

ORIGINAL ARTICLE

Effect of Wound Washing using 40% Red Betel Leaf (*Piper Crocatum*) Infusion on the Healing Process of Diabetic Ulcuses

Pengaruh Pencucian Luka menggunakan Infus Daun Sirih Merah (*Piper Crocatum*) 40% terhadap Proses Penyembuhan Ulkus Diabetik

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 <https://doi.org/10.18051/JBiomedKes.2022.v5.153-160>

ABSTRACT

Background

Diabetes mellitus (DM) is a chronic metabolic disease that can cause various complications. World Health Organization data for 2019, DM is the direct cause of 1.5 million deaths, and 48% of all deaths due to diabetes occur at the age of 70 years. Data from the International Diabetes Federation (IDF), in 2021, Indonesia will be the fifth largest country with DM sufferers, with a total of around 19.64 million and an increase of about 81.8% compared to 2019. One of the complications that can be caused by diabetes mellitus is diabetic ulcers. Diabetic ulcer treatment requires a long time. Proper wound washing is an important factor in wound healing. Red betel leaf infusion can be used as a liquid to wash wounds. This study aims to analyze the effect of wound washing using 40% red betel leaf infusion on the healing process of diabetic ulcers.

Methods

The type of research used is quantitative research using the quasi method - experiment one group pre-post test. The research design is purposive sampling. This research was conducted September-November 2017 at Semarang Independent Practice Nurses (PPM) consisting of 10 respondents.

Results

The test results obtained a p-value of 0.024 (<0.05), meaning that there is an effect of giving red betel leaf infusion more effectively in wound healing. Therefore, this study recommends that nurses washing diabetic ulcer wounds can use 40% red betel leaf infusion.

Conclusion

There is an effect of washing wounds using 40% red betel leaf infusion on the healing process of diabetic foot ulcers with a p-value of 0.024 (<0.05).

Keywords: Diabetic Mellitus; NaCl 0.9%; Red Betel Leaf 40%; ulcus diabetic

ABSTRAK

Latar Belakang

Diabetes melitus (DM) merupakan penyakit metabolik menahun yang dapat mengakibatkan timbulnya berbagai komplikasi. Data World Health Organization tahun 2019, DM menjadi penyebab langsung dari 1,5 juta kematian dan 48% dari seluruh kematian akibat diabetes terjadi di usia 70 tahun. Data International Diabetes Federation (IDF) pada tahun 2021, Indonesia menjadi negara terbesar kelima penderita DM dengan jumlah sekitar 19,64 juta dan meningkat sekitar 81,8% dibandingkan pada tahun 2019. Salah satu komplikasi yang dapat disebabkan oleh diabetes melitus adalah ulkus diabetik. Perawatan ulkus diabetik memerlukan waktu yang cukup lama. Pencucian luka yang tepat menjadi faktor penting dalam penyembuhan luka. Infusa daun sirih merah dapat digunakan sebagai cairan untuk mencuci luka. Penelitian ini bertujuan untuk menganalisis pengaruh pencucian luka menggunakan infusa daun sirih merah 40% terhadap proses penyembuhan ulkus diabetik.

Metode

Jenis penelitian yang digunakan adalah penelitian kuantitatif yang menggunakan metode quasi-experiment one group pre post test. Desain penelitian ini adalah purposive sampling. Penelitian ini dilakukan September-November 2017 di Perawat Praktek Mandiri (PPM) Semarang yang terdiri dari 10 responden.

Hasil

Hasil uji diperoleh p-value 0,024 ($<0,05$) artinya ada pengaruh pemberian infusa daun sirih merah lebih efektif dalam penyembuhan luka. Rekomendasi penelitian ini adalah perawat dalam melakukan pencucian luka ulkus diabetik dapat menggunakan infusa daun sirih merah 40%.

Kesimpulan

Terdapat pengaruh pencucian luka menggunakan infusa daun sirih merah 40% terhadap proses penyembuhan ulkus kaki diabetik dengan p-value 0,024 ($<0,05$).

