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EFEKTIVITAS *WOUND CLEANSING* REBUSAN DAUN BIDARA TERHADAP PENYEMBUHAN LUKA DIABETES

EFFECTIVENESS OF WOUND CLEANSING BREWING BIDARA LEAVES ON HEALING DIABETES WOUNDS

[1*]Nasrun Pakaya, [2]Adinda Maharani, [3]Widy Susanti Abdulkadir, [4]Anggriyani Langoni
[1*,2,4] Program Studi Ilmu Keperawatan, Fakultas Olahraga dan Kesehatan Universitas Negeri Gorontalo
[3] Program Studi Farmasi, Fakultas Olahraga dan Kesehatan Universitas Negeri Gorontalo

Kontak koresponden: nasrun.ners@ung.ac.id

ABSTRAK

Diabetes melitus (DM) merupakan penyakit kronis dengan adanya gangguan pada metabolik dengan terjadinya hiperglikemia dimana pankreas tidak dapat untuk melakukan sekresi insulin secara alami, adanya gangguan kerja insulin, ataupun keduanya. Kerusakan jangka panjang serta kegagalan yang dapat terjadi ialah pada organ mata, ginjal, saraf, jantung, serta pembuluh darah jika mengalami hiperglikemia kronis. Penelitian ini bertujuan untuk mengetahui pengaruh Pemberian *Wound Cleansing* Rebusan Daun Bidara Terhadap Penyembuhan Luka Diabetes Melitus. Metode Penelitian dilakukan dengan eksperimen semu menggunakan daun bidara di Ruangan Bedah RSUD Toto Kabila dengan jumlah sampel 20 responden intervensi dan 20 responden kontrol (tanpa intervensi). Hasil penelitian menunjukkan penyembuhan luka DM dengan *wound cleansing* menggunakan daun bidara berpengaruh pada indikator tipe eksudat dimana jumlah eksudat dipengaruhi oleh kandungan *alkaloid, tannin,* dan *christinin* yang bermanfaat sebagai antibakteri dan antiseptic alami. Sehingga dapat membantu menurunkan infeksi penyebab eksudat. *Wound cleansing* menggunakan daun bidara (*ziziphus spina-christi l.*) efektif untuk mempercepat penyembuhan luka DM dibuktikan dengan penurunan skor indikator BWAT yaitu tepi luka, tipe jaringan nekrotik, jumlah jaringan nekrotik, tipe eksudat, jumlah eksudat, warna kulit sekitar luka, edema perifer dan pengerasan jaringan tepi.

Kata Kunci: *wound cleansing;* rebusan daun bidara; diabetes

ABSTRACT

Diabetes mellitus (DM) is a chronic disease with metabolic disorders with hyperglycemia where the pancreas cannot secrete insulin naturally, there is a disruption in insulin function, or both. Long-term damage and failure that can occur are in the eyes, kidneys, nerves, heart, and blood vessels if chronic hyperglycemia occurs. This study aims to determine the effect of Wound Cleansing with Bidara Leaf Decoction on Healing Diabetes Mellitus Wounds. The research method was carried out with a quasi-experiment using bidara leaves in the Surgery Room of Toto Kabila Hospital with a sample size of 20 intervention respondents and 20 control respondents (without intervention). The results showed that healing DM wounds with wound cleansing using bidara leaves had an effect on the exudate type indicator where the amount of exudate was influenced by the content of alkaloids, tannins, and christinin which were useful as natural antibacterials and antiseptics. So that it can help reduce infections that cause exudate.

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Wound cleansing using bidara leaves (ziziphus spina-christi l.) is effective in accelerating the healing of DM wounds as evidenced by a decrease in the BWAT indicator score, namely wound edge, necrotic tissue type, amount of necrotic tissue, exudate type, amount of exudate, skin color around the wound, peripheral edema and hardening of the edge tissue.

Keywords: *wound cleansing; bidara leaf decoction; diabetes*

Introduction

Living things that are active and moving, do not rule out the possibility of experiencing accidental injuries and will cause wounds. A wound is the loss or damage of part of the body's tissue which can be caused by a sharp object puncture/scratch, blunt object impact, accident, gunshot, animal bite, chemical, hot water, water vapor, fire or burn, electric shock and lightning strikes that cause serious or minor injuries (Primadani & Safitri, 2021; Yazarlu et al., 2021). The statement provides a comprehensive definition of a wound and includes a range of clinically relevant causes.

