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THE EFFECT OF HONEY AND ZINC CREAM AS TOPICAL DRESSING FOR EPITHELIZATION IN DIABETIC FOOT ULCER

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ABSTRACT

Diabetic foot ulcer is a complication that often serves Diabetes Mellitus patients. Currently, wound care has used dressings to keep the wound environment moist, but in general, foot wound care requires high costs, so it is necessary to figure out the alternative wound care that is really effective and cost-effective in wound healing. One type of alternative therapy for topical treatment of diabetic foot ulcers that can be used is topical honey. The aim of this research was to identify the effect of topical honey and zinc cream on epithelization in the treatment process for diabetic foot ulcers. This type of research is inquiries, namely intervention, and control group design. The sample consisted of 60 respondents consisting of 30 wound care groups using topical honey and 30 wound care respondents using zinc cream with the sampling technique, namely consecutive sampling. Honey was used with 87% honey concentration and lipid tissue epithelialization was measured using the Bates Jensen Wound Access Tool (BJWAT). Data analysis used the Mann-Whitney test as an alternative test for the independent t-test. The results showed that there was no significant difference in wound tissue epithelialization between the wound care group with zinc topical cream and honey topical cream (p-value> 0.05). The Conclusions which is based on the results of analytical tests, wound care using topical zinc cream and topical wound care using honey did not have a significant difference in the epithelialization process of diabetic foot ulcers, but clinically the epithelialization process of diabetic foot wounds with topical honey treatment was faster than using zinc cream. It is recommended that topical wound care using honey can be used as an alternative topical in the treatment of diabetic foot ulcers.

***Keywords**: Diabetic Foot, Honey, Ulcer, Zinc Cream*

INTRODUCTION

The health data from the World Health Organization (2016) states that in 2014 there were 422 million people with diabetes mellitus with a prevalence of 8.5% of the adult population. Cho et al. (2018) state that the prevalence of diabetes mellitus will increase in 2030, namely with a prevalence of 439 million adults. Meanwhile, The data from the Indonesian Ministry of Health (2013) and the Indonesian Ministry of Health's Research and Development Agency showed that the prevalence of diabetes in Indonesia in 2013 was 2.1%. In 2014, diabetes mellitus sufferers in Indonesia increased by 12,189,685 people. A total of 31 provinces (93.9%) showed a very significant increase in the prevalence of diabetes mellitus.

If Diabetes Mellitus can not be handled properly will certainly increase the incidence of chronic complications. One of the complications of diabetes mellitus that can cause major problems is a diabetic foot ulcers (Yazdanpanah, 2015). diabetic foot ulcers is the most common complication experienced by type diabetes patients. II. Diabetic foot injuries occur due to local tissue death. The impact of untreated diabetic foot wounds is that they disrupt the patient's activities due to difficulty walking so that this can affect the psychological status of the patient (Ozawa et al. 2014)

Modern wound care using natural honey dressings can reduce the number of leg amputations in people with diabetic foot ulcers. Wound care is carried out by washing the wound, removing dead tissue, and choosing the right dressing with the principle of maintaining wound moisture (Jan et al. 2012). The advantage of this moist concept is that it creates an environment that accelerates re-epitalization, maintains moisture, and reduces infection, a moist wound bed can stimulate the release of growth factors that accelerate the wound healing process (Halim, Khoo, and Mat Saad 2012).

There is a type of topical zinc cream which is currently being used frequently for approximately 16 years in wound care as a modern dressing. This topical therapy is a salf type and has been tested previously at the Wocare Clinic, as was the research which was conducted by Affan (2014) about the effectiveness of topical therapy in the chronic wound healing process, the results showed that topical zinc cream therapy had a significant effect on speeding up the healing process of chronic wounds.