Kata Kunci: Diabetes mellitus; NaCl 0.9%; sirih merah 40%; ulkus diabetik.

INTRODUCTION

Diabetes mellitus (DM) is an imbalance in blood sugar levels due to disturbances in the hormone insulin, where the body is unable to produce enough insulin to meet its needs.¹ Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. Insulin is a hormone that regulates the balance of blood sugar levels, increasing the concentration of glucose in the blood.² The increasing prevalence of diabetes mellitus in several developing countries has recently been highlighted.³ Increasing per capita income and lifestyle changes, especially in big cities, have led to an increase in the prevalence of degenerative diseases, one of which is diabetes mellitus.⁴

World Health Organization data for 2019, DM is the direct cause of 1.5 million deaths, and 48% of all deaths due to diabetes occur at the age of 70 years.⁵ Data from the International Diabetes Federation (IDF) in 2021, Indonesia is the fifth largest country with DM sufferers, with a total of around 19.64 million and an increase of about 81.8% compared to 2019.⁶

The increasing number of DM sufferers every year demands the nursing profession to continue to improve health services in the future; from the above government programs that have been implemented, there are still many obstacles and deficiencies when implementing the program, so

DM is still a frightening specter. Uncontrolled DM can cause various kinds of macro and micro complications. Macro complications that can occur are heart failure, kidney failure and stroke, while micro complications such as diabetic retinopathy, diabetic nephropathy, peripheral diabetic neuropathy to diabetic ulcers.⁷

DM patients with uncontrolled sugar levels will result in complications if they don't get good treatment; one of the chronic complications is diabetic ulcers. Diabetic ulcers are chronic wounds that are difficult to heal due to neurological disorders (neuropathy) in the limbs that cause tissue damage.⁸ In addition, diabetic ulcers are a consequence of a diabetic peripheral neuropathy damage factor called Diabetic Peripheral Neuropathy (DPN) which is a nerve disorder due to diabetes which is characterized by tingling, pain, or numbness and often attacks the nerves of the feet.⁹ Diabetic ulcers quickly become infected and can expand and even end in amputation.¹⁰

The International Diabetes Federation in 2021 reports that 9.1-26.1 million people with DM have the potential to experience diabetic ulcers each year. Everett and Mathiodakis' research in 2018 an epidemiological survey in six districts in North–West England reported a two-year cumulative incidence of diabetic ulcers of 2.2%. Data from the American Diabetes Association (ADA) in 2019 says that compared to the United States and its prevalence worldwide ranges between 1.4% and 5.9%, where the prevalence of diabetic ulcers in Indonesia is relatively high, because 12% are in hospitals and 24% in the community environment. In Indonesia, the number of people with diabetic ulcers has increased by 11% (RISKESDAS 2018). Several studies have been conducted regarding the healing of diabetic foot ulcers, one of the alternatives that has proven its efficacy is referring to the use of red betel leaf infusion.¹¹

Red betel leaf (*Piper crocatum*) is one of Indonesia's medicinal plants that are easy to cultivate, and one is currently being encouraged to use it. Red betel leaves contain tannins, flavonoids, polyphenols and saponins, which function as antibacterials and can be an alternative in dealing with infections that occur in diabetic ulcers.¹² In vitro research conducted by Haryadi stated that red betel leaves with a concentration of 18% could inhibit the growth of *Staphylococcus bacteria*¹³

Research conducted by Fimani showed that topical administration of red betel leaf infusion with concentrations of 10%, 20%, and 40% affected the healing of diabetic foot ulcers in rats; a concentration of 40% red betel leaf infusion had a better effect on increasing the percentage of wound healing. Compared to concentrations of 10% and 20% red betel leaf infusion.¹¹ Another study by Purwaningsih et al. showed that irrigation with 40% red betel leaf infusion affected diabetic wound healing in alloxan-induced white rats. Based on the increasing phenomenon of patients with DM who experience diabetic ulcers, similar studies have never been carried out in humans. Researchers are interested in researching the effect of 40% red betel leaf infusion on the healing process of diabetic ulcers.¹⁴

