necessary. Perineal cleanliness involves using mild antiseptic solutions after urination and defecation to reduce swelling. Daily washing with water and mild soap helps maintain perineal hygiene and free from irritating secretions. Some researchers use oral proteolytic enzymes effectively to reduce edema and pain (Rija & Tanjung, 2021).

Currently, wound care often uses substances that inhibit bacterial growth on living tissue surfaces. The antibacterial efficacy of antiseptics depends on concentration, temperature, and time. At low concentrations, they can stimulate bacterial growth, and evaluating their effectiveness on patients can be challenging. Many topical agents, such as povidone-iodine (Betadine), are available in various forms, including aerosol, ointments, skin cleansers (liquid or foam), solutions, and swabs. A potential side effect of antiseptic use is dermatitis in allergic individuals, and povidone-iodine can be contaminated by other gram-positive and gram-negative bacteria. Postpartum mothers often use soaps with bacteriostatic effects for perineal wound care, which is considered antimicrobial and can prevent staphylococcal colonization. However, all soaps containing antiseptics can cause allergies or photosensitization.

Perineal lacerations during vaginal delivery often require suturing. Post-suturing, perineal wound assessment is necessary to evaluate the suturing results, which may pose problems during the postpartum period. Perineal examination involves positioning the mother in a lateral position with knees bent. The examination covers redness, edema, ecchymosis, drainage, and wound approximation using the REEDA scale developed by Davidson in 1974. The REEDA scale assesses five components of healing and perineal trauma: redness, edema, ecchymosis, discharge, and approximation (Afrilia & Sari, 2018; Sulastri et al., 2022; Ghassani et al., 2020).

Among the 19 research subjects receiving black honey intervention (3x15 ml per day), the results showed faster perineal wound healing compared to the control group, as assessed on postpartum days 3, 5, and 7. The study results demonstrated a significant difference in mean wound healing scores between the groups on day 3, with the intervention group having a lower score (faster healing) than the control group (p =

0.003). By day 5, the intervention group had almost healed compared to the control group (p = 0.000). By day 7, there was a significant difference in mean wound healing scores between the two groups (p = 0.000).

The purpose of suturing lacerations or episiotomies is to approximate tissue and prevent unnecessary blood loss, ensuring hemostasis. It is important to remember that any tissue penetration by a needle can cause injury and create a potential site for infection. Local anesthesia should be administered to every mother requiring suturing. Suturing is painful, and using local anesthesia is part of maternal care. The recommended method is lidocaine infiltration around the tear to be sutured or direct infiltration into the pudendal nerve. Local injection is performed using a "fan-like" technique. The standard local anesthetic is 1% lidocaine without epinephrine (silocaine).

Honey is a substance derived from plant nectar or plant secretion collected by honey bees (*Apis mellifera*). The bees combine it with other substances they produce, then store, dry, and keep it in honeycombs until it matures. Due to its remarkable biological properties, honey bees are dubbed "biological experts" for their ability to transform raw materials into highly nutritious food (Vranic et al., 2019; Akyıldız et al., 2022; Carabetta et al., 2020; Haider et al., 2022).

Honey is one of the oldest traditional medicines globally, used for its antibacterial, anti-inflammatory, and antioxidant properties. Some honey's antioxidants act similarly to those in vitamin C, vitamin E, enzymes (catalase, peroxidase), and phenolic compounds (Haider et al., 2022). Both gram-positive and gram-negative pathogenic bacteria are susceptible to honey, including *Staphylococcus aureus* (Balázs et al., 2021; Mekkaoui et al., 2021).

Honey contains macroelements and microelements. Macro elements include calcium, potassium, magnesium, and sodium, while microelements include iron, manganese, copper, zinc, nickel, lead, and cadmium. Elements such as Mn, Zn, Cu, and Ni are vital for normal human body function. Research by Kedzierska et al. found that darker honey has higher antioxidant activity due to high levels of manganese, copper, and zinc. This natural product is highly valuable as it provides numerous health benefits, making it a common therapeutic agent worldwide. Nearly every country produces honey, with diverse plant biodiversity and monoculture, resulting in multifloral and unifloral honey (Kędzierska-Matysek et al., 2021).

Darker honey types contain more protein, proline, and higher enzyme activity compared to lighter honey (Flanjak et al., 2016; Akinwande & Oladapo, 2022). Black honey, derived from bees that collect nectar from mahogany flowers, has a dark brown color and a slightly bitter taste due to the alkaloid compounds from mahogany trees (Scripcă & Amariei, 2021).

Black honey has basic antibiotic properties. Research conducted by the University of Memphis, USA, found honey more effective than glucose water in supporting body endurance. Black honey consumption can be an alternative complementary therapy for accelerating perineal wound healing, minimizing the risk of perineal suture infection. Pharmacological research shows that bitter black honey has greater antibacterial activity than other types of honey. Black honey effectively inhibits *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*. At concentrations of 10 to 100%, black honey can inhibit the growth of *Pseudomonas aeruginosa*. Darker honey contains more antioxidants and antibacterial properties (Nedoklan et al., 2021; Astrini et al., 2014; Tashkandi, 2021).

The antibacterial activity of black honey is attributed to several factors, including hydrogen peroxide (H_2O_2), acidity (pH), and osmotic pressure. Hydrogen peroxide inhibits bacterial growth by denaturing proteins and disrupting bacterial nucleic acid synthesis or function. The high acidity of honey (low pH between 3.2–4.5) inhibits bacterial growth, as pathogenic bacteria typically thrive at an optimal pH of 7.2–7.4. The minimum pH for Pseudomonas aeruginosa survival is 5.6. Low pH disrupts ion bonds in bacterial cells, impairing nutrient transport and energy renewal, ultimately inhibiting bacterial growth and causing bacterial death (Almasaudi, 2021). Additionally, honey's antibacterial activity is due to polyphenol compounds and high osmotic concentration (Baci et al., 2021; Mekkaoui et al., 2021).

Honey, recognized for its nutritional content and therapeutic potential, is widely used as a natural remedy. The use of herbal medicines derived from natural sources is increasing worldwide due to environmental changes, lifestyle factors, and the emergence of various diseases. Natural resources, such as plants, impact the economy and community well-being, especially in Indonesia. Honey is a natural substance frequently used in complementary medicine due to its positive contributions to wound healing, including inhibiting bacterial activity, debridement, odor removal, anti-inflammatory properties, and stimulating tissue growth (Sahlan et al., 2019).

Honey's effectiveness on wounds extends beyond its antibacterial properties. It also influences cell regeneration through hydrogen peroxide production when honey contacts wound exudate, contributing to physiological inflammatory reactions that stimulate fibroblast, epithelial cell, and capillary growth, accelerating the healing process (Mieles et al., 2022).

Conclusion

The study demonstrates that black honey consumption can significantly accelerate the healing of grade II perineal wounds in postpartum mothers. Its antibacterial properties and ability to promote cell regeneration contribute to faster wound recovery and reduced infection risk. Black honey is an effective complementary therapy that can enhance standard postpartum care practices.

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Conceptualization, investigation, data curation, S.R.; methodology, validation, writing—original draft preparation, N.Y. and S.R.; formal analysis, N.Y.; resources, writing—review and editing, A.Y.; visualization, N.Y. and A.Y. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest
The authors declare that they have no conflict of interest.

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