Patients with diabetic foot ulcers need long-term care to recover and definitely have risks in caring that are warranted by the patient and family. Treatment of diabetic wounds in Indonesia requires a high cost of Rp. 1.3 million to Rp. 1.6 million per month and Rp. 43.5 million per year for a patient. This is a phenomenon that causes injured patients or their families to not routinely undergo the wound care process. So that the wound healing is not maximized until the epithelialization process. Wound care that is not optimal until the epithelialization process can lead to failure of wound healing due to new wounds due to bleeding or infection (Hudha et al. 2014)

Nurses need to pay attention to alternatives in wound care. Complementary therapies can aid in wound healing in a cost-effective way. One of the traditional medicines that can be used to treat

wounds is honey (Al-Waili et al. 2015). Honey contains sugars and flavonoids so it can prevent the development of the bacterial activity. In addition, the antibacterial activity in honey occurs due to the presence of hydrogen peroxide and flavonoids (Labban, 2014)

Asri Wound Care is a Wound Care Center that has been using modern dressing therapy for ± 8 years. This is because the main principle of modern dressing is to use the concept of moist with closed wound care. Based on the results of interviews conducted by researchers with 12 patients who received wound care by researchers while doing independent practice, the 12 patients stated that they were satisfied with wound care using modern dressings, it was because the smell of the wound was reduced and the growth of wound tissue was faster. However, among the 12 people, 7 of them expressed financial constraints in ongoing care, so they were unwilling to carry out ongoing wound care.

Based on this phenomenon, the researchers plan to find the most cost-effective topical type of therapy when used in wound care, one of which is using honey therapy as the lowest topical which can make microorganisms on the wound difficult to reproduce so that the tissue granulation process is faster and has a low pH level because the pH level has passed laboratory tests. So that the researchers are interested in conducting further research on "The Difference of Epithelialization Between Wound Care Using Topical Honey Therapy with Topical Zinc Cream Therapy for Diabetic Foot Ulcers ". This study aims to determine the effect of topical honey and zinc cream on epithelialization in the treatment process of diabetic foot ulcers.

METHOD

This study used a quasi-experimental type using a non-equivalent control group design. The number of samples involved was 60 respondents consisting of 30 respondents in the wound care group using topical honey and 30 respondents in the wound care group using zinc cream with the following criteria: 1) Patients aged ≥ 35 years, 2) Never received the same intervention from researchers or other health workers, 3) Consuming oral diabetes medication or insulin, 4) No nutritional disturbances, 5) The wound is already in the granulation stage. The exclusion criteria were: 1) experiencing symptoms of shock, shortness of breath, and needing immediate treatment (emergency situation), 2) unwilling to become respondents, 3) the dead patient.

The sampling technique was consecutive sampling. Honey was used with 87% honey concentrate and wound tissue epithelialization was measured by using the Bates Jensen Wound Assessment Tools (BJWAT).

Data were analyzed by using the Mann-Whitney test as an alternative independent t-test with p value <0.05 to determine the difference in epithelialization between wound care using honey topical therapy and zinc cream topical therapy on diabetic foot ulcers. Meanwhile the homogeneity test of the characteristics of the respondents, namely age, gender, nutritional status, and occupational status, used the chi square statistical test.

RESULT

The study was conducted on November 24 to December 25 2019 on 60 patients who had diabetic foot ulcers and fulfiil the study inclusion criteria at the Asri Wound Care Medan. A number of respondents were divided into 2 groups, namely 30 respondents as a wound care group using topical honey therapy and 30 respondents as a wound care group using zinc cream topical therapy. The data that has been collected then were analyzed by univariate and bivariate methods. The results of the study will be presented in the following table form:

1. Univariate Analysis

Univariate analysis was performed to describe respondent's characteristic and wound epithelialization category in both groups

a. Characteristics of Respondents

Based on table 4.1, it shows that the majority of the wound care group with topical zinc cream is in the elderly age range (45-> 90 years) as many as 28 people (93.3%), as well as wound care with topical honey, the majority are in the elderly age range (45-> 90 years). as many as 26 people (86.7%). Based on gender, most of the respondents in the wound care group using topical zinc creamber were male as many as 16 people (53.3%). Meanwhile, the wound care group using topical honey was mostly female as many as 16 people (53.3%). The nutritional status of respondents in the wound care group using topical zinc cream, mostly were in good nutritional status as many as 21 people (70.0%) Likewise, the nutritional status of respondents in the wound care group using topical honey, most of them were in good nutritional status as many as 24 people (80.0 %). The work status of respondents in the wound care group using topical zinc cream was 17 people (56.7%) and 18 people (60%) in the wound care group.