METHODS

This research is quantitative with a quasi-research design – one group pretest-posttest experiment. As for the sampling technique using purposive sampling, there was only 1 group, namely the intervention group.¹⁵ This research was conducted within ± three months, from 16 September to 20 November 2017. This research was carried out in Semarang, the Independent Practice Nurse Clinic (PPM). The population of this study were 1790 people with DM accompanied

by diabetic foot ulcers with various types of ulcer degrees; using the Frederer formula to determine the number of samples, a total sample of 10 respondents was obtained. The ethical clearance number in this study is No. 295/IX/2017/Commission on Bioethics. The part in the informed consent consists of volunteering to participate in research, explaining research procedures, explaining response obligations, risks and side effects, benefits, maintaining the confidentiality and all costs borne by researchers. Data analysis in this study consisted of univariate and bivariate analysis using a computerized system. In this study, paired t-test analysis was used to determine the effect of 40% red betel leaf infusion on the healing process of diabetic ulcers.

RESULTS

Table 1. Characteristics of diabetic foot ulcer respondents

Variable	Intervention		
	Mean	SD	Min - Max
Age	55,60	7,027	40 – 63
Duration with DM	8,40	1,77	7 – 10
Duration of wound	22,70	7,97	14 – 30

Table 1 shows the results that the average age of the respondents is 55.60 years. The youngest is 40 years old, and the oldest is 63 years. Based on the length of time the respondents had suffered from DM, the average was 8.40 years. Long suffered from DM, the lowest was seven years, and the highest was ten years. The respondent's injury length was 22.70 days, the fastest was 14 days, and the longest was 30 days.

Table 2. Characteristics of diabetic foot ulcer respondents

Variable	Intervention	
	N	%
Gender		
Male	5	50
Female	5	50
Wound location		
Right foot	4	40
Left foot	6	60

Table 2 shows that the characteristics of respondents based on male and female gender have the same number, namely five people (50%) each. The characteristics of respondents based on the location of the wound were mostly on the left foot, where the number was six people (60%), and the lowest was on the right foot, namely four people (40%).

Table 3 shows that washing the wound using 40% red betel leaf infusion on the healing process of diabetic ulcers in the first measurement with the second measurement obtained a p-value of $0.024 < 0.05$, which means it is significant or has an effect. In addition, the comparison value of measurements in the first treatment and the third treatment showed a significant significance value, namely p-value $0.000 < 0.05$ and the comparison of measurements in the first and fourth treatments showed a significant significance value, namely $p=0.000 < 0.05$.

Table 3. Analysis test of the effect of washing wounds using 40% red betel leaf infusion on the healing process of diabetic ulcers

Variable	N	Mean	SD	p-value
H 1-2	10	0,60	0,69	0,024
H 1-3	10	3,70	1,63	0,000
H 1-4	10	6,40	2,63	0,000

DISCUSSION

This is because people at this age are less active, gain weight, reduce muscle mass and due to the ageing process, which results in a progressive shrinkage of beta cells. The results of this study indicate that the average length of DM respondents in this study was 8.40 years in the intervention group and 8.70 years in the control group, where the highest number of DM characteristics was ten years. This research is in accordance with the results of Roza's study, which stated that the duration of DM \geq 5 years is a risk factor for diabetic ulcers because neuropathy tends to occur around five years or the same as after suffering from DM. The results showed that the average duration of the respondents' injuries in this study was 22.70 days in the intervention group and 12.70 days in the control group. Old wounds in diabetic ulcers are initially caused by open wounds on the skin surface caused by macroangiopathy complications resulting in vascular insufficiency and neuropathy. Furthermore, there are wounds in patients that are often not felt and can develop into infections caused by aerobic and anaerobic bacteria.¹⁶

This research is in line with the results of a study by Wicaksono, which stated that men are 0.9 times more at risk of developing DM than women, although this is not statistically significant. This is due to hormonal factors (the hormone estrogen in women, which can prevent vascular complications, which decrease with age) and differences in life habits, such as smoking and alcohol consumption in men. Smoking habits cause impaired glucose metabolism and increased insulin resistance which causes an increased risk of developing DM.¹⁷

