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Article

The Effect of Wound Treatment Using Honey on Colonization of *Staphylococcus Aureus* Bacteria in Diabetic Wounds in Patients with Diabetes Mellitus in the Work Area Banjarmasin Health Center

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Abstract: Background: Diabetic wounds are very easy to experience complications in the form of infection due to bacterial invasion, and sugar conditions blood which tall encourage the growth of bacteria.Bacteria that can cause infection in diabetic wounds wrong one is *staphylococci aureus* . Wound diabetes can treated with honey. Honey contains antibacterial , antioxidant and hydrogen peroxide properties that help kill bacteria dangerous. Objective: The purpose of this study was to determine the effect of the wound dressing contains honey against bacterial colonization *Staphylococcus aureus* on wound diabetic. Methods: The research design used is *pre-experimental* with o *ne-group pre-test and post-test design* . Sampling method using *consecutive sampling* as many as 7 respondents. Results: Analysis data use test *dependent t-test* and obtained score *p value* 0.000 (*p value* < = 0.05), so could concluded there is influence care wound use honey to colonization bacteria *Staphylococcus aureus* in wounds diabetic Diabetes Mellitus patients in the region work Public health center Banjarmasin. Conclusion: best Use honey as product care wound because nature the antibacterial which could prevent infection and speed up process healing wound .

Keywords: care wound ; wound diabetic ; honey ; *staphylococcus aureus*

INTRODUCTION

Diabetes is group disease which variety marked with increased or hyperglycemia accompanied by disturbances metabolism due to imbalance hormone, which cause a variety of acute complications and chronic [1]. This disease causes several complications. The most common complications in diabetic patients mellitus is the appearance of pathological changes in the extremities, namely pain on foot, developing wound [2].

The goals of diabetes mellitus treatment are to: reduce the risk of microvascular and macrovascular complications , improve symptoms of complications, reduce the number of cases of death, and improve the quality of life of people with diabetes mellitus. The risk of complications due to medication and diet management, as well as efforts to prevent complications of diabetes mellitus , has the potential to affect the quality of life for sufferers. Health professionals should pay more attention to the quality of life of people with diabetes mellitus because it can refer to the success of intervention or therapy [27].

Amount people with diabetes mellitus worldwide are about 171 million in 2000 and is estimated to be will reach 366 million by 2030 [3]. Amount It is estimated that diabetics in Indonesia more from double Becomes around 21.3 million by 2030 [4]. In Indonesia, death consequence wound in diabetes mellitus is 17-32% and the amputations 15-30% [5]. Diabetes mellitus in Banjarmasin is disease abscess the most fifth in South Kalimantan from 2009 to 2010 , after influenza, diarrhea , hypertension , and fever typhoid clinical ,

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calculated by 3.66% in 2009 and 3.61% in 2010. % is [6]. Banjarmasin is one districts diabetics in South Kalimantan . In 2013, 9,112 diabetic patients were treated at home sick . Three big visit diabetic patients are Public health center Banjarmasin as many as 673, Puskesmas Banjarbaru as many as 611 and Puskesmas Peat as many as 561. In 2013 , the number of Diabetic patients at the Banjarmasin Health Center continue increase from month to month . In October 2013 there were 38, November 2013 45 people and December 2013 49 people .

Very diabetic wound easy develop Becomes complications in the form of infection consequence invasion bacteria , and the presence sugar high blood is perfect place for growth bacteria [7]. Bacteria potential is bacteria biofilm former. This biofilm produced by bacteria *Staphylococcus aureus* and Pseudomonas aeruginosa. Presence of a biofilm on the base wound could hinder activity phagocytosis neutrophil polymorphonuclear during the healing process wound [8] .

Care wounds in diabetics could conducted with therapy nonpharmacologic . Honey is therapy the usual non- pharmacological given in treatment diabetic wounds [9]. Nature antibacterial honey help treat infection wounds and effects anti-inflammatory reduce pain , improve Genre blood , and affect the healing process . Because honey also stimulates growth network new . no only speed up healing but also reduce appearance skin stains and marks wound [26].

Based on description above so researcher To do study about influence treatment wound honey to colonization Bacteria *Staphylococcus Aureus* on diabetic wounds of diabetic patients at the Banjarmasin Public Health Center , I interested for apply it .

METHOD

Study this use pre - experimental design : one group with pre-and post-tests with count colonization bacteria *Staphylococcus Aureus* before and after intervention . Population study this is amount Diabetic patients registered in the region work Public health center Banjarmasin between month October until December 2013 that is as many as 132 diabetic patients . retrieval technique sample using sequential sampling. Taking sample for study this based on respondents who meet criteria inclusion .