Basically, both serious and minor injuries can heal on their own through the body's natural process to repair damaged tissue (Gonzalez et al., 2016), only the duration of healing distinguishes the two and if not treated properly can cause serious infections. Factors that affect wound healing include nutrition, metabolic status, circulatory status, hormones, infection, mechanical factors, foreign objects, size, location and type of wound (Handayani et al., 2020). Wounds are the process of damage to the anatomical structure and function of the skin. This condition can be caused by trauma from sharp or blunt objects, changes in temperature, chemicals, explosions, electric shocks or animal bites.

Wound healing goes through several phases, namely the inflammatory phase, the proliferation phase and the remodeling phase (Velnar et al., 2009). One sign of wound healing is the formation of collagen (Mathew-Steiner et al., 2021). The proliferation phase starts from the 4th day to the 21st day after the injury occurs (Landén et al., 2016). At this stage, collagen begins to form and in general, people treat wounds using drugs in liquid or solid form such as ointments. Drugs that are often used for wound healing and preventing infection in wounds are red medicine and povidone iodine (Betadine) which are modern medicines, there are also forms of herbal medicine where the ingredients used are natural from plants that have been clinically tested for their content which can be used as medicine.

Diabetes mellitus is a chronic disease with metabolic disorders with hyperglycemia where the pancreas cannot naturally secrete insulin, there is a disruption in insulin function, or both. Long-term damage and failure that can occur are in the eyes, kidneys, nerves, heart, and blood vessels if experiencing chronic hyperglycemia (Marathe et al., 2017). In 2013, the prevalence of the Indonesian population with diabetes mellitus was 6.9% with the number of cases ranging from 12,191,564 million based on the population aged ≥15. While in 2018 the prevalence of the Indonesian population with diabetes mellitus increased by 1.6% from 2013 to 8.5% (Riskesdas, 2018). Diabetic ulcers are included in the components that can damage the development of diabetes with a percentage of 15% during the course of their disease. Boulton concluded that up

to 85% of diabetic foot ulcers are caused by underlying peripheral neuropathy that alters foot pressure (Boulton et al., 2005). Ulcers are open wounds on the surface of the skin or mucous membranes.

One of the medicinal plants that has the potential for treating wounds is the Bidara Plant (Ziziphus mauritiana). The Bidara plant (Ziziphus mauritiana) is a plant that has many benefits and has been used for herbal medicine in several countries and has been clinically studied for its content such as alkaloid compounds, glycosides, saponins, flavonoids, terpenoids and phenolics and the best antioxidant activity in its leaves (Khanam et al., 2025; Nilofar et al., 2024). The content in bidara leaves has the potential as a wound healing medicine because it has antibacterial, antiviral, antiseptic properties and also functions in cell regeneration and repair (Irfanitha et al., 2024). Alkaloid compounds have an analgesic function and saponin compounds also stimulate collagen growth in the wound healing process and stimulate the formation of new cells and have a pain relieving effect and have antipyretic activity which is useful as a fever medicine (Falbo et al., 2023).

Independent nursing practices in Surabaya and Sidoarjo use wound cleansing using products marketed by manufacturers such as normal saline or NaCl. At Rumah Luka Surabaya, wound care is done using NaCl wound washing fluid (Sabela, 2022). Such materials are less economical for patients with lower middle economic levels. Wound cleansing using herbal ingredients is also still rarely done, so it is necessary to develop herbal medicines for wound care that are easily obtained and economical.

Nurses play a very important role in patient wound care. A nurse is responsible for helping clients gain comfort, regain optimal health and independent life through the recovery process with minimal cost, time and effort. Wound cleansing using boiled bidara leaf water can be a new alternative, because it has many benefits and advantages. Arabic bidara leaves contain flavonoid compounds (anti-oxidants and anti-inflammatory), alkaloids (anti-bacterial), tannins (anti-inflammatory) and christinin (anti-bacterial) which can be formulated as natural antiseptics (Sabela, 2022). Based on the problems found and the resolution of health problems supported by previous research data, the researcher is interested in raising the title of this mini research proposal for Nursing Professional Education with the title "The Effect of Wound Cleansing of Bidara Leaf Decoction on Healing of Diabetes Mellitus Wounds in the Surgical Room of Toto Kabila Hospital".

Method

The type of research is a quasi-experimental design, with a static group comparison design (Static Group Comparison), namely research on a group that is not given intervention, and comparing it with another group that receives different treatment. In this case, the research design was carried out to determine the effectiveness of wound cleansing of bidara leaves on healing Diabetes Mellitus wounds in the operating room with a Pre-Post control group design approach where in this study, the measurement time of the effectiveness of wound cleansing with bidara leaf decoction on healing Diabetes wounds.