This study is in line with research conducted by Nurhanifah¹⁸ that most ulcers are categorized as Limb Threatening/threatening the lower extremities, namely in the leg area, as many as 32 respondents (64%). Diabetic ulcers consist of a central cavity, usually larger than the entrance, surrounded by thick, graded calluses. Initially, the ulcer formation process is associated with hyperglycemia which affects peripheral nerves, collagen, keratin and vascular supply. With mechanical stress, hard keratin forms in the areas of the feet that experience the greatest load. Peripheral sensory neuropathy allows repeated trauma to result in tissue damage in the callus area. Subsequently, a cavity forms, which enlarges and eventually ruptures through the skin surface through the ulcer. The presence of ischemia and abnormal wound healing impede resolution. Neuropathy and vascular disease are the main factors contributing to injuries. The wound problems that occur in patients with diabetes are related to the impact on the nerves in the feet and are

usually known as peripheral neuropathy. Disorders of the blood vessels in the diabetic foot, a state of continuous hyperglycemia, will have an impact on the ability of the blood vessels not to contract and decrease relaxation; this results in a decrease in the body's blood circulation.¹⁹

The findings of this study are in accordance with the results of previous studies that topical administration of red betel leaf infusion at concentrations of 10%, 20% and 40% affected wound healing in diabetic rats. Red betel leaf infusion concentration of 40% had a better effect on increasing the percentage of wound healing than red betel leaf infusion concentrations of 10% and 20%. The results of the phytochemical screening examination using thin-layer chromatography concluded that the red betel leaf sample contained flavonoids, alkaloids, polyphenolic compounds, tannins, and essential oils.¹¹ The essential oil content in the betel plant is around 40%. The essential oil of the red betel plant consists of several chemical compounds, namely chavicol, chavibetol, estragole, cineol, carvacrol, phenyl propada, terpenes, eugenol, methyl eugenol, caryophyllene, and arecoline. In addition to containing essential oil components, red betel also has water and protein, fat, carbohydrates, fibre, calcium, phosphorus, iron, carotene (in the form of vitamin A), thiamine, riboflavin, nicotinic acid, and vitamin C.⁴ The content of alkaloids and flavonoids in red betel plants has hypoglycemic activity. Chavicol is one of the phenolic compounds in the red betel plant, which has antibacterial power five times stronger than ordinary phenol. Another phenol derivative that has antibacterial properties like chavicol is chavibetol. Carvacrol is efficacious as a stimulant, antiseptic, and antispasmodic. In addition, eugenol and methyl eugenol have antiseptic and analgesic properties, so that they can be used for pain relief. Cardinene and sesquiterpenes are a class of hydrocarbons which have antiseptic, diuretic and carminative properties. In general, the essential oils contained in the betel plant are antiseptic and antimicrobial. Arecoline, contained in all parts of the betel plant, is useful for stimulating the central nervous system and thinking power. Iodine in this plant is efficacious as an anti-fungal. Tannins are efficacious as astringents. The terpene content in the betel plant has properties as a disinfectant.¹⁹ Empirically, red betel leaf, used alone or in combination with other medicinal plants, can treat various diseases, such as diabetes mellitus, and wounds that are difficult to heal. In addition, red betel leaves are also efficacious for cleaning wounds.²⁰

CONCLUSION

The findings of this study can add to the latest wound care theory that there is an effect of washing wounds using a combination of 40% red betel leaf infusion on the healing process of diabetic foot ulcers with a p-value of 0.024 (<0.05).

ACKNOWLEDGEMENT

Acknowledgments are addressed to those who professionally contributed to the writing of this article, including technical, financial and material assistance.

AUTHORS CONTRIBUTION

W: Research design, data analysis, report writing, publication preparation

W and IP : collecting data

M : Research permit

FUNDING

Research funding is covered by researchers.

CONFLICT OF INTEREST

There is no conflict of interest between the authors.

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