If viewed from the results of the equality test of respondents between the wound care group using topical zinc cream and the wound care group using topical honey, the p value> 0.05 was obtained for the characteristics of age, sex, nutritional status, and work status. It shows that the characteristics between the two groups are equal

Table 1. Characteristics of Respondents in Group with *Zink Cream* and Group with Honey

Characteristics		Group of Zinc (n=30)		Group of Honey (n=30)		*p value*
		f	(%)	f	(%)	
Age	35-44 years	2	6.7	4	13.3	1.000
	45->90 years	28	93.3	26	86.7	
Total		**30**	**100**	**30**	**100**	
Gend	Male	16	53.3	14	46.7	0.299

er	Female	14	46.7	16	53.3	
Total		**30**	**100**	**30**	**100**	
Nutrition Status (IMT)	Inadequate (<18,5)	6	20.0	5	16.7	0.879
	Good (18,5-25,0)	21	70.0	24	80.0	
	Over (>25,0)	3	10.0	1	3.3	
Total		**30**	**100**	**30**	**100**	
Work Status	Work	17	56.7	18	60.0	0.465
	Doesn't Work	13	43.3	12	40.0	
Total		**30**	**100**	**30**	**100**	

Note : the p value uses the chi square statistical test.

b. Wound Epithelialization Category in Both Groups

Table 2. Distribution of Wound Epithelialization Categories in the Treatment Group with Zinc Cream and

Category Epithelialization	Group Zinc (n=30)		Group Honey(n=30)	
	n	(%)	n	(%)
1 100% Close wound (score 1)	12	40.0	15	50.0
2 75% to 100% Close wound (score 2)	15	50.0	13	43.3
3 50% to < 75% Close wound (score 3)	2	6.7	1	3. 3
4 25% to < 50% Close wound (score 4)	1	3.3	1	3.3
5 < 25% Close wound (score 5)	0	0	0	0
Total	**30**	**100**	**30**	**100**

Based on table 2, it shows that the wound care group using topical zinc cream was mostly in the 75% to 100% category of closed wounds as many as 15 people (50.0%) and some others were in the 100% category of closed wounds as many as 12 people (40.0%). While wound care using topical honey, most of them were in the category of 100% closed wounds as many as 15 people (50.0%) and some were in the 75% to 100% category of closed wounds as many as 13 people (43.3%).

2. Bivariate Analysis

Bivariate analysis was carried out to test the mean difference in the value of wound epithelialization in the treatment group using topical zinc cream and the treatment group using topical honey. Before the bivariate analysis is carried out, a data normality test will be carried out, which is an absolute requirement for a parametric test. Researchers used the normality test inferentially, namely looking at the p value in the Shapiro-Wilk test. The data distribution was normal if the p value was> 0.05. The normality test for the intensity of the child's pain was presented in the following table:

a. Normality Test

Table 3. Normality Test of Wound Epithelialization Values in The Zinc Cream Group and the Honey-Using Group

Variable	Group	*p value*
Epithelialization Value	Using *Zink cream*	0.000
	Using Honey	0.000

The results of the normality test in table 3 above show that in the analytic test of the data distribution of the epithelialization score of the wound care group with zinc cream and wound care with honey, the p value was <0.05. So it is said that the distribution of the data is not normally distributed (p value 0,000). Therefore, the statistical test used a non-parametric test, namely the Mann-Whitney test as an alternative test for the independent t-test.

b. Difference Of Mean Wound Epithelialization In The Wound Care Group With Zinc Cream And Wound Care With Honey

Table 4. Differences In The Mean Of Wound Epithelialization In The Wound Care Group With Zinc Cream And Wound Care With Honey

Wound Epithelialization	n	Mean	SD	SE	*Me (Min-Max)*	*P value*
Treatment with Zink Cream	30	1.73	0.740	0,135	2.00 (1.46-2..01)	0,420
Treatment with Honey	30	1.60	0.724	0,132	1.50 (1.33-1.80)	

Based on table 4, it shows that the mean of wound epithelialization value was smaller by using honey topical therapy than using topical zinc cream. The smaller the epithelialization value, the wider the wound is epithelialized. Further analysis, if viewed from the statistical test value obtained p value 0.420 (p value> 0.05) so that the mean value of wound epithelialization in the wound care group using topical zinc cream and wound care using topical honey was not significantly different.