Results

Table 1. Respondent Characteristics

No	Respondent Characteristics		Respondent Characteristics		Control Group	
			n	%	n	%
1	Age	30-40 Years	0	0	0	0
		40-50 Years	4	20	4	20
		50-60 Years	9	45	10	50
		>60 Years	7	35	6	30
2	Gender	Female	6	30	4	20
		Male	14	70	16	80
3	Work	Housewife	5	25	4	20
		Farmer	0	0	0	0
		Self-employed	1	5	0	0
		Private	2	10	0	0
		Civil Servants/Soldiers/Police	0	0	1	5
		Retired	7	35	6	30
		Other	5	25	9	45
4	Long time suffering from DM	<12 Months	0	0	1	5
		1-2 Years	6	30	7	35
		2-3 Years	4	20	7	35
		>3 Years	10	50	5	45
5	Family History	Yes	20	100	19	95
		No	0	0	1	5
6	Regular Exercise/Physical Exercise	Yes	0	0	0	0
		No	20	100	20	100
7	Regular Consumption of Diabetes Medication/Insulin Injections	Yes	20	100	20	100
		No	0	0	0	0
8	Maintaining a Diet	Yes	20	100	20	100
		No	0	0	0	0
9	Random Blood Sugar	Yes	20	100	20	100
		No	0	0	0	0

Source: Primary Data (2025)

The table shows that family history, not exercising regularly/physical exercise, regular consumption of diabetes medication/insulin injections and maintaining a diet are the most as many as 20 respondents (100%) in the intervention group and 20 respondents (95%) in the control group. And the least respondents who work as self-employed as many as 1 respondent (5%) in the intervention group and Civil Servants/Soldiers/Police as many as 1 respondent (5%), duration of suffering from DM <12 months as many as 1 respondent (5%), do not have a family

history as many as 1 respondent (5%) in the control group.

Table 2. Distribution of Respondents Based on DM Wound Healing Before and After Wound Cleansing Using Boiled Bidara Leaves

No	BWAT Indicator	Pre-Intervention	Post-Intervention	Score Decrease
1	Size	2	2	0
2	Depth	3	3	0
3	Wound Edge	3	2	1
4	Tunnel	2	2	0
5	Type of Necrotic Tissue	3	2	1
6	Amount of Necrotic Tissue	3	2	1
7	Type of Exudate	3	2	1
8	Amount of Exudate	4	3	1
9	Color of Skin Around Wound	3	2	1
10	Peripheral Edema	2	1	1
11	Hardening of Edge Tissue	2	1	1
12	Granulation Tissue	5	5	0
13	Epithelialization	5	5	0
	Jumlah Responden	20	20	

Source: Primary Data (2025)

Based on the table, it shows that the mode (the most frequently appearing score) in the observation results of each indicator using BWAT after wound cleansing using bidara leaf decoction showed a decrease in the score on the wound edge indicator. A decrease in the score on the type of necrotic tissue, the amount of necrotic tissue, the type of exudate, the amount of exudate and hardening of the edge tissue. While the decrease in the score on the skin color indicator around the wound and peripheral edema occurred on the 7th day. Based on the statistical test with the Wilcoxon test, it showed that $p = 0.000 \leq \alpha = 0.05$, which means that there was an improvement in DM wound healing in the intervention group using bidara leaf decoction wound cleansing.

Table 3. Effectiveness of Wound Cleansing with Boiled Bidara Leaves on Healing Diabetic Mellitus Wounds

	N	Median (min-max)	Mean	p
Intervention	20	2,12	37,7	0,000
Control	20	3,87	37,2	

Based on statistical tests with the Wilcoxon test, it shows that $p = 0.000 \leq \alpha = 0.05$, which indicates that there is an effect on wound healing in the intervention group that uses wound cleansing using bidara leaves.

Discussion

Based on the table above, it shows that the mode (the most frequently appearing score) in

the observation results of each indicator using BWAT after wound cleansing using bidara leaf decoction showed a decrease in the score on the wound edge indicator on the third day. A decrease in the score on the type of necrotic tissue, the amount of necrotic tissue, the type of exudate, the amount of exudate, the amount of exudate and hardening of the edge tissue. While there was a decrease in the score on the skin color indicator around the wound and peripheral edema on the third day. Based on the statistical test with the Wilcoxon test, it showed that $p = 0.000 \leq \alpha = 0.05$, which means that there was an improvement in DM wound healing in the intervention group using bidara leaf decoction wound cleansing.