Sample for survey this fulfills criteria inclusion are 7 respondents . Criteria inclusion study this is Diabetic patients registered in the region work Public health center Banjarmasin with Grade I, II, and III diabetic wounds as well as genuine and willing ones Becomes respondent is diabetics . Criteria exclusion study this is diabetics who receive bandage wounds containing honey , diabetics who have history or proven allergy honey , diabetics with disease kidney or wounds , and those that don't could continue the research process , while respondents who do not . solution .

Survey done at home each respondents . Intervention for every respondent conducted four times, once a day , with each treatment in progress about 30 to 60 minutes . Taking sample pre-test was carried out on the day first before treatment and taking post-test samples were carried out on the 6th day after treatment . Tool data collection used in study this is counter colony and sheet observation amount colonization *Staphylococcus Aureus* . Processing and analyzing data with the SPSS program using a statistical test dependent t-test or statistical test pair at level 95% confidence (α = 0.05).

RESULTS

Characteristics of Respondents

Table 1. Distribution of Characteristics of Diabetes Mellitus Respondents with Diabetic Wounds in the Work Area.

Health Center Banjarmasin.

No	Characteristics Respondent	Amount (person)	Percentage (%)

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1.	Gender		
	a. Man	2	28.6
	b. Woman	5	71.4
	Total	7	100
2.	Education		
	a. No school	1	14.3
	b. SD	4	57.1
	c. JUNIOR HIGH SCHOOL	0	0
	d. SENIOR HIGH SCHOOL	2	28.6
	e. College	0	0
	Total	7	100
3.	Work		
	a. Doesn't work	1	14.3
	b. civil servant	1	14.3
	c. Self-employed	1	14.3
	d. Farmer	4	57.1
	e. Retired	0	0
	f. Etc	0	0
	Total	7	100

Data on table 1 describe characteristics general respondent in study this . Majority respondent is woman that is as much 5 person (71.4%). Part big respondent educated school base (SD) that is as many as 4 people (57.1%). Workrespondent part big is farmer that is as much 4 people (57.1%).

Description Colonization Bacteria Staphylococcus aureus in Diabetic Wounds Diabetic Patients Mellitus Before Given Care Wound Use Honey

Table 2. Distribution of the Average Colonization of *Staphylococcus Bacteria aureus* On Diabetic Wounds of Diabetes Mellitus Patients in the working area of the Banjarmasin Public Health Center before being given wound care using honey.

Respondent Code	***Staphylococcus* Colonization *aureus***	
	Results	**Interpretation**
1	276	Normal
2	428	More Than Normal
3	246	Normal
4	268	Normal
5	352	More Than Normal
6	280	Normal
7	292	Normal
mean	306	
median	280	
SD	63.003	
Min- Max	246-428	

Data on table 2 describe about score average colonization bacteria *Staphylococcus aureus* before given care wound use honey . Results analysis shows the average colonization bacteria*Staphylococcus aureus* before given care wound use honey is 306 cfu /ml with standard deviation 63.003 cfu /ml. Colonization results bacteria *Staphylococcus aureus* Lowest before care wound using honey is 246 cfu / ml and the colonization of *Staphylococcus bacteria aureus* the highest was 428 cfu /ml. Judging from the interpretation data of the results,

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the number of respondents with more than normal colonization were 2 patients (28.57%) and the normal category was 5 patients (71.43%).

Description Colonization BacteriaStaphylococcus aureus in Diabetic Wounds Patient Diabetes Mellitus After GivenCare Wound Use Honey

The data shows the average of *Staphylococcus colonization aureus*after wound care with honey. The analysis shows the average rate of *Staphylococcus colonization aureus*of 178.71 CFU/ml with a standard deviation of 55.581 CFU/ml after honey treatment. *Staphylococcus* Colonization *aureus*The minimum after honey wound treatment was 84 CFU/ml and *Staphylococcus colonization aureus* the maximum is 264 CFU/ml. Judging from the interpretation of the resulting data, all respondents (100%) entrenched in the usual category.

Table 3. Distribution of the Average Colonization of *Staphylococcus Bacteria aureus* on Diabetic Wounds of Diabetes Mellitus Patients in the Work Area of the Banjarmasin Public Health Center after being given wound care using honey.