DISCUSSION

1. Characteristics of Respondents

Based on the results of the study, it can be described that the majority of respondents who experience diabetic ulcers are in the elderly age range (45 -> 90 years). This is supported by the results of other studies by Manda, Sreedharan, Muttappallymyalil, Das, Hisamatsu (2012) that the prevalence of experiencing diabetic ulcers is mostly in the age range of 50 - 59 years. The increasing age, the greater the risk of developing diabetes mellitus and diabetic ulcers. An elderly person> 60 years old is more susceptible to diabetic ulcers due to decreased secretion or insulin resistance so that the body's ability is less than optimal in controlling high blood sugar levels, the risk of experiencing arteriosclerosis, macroangiopathy, which can affect the decrease in blood circulation in the leg veins.

Most of the respondents in the wound care group using topical zinc cream were male, while the wound care group using topical honey were mostly female. The majority of respondents who were female in this study were in the elderly age range, so that they may have had menopause. Arnetz, Ekberg, and Alvarsson (2014) states that women who had menaupose are very susceptible to diabetes mellitus and are at risk of experiencing complications, namely diabetic ulcers. This is because in menopausal women, there is a decrease in the hormones estrogen and progesterone, which triggers an increase in blood sugar levels. High blood sugar levels can cause a decrease in peripheral tissue perfusion, decreased immunity, and provide glucose nutrition to microorganisms, which can affect the occurrence of pressure ulcers.

The nutritional status of respondents is seen from the value of BMI (Body Mass Index) based on measurements of height and weight. Based on the nutritional status in this study, the majority of respondents in the wound care group with topical zinc cream were in the good nutritional status category (BMI 18.5 - 25.0 kg / M2) and the majority of respondents in the wound care group using topical honey had good nutritional status (BMI 18, 5 - 25.0 kg / M2). A person with good nutritional status, having sufficient albumin and transferrin can accelerate the wound healing process. Basri, Harastuti, and Rahmatia (2018) also explains that nutrition is a substance needed in the process of growing new tissue and accelerating the wound healing process.

Based on the results of the study, it was illustrated that most of the respondents in the wound care group used topical zinc cream and topical honey treatment has working status. The slow healing process was seen in patients who had high activity, in addition to dressing dirty quickly, wounds often bleeding and swollen feet. Activity is proportional to pressure, the higher the patient's activity, the higher the pressure obtained by the wound. The development of wounds tends to be slow. Person's activity> 15 minutes without using off loading can increase pressure in the distal area and reduce perfusion of wound tissue due to arterial pressure.

2. Wound Epithelialization in Both Groups

Wound care at the Asri Wound Care for diabetic foot ulcers patients is carried out in accordance with modern wound care standards that maintain the concept of moisture balance. The

wound care process begins with washing the wound and assessing the wound using the BJWAT format with an epithelialization value range of 1-5, then choosing a topical dressing according to the needs of the wound. In this study, researchers focused on patients with topical wound care using zinc cream, and topical honey as the primary dressing for wounds that had 50% granulation. The wound dressing is changed every 3-4 days, in order not to interfere with the wound healing or epithelialization process. If the bandage is changed for less than 3 days, it is feared that the wound tissue will bleed more easily. So that the healing process is getting longer. After 3 weeks of wound care, different wound characteristics were obtained for each patient, both in terms of wound size, wound edges, surrounding skin color, and epithelialization. Granulated and epithelialized wound tissue, characterized by a pink wound bed extending> 0.5 cm from the edge and bed of the wound. A pink wound base indicates that the tissue has granulated and is epithelialized.