Bidara leaves have 4 main compositions, namely alkaloids as anti-bacterial, flavonoids as antioxidants and anti-inflammatory, tannins as anti-bacterial, and christinin as natural anti-bacterial/antiseptic. Factors that affect the healing of DM wounds include age, routine exercise/physical activity, regular consumption of medication/insulin injections, maintaining a controlled diet and blood sugar. The wound care method used to help heal wounds is wound cleansing using boiled Arabic bidara leaves for 3 days.

Wound cleansing is an important component and is a standard goal during acute and chronic wound care, wound cleansing involves the use of cleaning fluids whose selection should be based on the effectiveness and lack of cytotoxicity of the cleaning solution (Wilson et al., 2005). Bidara leaves have been used in alternative medicine for wound treatment and have been shown to have antibacterial, antifungal, antioxidant, antihyperglycemic and antiocciceptive activities (Shady et al., 2022). Bidara leaves are plants that are easy to collect, inexpensive and widespread in many countries and have extraordinary biological activity. Bidara leaves have become medicine and food in several parts of the world, especially throughout the Middle East including Iran. Bidara leaves contain alkaloids, flavonoids and tannins which function as antibacterials (Asgarpanah, 2012).

Bidara leaves contain flavonoids as antioxidants and anti-inflammatories. Flavonoids also have antimicrobial effects and are responsible for wound conditions and increased epithelialization rates (Khanam et al., 2025). Bidara leaves also contain alkaloids as antibacterials (Nurrahma, 2022). The content of cardiac glycoside polyphenols (tannins) which are also antibacterial are also found in bidara leaves (Keita et al., 2018). The christinin compound in the leaves also has benefits as an antibacterial and can be formulated as a natural antiseptic (Darusman & Fakih, 2020). The leaves of this plant are active against salmonella typhi, proteus mirabilis, shigella dysenteriae, Escherichia coli, K. pneumonia, B. melintesis Bordetella bronchiseptica and P. Aeruginosa. Alcohol extract from bidara leaves from leaves also showed good antibacterial activity against staphylococcus aureus. The christinin compound derived from bidara leaves (Ziziphus Sphina-Christi L.) has been shown to be able to inhibit 2 target macromolecules in escherichia coli, and staphylococcus epidermis.

Exudates caused by bacterial infections are closely related to wound healing failure. If there is an excess of bacteria in the wound that causes infection, the body will react with the accumulation of bacteria and dead tissue will form a layer that covers the wound area, inhibiting cell regeneration underneath (Wolcott & Rhoads, 2008). Researchers assume that healing DM

wounds with wound cleansing using bidara leaves affects the type of exudate indicator and the amount of exudate is influenced by the content of alkaloids, tannins, and christinin which are useful as natural antibacterials and antiseptics. So it can help reduce infections that cause exudates.

The decrease in scores in the intervention group using bidara leaf wound cleansing was in the indicators of wound edges, skin color around the wound and hardening of the edge tissue. Based on statistical tests with the Wilcoxon test, it showed that $p = 0.000 \leq \alpha = 0.05$, which means that there is an effect of DM wound healing in the intervention group using bidara leaf wound cleansing.

Bidara leaves have 4 main compositions, namely alkaloids as anti-bacterial, flavonoids as antioxidants and anti-inflammatory, tannins as anti-bacterial and christinin as natural anti-bacterial/antiseptic. While NaCl has 4 main compositions that can help moisturize the environment around the wound, anti-inflammatory, reduce symptoms of pain and erythema, and help increase blood flow to the wound area. Factors that affect DM wound healing include age, routine exercise/physical activity, regular consumption of medication/insulin injections, maintaining a controlled diet and blood sugar. The wound care method carried out to help the wound is wound cleansing using bidara leaf decoction and added NaCl for 3 days.

The leaves of the bidara plant contain flavonoids as antioxidants and anti-inflammatories. Flavonoids also have antimicrobial effects and are responsible for wound contraction and increasing the speed of epithelialization (Hillman et al., 2023). Other contents of the Arabian bidara leaves are alkaloids as antibacterial (Aisyah et al., 2020). The content of cardiac glycoside polyphenols (tannin) which is also antibacterial is also found in the leaves (Keita et al., 2018). The christinin compound in the Arabian bidara leaves also has benefits as an antibacterial and can be formulated as a natural antiseptic (Darusman & Fakih, 2020).

NaCl 0.9% is one of the isotonic fluids that is physiological, non-toxic and does not cause hypersensitivity so it is safe to use for the body in any condition. This isotonic fluid is safe for the body, non-irritating, protects tissue granulation from dry conditions, maintains moisture around the wound and helps the wound undergo the healing process. In addition, NaCl 0.9% has an anti-inflammatory response so that it can reduce symptoms of pain and erythema that arise in wounds, and increase blood flow to the wound area, thereby accelerating the wound healing process (Utami et al., 2024).