Respondent Code	***Staphylococcus* Colonization *aureus***	
	Results	**Interpretation**
1	188	Normal
2	264	Normal
3	84	Normal
4	187	Normal
5	213	Normal
6	163	Normal
7	152	Normal
mean	178.71	
median	187	
SD	55.581	
Min- Max	84-264	

Comparison Amount Colonization Bacteria Staphylococcus aureus Before and AfterConducted Care Wound Use Honey

Table 4. Comparison of the Number of Colonization of *Staphylococcus bacteria aureus on* Diabetic Wounds of Diabetes Mellitus Patients in the Banjarmasin Health Center Work Area Before and After Wound Treatment Using Honey.

Respondent Code	Colonization *Staphylococcus aureus pretest*		Colonization *Staphylococcus aureus posttest*		
	Results	Interpretation	Results	Interpretation	
1	276	Normal	188	Normal	-88
2	428	More Than Normal	264	Normal	-164
3	246	Normal	84	Normal	-162
4	268	Normal	187	Normal	-81
5	352	Normal	213	Normal	-139
6	280	More Than Normal	163	Normal	-117
7	292	Normal	152	Normal	-140
Total	2142		1251		-891
mean	306		178.71		-127.286
median	280		187		
SD	63.0		55.5		
Min-Max	246-428		84-246		

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The data in Table 4 shows the comparison of *Staphylococcus colonization aureus* at pre and post test with the action of wound care using honey. Average number of *Staphylococcus colonization aureus* the pre-test was 306 cfu / mL , while the mean post-test was 178.71 cfu / mL , resulting in an average decrease in pre-test and post-test of 127.286 cfu / mL . In comparison of *staphylococcal* colonization *aureus* before and after the procedure, two patients (28.57%) had colonization above the mean before the test and all respondents (100%) had colonization in the normal range after the test. reject.

Influence Care Wound Use Honey To Colonization BacteriaStaphylococcus aureus

Table 5. Effect of Wound Treatment Using Honey on Colonization of *Staphylococcus Bacteria aureus* in the Working Area of the Banjramasin Health Center.

Variable	mean	SD	df	p- value	T
Staphylococcus Colonization *Aureus* Before and after	-127 86	33.27 5	6	0.000	-10,12 1

data in Table 5 shows difference score colonization *Staphylococcus aureus* before and after treatment honey , with average drop colonization *Staphylococcus aureus* of 127,286 CFU/ml with standard 33,275 deviation . Data analysis using dependent t-test shows a p-value of 0.000 (p-value <= 0.05). Diabetes mellitus is one _ field study at the health center Banjarmasin .

DISCUSSION

Characteristics Respondent

Characteristics respondent are 5 girls and 2 boys . Diabetes more often happens to women from in men. There are three factor for this. Factor first is woman have rate higher HDL , LDL, and triglycerides cholesterol tall compared man. Factor second is drop insulin sensitivity . Factor third is mechanism protection wall vessels blood in women , which is more tall than man and can make it worse occlusion vessels blood [10].

In in terms of educational status , school baseline (SD) was the most common , with 4 (57.1%). Education level someone ok tall nor low , can influence the knowledge they apply in life everyday , especially in detect change and assimilate information about diabetes mellitus and its treatment , especially foot care , for reduce risk foot complications. could affect [11]. Lack of knowledge about affected disease could cause the developmental process disease that is not controlled , leading to detection early complications disease [12].

Employment Status respondent part big is farmers , up to 4 (57.1%). Work is determinant important from health [11]. Diani's research shows that respondents who work in the sector public To do more foot care regular than farmer because they could check feet and wear comfortable shoes [13] .

Average age respondent is 63.29 years , with age the lowest was 52 years and the highest was 78 years . one factors that cause happening insulin resistance in diabetes mellitus is age [14]. People over 50 years old risky caught ulcer diabetic . After the age of 50 years , function physique decrease by physiological . This thing caused by a decrease secretion or insulin resistance , so result in ability function body for control hyperglycemia Becomes less than optimal [15] .

Colonization Bacteria Staphylococcus Aureus Before Conducted Care Wound Use Honey

A colonization test *Staphylococcus aureus* show that amount colonization *Staphylococcus aureus* average before sauce honey is 306 CFU/ml, exceeding normal range is 30-300 CFU/ml [16]. Research results showed 2 patients (28.57%) with colonization above normal range . Luka provides point enter for invasion polymicrobials , including Gram - positive and Gram- negative bacteria and bacteria aerobics , which can spread with fast from the

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feet and cause damage severe network .Wounds become the place develop fertile breed for growth microbes [17].

