

The Effectiveness of Dialkylcarbamoylchloride and Silver Dressings on a Wound Healing Process in the Diabetic Foot Ulcer Patients at the Health Service Centre in Bekasi City

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ABSTRACT. Silver Dressings are dressings containing silver that can destroy the germ colony well. These dressings can keep the wound moist, so they can speed up reepithelialization by up to 40% compared to using antibiotics. DACC (dialkyl carbamoyl chloride) is a fatty acid derivative that has strong hydrophobic properties[1]. DACC will bind and inactivate bacteria/ microorganisms. This bond is "irreversible" so that it will remove bacteria/ microorganisms at the time of dressing change. The removal of bacteria will accelerate the wound healing process. The study aimed to determine the effectiveness of wound care with modern techniques using Silver and DACC for the wound healing process. The total sample size was 42 people, consisting of 21 wound care patients using silver and 21 wound care patients with DACC. The sampling technique in this study was using purposive sampling. Data analysis was collected using multiple linear regression. The type of silver dressings was more effective against the length of the wound healing process compared to the DACC dressing type. The most dominant variable affecting the wound healing process was comorbidities after being controlled by factors confining nutritional status and mobilization.

Keywords: Dialkylcarbamoylchloride, Healing Process, Diabetic Food.

1. INTRODUCTION

Lifestyle changes lately have led to an increase in the prevalence of degenerative diseases, one of which is Diabetes Mellitus (DM) [1]. Diabetes Mellitus prevalence data in the world in 2017 was 425 million from the total population worldwide or around 8.8 percent of adults aged 20-79 years. It predicted to continue to increase and reach 16.7 million in 2045[2].

The prevalence of Diabetes Mellitus in Indonesia is also increasing, as described in Basic Health Research (2018), the prevalence rate of diabetes in Indonesia has increased quite significantly over the last five years. In 2013, the prevalence rate of diabetes in adults reached 6.9 percent, and in 2018 increased to 8.5 percent [3]. The complication that often occurs in people with diabetes mellitus is the occurrence of pathological changes in the limbs [4]. One of the pathological changes that occur in the limbs is the appearance of ulcers. Diabetic foot ulcers are wounds experienced by diabetics in the foot area with wound conditions ranging from superficial wounds, skin necrosis, to full-thickness wounds. It can extend to other tissues such as tendons, bones,

and joints. If the ulcer does not get the proper treatment it will result in infection.

Diabetic foot ulcer infection is a complex infection and the prognosis is influenced by many factors, depending on ulcer factors (location, extent, whether chronic or not, previous amputation, degree of ischemia) and patient factors (age, renal impairment, time of onset of diabetes, associated comorbidities) [5].

The prevalence of diabetic foot ulcers in the United States is 15-20%, the risk of amputation is 15-46 times higher than that of people with non-diabetes Mellitus. The prevalence of diabetic foot ulcer patients is around 15% with a risk of amputation of 30%, the mortality rate is 32%, and in Indonesia, diabetic foot ulcers are the biggest cause for hospital treatment by 80% [6].

Wound healing in diabetic ulcers is very dependent on the wound care given, where proper wound care techniques can help the wound healing process faster, and handling diabetic wounds can effectively prevent amputation [7]. This modern wound care technique complies with international standards, namely moist wound healing and moist wound dressing. Moist-based wound care techniques produce optimal wound

healing both in terms of the quality of tissue integrity and the time of the wound healing process. Results of research conducted by [8][9]. Several types of Moist Wound Healing can be used in wound care, including Silver, PHMB (*polyhexamethylene biguanide*), DACC (*Dialkylcarbamoyle chloride*), and honey [10].

Silver Dressing is a dressing containing silver that can destroy a colony of germs properly. This type of dressing can keep the wound moist, so it can speed up reepithelialization by up to 40% compared to using antibiotics. DACC (*Dialkylcarbamoylechloride*) is a fatty acid derivative that has strong hydrophobic properties [1]. DACC will bind and inactivate bacteria/microorganisms. This bond is "irreversible" so that bacteria/microorganisms will be lifted at the time of dressing change. Removing bacteria will speed up the wound healing process.