Based on the results of the study, there were differences in the mean and standard deviation of the wound epithelialization values in the wound care group using topical zinc and topical wound care using honey. In the wound care group with topical zinc cream, the mean value was 1.73 and a standard deviation was 0.740. Whereas in the wound care group using topical honey therapy, the mean value was 1.60 and the standard deviation was 0.724. The smaller the wound epithelialization value, the better the wound condition. The average wound epithelialization value in the two groups was not that much difference. This is because zinc cream is a topical therapy as a modern dessing that can accelerate the epithelialization process and maintain wound moisture. Likewise with honey. Honey can be used as an alternative in wound care, which can speed up the epithelialization process of diabetic foot wounds, so that wound healing is also faster. Wound care using honey as a cost-effective treatment for patients with diabetic foot wounds requires long-term care.

Wound epithelialization is also described in the form of categories with a value of 1 = 100% epithelialization, a value of 2 = 75% -100% epithelialization, a value of 3 = 50% - 75% epithelialization, a value of 4 = 25% - 50% epithelialization, and a value of 5 = <25% epithelialization. The results illustrated that the majority of respondents in the diabetic foot wound care group using topical zinc cream (50%) experienced epithelialization 75% to 100%. Clinically, the picture of the results of wound care with topical zinc cream during treatment, namely people with pink scar tissue, reduced exudate , odor decreases, and slough disappears. While the topical treatment using honey, most (50%) experienced epithelialization, namely 100% closed wound, intact surface. The description of the results of treating diabetic foot wounds using honey topical during treatment showed that the wound tissue looked moist, had no smell, decreased or even disappeared, and revealed by some respondents that the wound felt cooler and less painful.

As the opinion of Horn (2013) that honey has anti-histamine substances which work to reduce capillary permeability, reduce edema of activation of free nerves

that carry pain sensations. According to Mama, Teshome, and Detamo (2019) and Saikaly and Khachemoune (2017) that the glucose and water content in honey can provide osmotic properties and can maintain a moist environment in the wound. So that a moist wound environment will stimulate granulation and epithelialization of the wound. In the wound care group, topical honey was used to kill the microbes in the wound so that it could accelerate the process of forming new tissue which is said to be epithelialization. This is because honey can release hydrogen peroxide as a reaction of the enzymes glucose oxidase and catalase. Honey used in this study is a type of real honey with a concentrate of 87% which contains glucose and water. Faisal Al Fady (2012) Original honey has a water content of 17 , 10 grams, while the mixed honey has a water content of approximately 20 grams of water.

3. The Difference Of Epithelialization Of Diabetic Foot Wounds Between Wound Care Using Honey Topical And Zinc Cream

Treatment of diabetic foot wounds at the Asri Wound Care Center maintains the principle of feature balance. Halim, Khoo, and Mat Saad (2012) stated that a moist wound bed can stimulate the release of growth factors that accelerate the wound healing process. Based on the results of statistical tests, it shows that at the 95% confidence level the p value is 0.420 (p value> 0.05) so that the mean value of wound epithelialization using topical zinc cream and wound care using topical honey was not statistically different.

The mean of tissue epithelialization treated on diabetic foot wound treatment using honey topical was smaller than the tissue epithelialization rate treated using zinc cream topical. The smaller the epithelialization value, the better the wound epithelialization process. This is supported by research conducted by Moghazy et al (2010) that the technique of treating diabetic foot ulcers using honey is applying honey infused with gauze to the wound, then showing the size of the wound is getting smaller and there is a granulation process. So that this will speed up the healing process.

It could be said a good wound healing if the wound base is bright red and moist with pink wound epithelium on the wound edge. The wound will be completely closed if the epithelium will spread to the center of the wound while the granules that grow from the wound base will go to the wound surface (Halim et al, 2012). Honey is a product made by bees with several processes from plants collected from various plants. The honey used by researchers to treat diabetic foot ulcers is taken from bees that eat food from mango leaves. The honey used by researchers has passed the USU Pharmacy laboratory test process to assess the glucose and water concentrates in the honey content. The value of the honey concentrate used by the researchers was 87% and the wound tissue in the proliferation phase was completely epithelized with topical honey treatment. Objectively, the investigators saw that the wound was pink, moist and not accompanied by blood, and the patient revealed that the pain was decreased.