Other factors that can cause colonization severe on the wound respondent is rate sugar high blood . Sugar blood tall damage vessels blood , nerves , and other internal structures , so that hinder Genre blood [18]. Disturbance circulation blood , decrease sensitivity , loss function nerve sensory , ulcer diabetes , and infections that are not controlled could happens , which leads to gangrene [14].

Colonization Bacteria Staphylococcus Aureus After Done Wound Treatment Using Honey

Research results shows the average colonization *Staphylococcus aureus* after care wound of 178.71 CFU/ml. Post-test colonization showed decrease in average amount colonization *Staphylococcus aureus* after care wound with honey .

Honey is therapy the usual non- pharmacological given in treatment diabetic wounds [9]. Honey could used for therapy topical as bandage leg wound pressure , diabetic foot wounds , trauma, infection post surgery and injury burn . As treatment wound topical , honey easy absorbed by the skin , creating moisture to the skin and provides nutrients it needs [20].

Honey has proven have ability for eradicate various type bacteria , including Gram-positive and Gram- negative bacteria . Honey increase pressure osmotic surface wound . This hinder growth bacteria and then killed him [21].

Influence Care Wound Use Honey To Colonization Bacteria Staphylococcus Aureus On Patient Diabetes Mellitus

Research results show that difference score colonization *Staphylococcus aureus* before and after honey dressing was 127,286 CFU/mL with average drop colonization *Staphylococcus aureus* with standard 33,275 deviation . Data analysis using dependent t-test shows a p-value of 0.000 (p-value <= 0.05). Diabetes mellitus is one field study at the health center Banjarmasin.

Content high sugar in honey could slow down growth bacteria . Thick texture help shape layer protector to decay external [21]. Research results previously report that honey is known have ability as agent antibacterial against B. aureus and E. coli [22]. Other research also mentions that honey contain substance antibacterial , so suitable for treat wounds and infections . Because honey have pressure high osmotic , make bacteria difficult endure live . Nature this found in honey pure , but on honey mixture bacteria the still could live [23].

Activity antibacterial honey generated from existence hydrogen peroxide , flavonoids, and concentration hypertonic sugar .Hydrogen peroxide produced in honey by activity glucose oxides , enzymes that produce sour gluconate and hydrogen peroxide from glucose . Enzyme this activated when honey diluted . Hydrogen peroxide formed accumulated in the medium and inhibit growth bacteria . Hydrogen peroxide in honey is preservative because nature antibacterial . Hydrogen peroxide could hinder about 60 species bacteria aerobes and anaerobes , as well as gram positive and gram negative bacteria [21].

Flavonoids are helpful antioxidants and antibiotics strengthen vessels blood and prevent damage , as well agent with anti inflammatory and antiviral properties [24]. Concentration sugar hypertonic could hinder growth bacteria . Concentration high glucose in honey could kill bacteria through an osmotic process Among liquid inside cells and environment outside . Due to the pH of honey between 3.5 and 4.5, bacteria no could endure live . Sour have effect deep into growth and survival life from cell bacteria . Every seed have range optimum acid for its growth . When the pH drops to limit lower growth bacteria , no only growth cell bacteria stop , but bacteria also lose viability . Besides that , honey also contains helpful antibiotics oppose pathogen reason infection , so growth a number of related microorganisms with disease and infection could inhibited by honey [21].

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Effect honey on healing wound create class ingredient chemical for debridement, damaged tissue , and tissue dead . Debridement in treated patients with honey very easy removed or washed , and tissue its necrotic colored white yellowish , fibrous debris mass that can lifted with very easy from base wound [18].

CONCLUSION

Respondent survey characterized i.e. average age respondent is 63 years , part big respondent is female , educated elementary (SD) and work as farmer . Average results colonization *Staphylococcus aureus* before care wound honey is 306 CFU/ml and the mean results colonization *Staphylococcus aureus* after care wound honey was 178.71 CFU/ml. Influence care wound honey to colonization *Staphylococcus aureus* in wounds diabetes mellitus in patients with diabetes mellitus, p-value = 0.000 ($p<0.05$), in the region work Public health center Banjarmasin , average drop colonization Amount *Staphylococcus aureus* is 127,286 cfu /ml.

SUGGESTIONS

Suggestion to officer health is increase quality service health through gift non- pharmacological program like care wound honey as form handling wounds in diabetics . Respondent expected knowing benefit care wound with honey so that could To do care wound diabetic by independent and lower risk infection optimally .

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