Both fluids have in common that they contain anti-inflammatory properties. When injured, the inflammation process begins with erythema (redness) which is characterized by the accumulation of blood in the area of tissue injury due to the release of chemical mediators in the body. Then there is edema (swelling) characterized by plasma seeping into the intestinal tissue at the site of injury and the presence of calor (heat) caused by increased blood collection or because of pyrogens that cause fever. Then dolor (pain) is caused by the release of inflammatory mediators. Drugs that contain anti-inflammatory properties have the activity of suppressing or reducing inflammation. This activity can be achieved in various ways, namely inhibiting the formation of inflammatory mediators prostaglandins, inhibiting the migration of leukocyte cells

to the area of inflammation, inhibiting the release of prostaglandins from the cells where they are formed (Ferrero-Miliani et al., 2007).

The advantages of bidara leaves are that they contain alkaloids and christinin as antibacterial and antiseptic. The antibacterial properties of bidara leaves have been proven to inhibit two bacteria in DM wounds, namely Escherichia coli and staphylococcus epidermidis (Yahia et al., 2020). Bidara leaves also have the advantage of containing flavonoids as antioxidants and anti-inflammatories. Supplementing wounds with antioxidants will help prevent damage due to cell oxidation, thereby improving wound healing. This has been proven that giving antioxidant supplements to diabetic wounds can protect these cells from oxidative stress (the number of free radicals in the body exceeds the body's capacity) which is produced due to high glucose levels (Packer et al., 2001).

The advantage of adding NaCl fluid is as a physiological fluid or isotonic fluid, which has the same concentration of dissolved substances as the human body. NaCl also has a content that can keep wounds moist. A wound environment with balanced moisture will facilitate cell growth and collagen proliferation, while an environment that is too humid can cause wound edge maceration and conditions that are not humid enough can cause cell death. Creating a moist wound environment can help soften and destroy necrotic tissue without damaging healthy tissue (Nunes et al., 2017).

There are various factors that can inhibit the wound healing process. Humans experience physiological changes that drastically decrease rapidly after the age of 45. When old age, skin cells also lose elasticity due to decreased vascularization fluid in the skin and reduced sebaceous glands which further reduce skin elasticity. Inelastic skin will reduce the ability of cell regeneration when the wound will and begins to close so that it can slow down wound healing (Bujakowska et al., 2017). Another factor is lack of physical exercise such as Ankle ROM Exercise. Physical exercise is an important factor in wound healing because it can help smooth blood circulation, so that it can repair tissue in DM wounds. Physical exercise that is carried out continuously and seriously will be beneficial for DM wound sufferers, such as lowering blood glucose levels and improving blood circulation. During physical exercise, muscles contract continuously and activate the blood vessel system and venous pump so that blood circulation will increase. Nerve function and blood pumping to the heart become more active so that it activates the supply of oxygen and nutrients properly. Physical exercise is the main management in healing DM wounds.

Researchers assume that the difference in the decrease in scores on each indicator of the two groups is influenced by the difference in content in Arabic bidara leaves and NaCl. Bidara leaves have content with strong anti-bacterial and antiseptic properties that are useful for fighting bacteria that cause infections in DM wounds. While NaCl has content that can maintain wound moisture, so it can help soften and destroy necrotic tissue without damaging healthy tissue. However, both have the same content, namely as an anti-inflammatory that can suppress or reduce inflammation in wounds and reduce edema, so that blood flow to the wound will be smooth and help heal wounds.

Evidence of the results of the study above is that all respondents 40 people (100%) regularly take diabetes medication or insulin injections, 40 people (100%) maintain a diet, and 40 people (100%) control blood sugar. However, there are several indicators that do not experience a decrease in score. This can be caused by an average age of over 45 years as many as 40 people (100%) and not routinely for sports or physical exercise as many as 40 people (100%). So that wound healing on the indicators of size, depth, tunnel, granulation tissue and epithelialization did not experience a decrease in score. Another factor that influences DM wound healing is the intervention time which is only carried out for approximately 3 weeks which should be carried out for 4 weeks to 2 months for wound care.

Conclusion

Based on the research results, it can be concluded that wound cleansing using bidara leaves (Ziziphus spina-christi L.) and NaCl is effective in accelerating the healing of DM wounds, as evidenced by a decrease in the BWAT indicator score, namely wound edge, type of necrotic tissue, amount of necrotic tissue, type of exudate, amount of exudate, skin color around the wound, peripheral edema and hardening of the edge tissue.

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