Honey has several therapeutic benefits in wound healing including

as an antimicrobial, anti-inflammatory, and stimulating tissue growth. The content of hydrogen peroxide in honey is effective at killing microbes and activates proteases thereby increasing percutaneous blood flow in ischemic tissue which can stimulate the formation of new tissue. Anti-inflammatory in honey is related to the formation of free radicals by hydrogen peroxide. In addition, honey can increase fibroblasts so that the formation of new tissue is faster. Furthermore, these free radicals activate anti-oxidant substances in honey, so that the anti-oxidant substances will be active and prevent the tissue damage.

This is supported by research conducted by Biglari et al. (2013) that the level of diabetic foot pain has decreased significantly with treatment using topical honey. Regarding the observation of wound care professionals using honey, that honey can be used as a topical wound care. Topical wound care using honey with a concentrate of 87% has almost the same wound healing ability as other topical therapies such as zinc cream. As supported also by the opinion of Robson, Dodd, and Thomas (2009) that honey with high concentrations used on the wound surface has the ability to kill microorganisms greater, which is because honey with high concentrations can increase the concentration of hydrogen peroxide (H2O2) so that microorganisms cannot reproduce in the wound area. In addition, honey nourishes wound tissue. Research conducted by Nilawati Usman et al. (2016) and Majtan (2014) states that using trigone honey contains phenol, quercetin, vitamins and minerals.

Wound care using zinc cream, which is a topical wound treatment that can improve the wound healing process, is generally used in patients with diabetic foot wounds. In addition, topical zinc cream has benefits for the epithelialization process, but has a risk of hypergranulation. This zinc cream topical has often been used for approximately 16 years in wound care. This topical therapy is a salf type, and has been previously tested at the Wocare Clinic. Wound care using zinc cream is supported by research conducted by Affan (2014) on the effectiveness of topical therapy in the chronic wound healing process. The results showed that zinc cream topical topical therapy had a significant effect on accelerating the healing process of chronic wounds (p value = 0.0001).

In this study, apart from the topical therapeutic effects of honey and zinc cream, wound healing can also be influenced by other supporting factors such as nutritional status and patient compliance in carrying out treatment. Wound care at the Asri Wound Care Nursing Center was carried out holistically by paying attention to physical needs, Psychological, social and spiritual patients. Before the patient is treated with wounds, the patient is analyzed and his nutritional status is assessed to determine the general condition of the patient and the patient's readiness to perform wound care with optimal results. After the wound care is done, the patient is given education regarding things that can affect the wound healing process such as nutrition that must be fulfilled during treatment so that the patient has a good nutritional status, and activities that need to be limited to

prevent pressure on diabetic foot ulcers. Therefore, based on the results of data collection, it was found that most patients with diabetic foot ulcers had a good nutritional status. So that it is possible to help the wound healing process, either by using topical honey or zinc cream.

Based on the explanation above, it can be concluded that honey with concentrate (87%) can be used as a topical alternative such as zinc cream because it is proven to increase the epithelialization process due to the content of honey which has properties to maintain wound moisture (mouisture balance) like opical in general. The choice of topical used in the treatment of diabetic foot wounds requires higher costs, so the wound nurse should always consider cost effectiveness and the economic capacity of the patient. In general, these findings suggest that honey is an effective and feasible treatment option for the professional treatment of diabetic foot wounds.

CONCLUSION

Based on the results of this study, the researchers concluded that statistical results showed that topical wound care using zinc cream and topical honey treatment did not significantly differ in the epithelialization process of diabetic foot ulcers. In the wound care group with topical zinc cream, the mean value was 1.73 and a standard deviation was 0.740. Meanwhile, in the treatment group using an apitopical medium, the mean value was 1.60 and the standard deviation was 0.724. The less the value of the wound, the better the wound. Therefore honey can be used as an alternative topical therapy in cost effective wound care for patients with diabetic foot ulcers. It is hoped that it can become a scientific treasure of modern wound care in applying alternative (complementary) therapies with the use of honey as a topical treatment for patients with diabetic foot ulcers. Topical honey therapy with high concentrations can improve the process of wound epithelialization as an alternative to topical therapy with cost-effective attention.

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