2. LITERATURE REVIEW

Infection ulcer feet infection retinopathy is complex and influenced by a lot of factors, depending on factors ulcer (a location, the breadth of, chronic whether or not, formerly an amputation, degrees ischemia) and factors patients (the age, kidney disorders, the creation of distorting diabet time, komorbid and agencies [5]. These factors are set to be considered when governance. Modalities care treatment of an infection in ullkus feet retinopathy is complex and have to use multi discipline approach includes the act of debridement, purulent exudate of disposal, adequate antibiotic therapy, revaskularisasi and management treatment of injuries [5]. One effect caused by taking into account the wound on foot ulcer retinopathy long the process of healing the wounds of the old [11].

3. RESEARCH METHOD

Used research design kuasi experimental design, to 42 respondents in health services in the Bekasi District. Respondents with diabetes is being ulcer treatment wound with antimicrobial dressing, good silver and DACC. Any dressings represented by 21 respondents. In this while we do not intervene dressings, but the implementation of the treatment of injuries unknowingly tossed with a dressing who used to give on a patient in each question is as high as health services.

The data collection was done using a interviews and the process of the health observed with sheets of bates jensen and reliabilitasnya well-adapted the validity of .Observation is conducted in accordance with the schedule the treatment of injuries every 2-3 days ahead that has been adjusted to the condition of health care in protocol wound with due observance to avoid a spread of covid 19 .The process of the health are considered to be of the onset of granulation wound to the tissues .The process of it calculated from the first day of the start of the treatment of injuries until the emergence of granulation. Data analysis was collected using multiple linear regression

4. RESULT AND DISCUSSION

The multivariate analysis aimed to determine the correlation of one variable or several independent variables with one or more dependent variables. If the bivariate results produced a p-value <0.25 , then the variable would go directly to the multivariate stage. This test used multiple linear regression to control for possible confounding. The steps in this modeling are:

4.1 Bivariate Selection

The bivariate selection was carried out after each independent variable and confounding was carried out with the dependent variable. If the bivariate result produces P-value <0.25 , then the variable enters the multivariate stage.

TABLE 1. Research Variable Bivariate Selection Results

No	Variable	p-value
1.	Type of Dressing	0,001
2.	Age	0,003
3.	Concomitant Diseases	0,000
4.	Nutritional status	0,000
5.	Mobilization	0,000
6.	Drug consumption	0,000

Source: Data Primer

From table 1, it concluded that all variables havd a p-value <0.25 . Thus all variables become candidates and can enter into multivariate modeling.

4.2 Early Model

In the complete modeling stage, to determine the effectiveness of the use of antimicrobial dressings associated with the duration of the wound healing process, the researcher created a model that includes variables and potentials of a confounder without interactions (no interaction test).

TABLE 2. Early Modeling

Variable	Early Model			
	<i>Koefisien B</i>	<i>SE</i>	<i>T</i>	<i>p-value</i>
Type of Dressing	2,787	1,484	1,878	0,069
Age	-0,188	0,099	-1,907	0,065
Concomitant Diseases	4,000	2,206	1,814	0,078
Nutritional status	2,148	2,074	1,036	0,307
Mobilization	0,534	2,352	0,227	0,822
Drug consumption	0,391	2,348	0,166	0,869

From table 2, the bivariate selection results obtained 3 variables with $p\text{-value} > 0.25$, namely nutritional status, mobilization and drug consumption. So that, they will be excluded from the model. The

variables excluded were those with the largest $p\text{-value}$, namely drug consumption

4.3 Multiple Linear Regression Modeling

TABLE 3. Multiple Linear Regression Modeling

Variabel	Model 1	Model 2	Model 3
	<i>p-value</i>	<i>p-value</i>	<i>p-value</i>
Type of Dressing	0,069	0,053	0,034
Age	0,065	0,052	0,045
Concomitant Diseases	0,078	0,058	0,008
Nutritional status	0,307	0,256	0,167
Mobilization	0,822	0,797	-
Drug consumption	0,869	-	-

From table 3, in model 1, the variables of dressing type, age, and comorbidities were able to significantly influence the duration of the wound healing process (with a $p\text{-value} < 0.25$), while the nutritional status and drug consumption variables had a $p\text{-value} > 0.25$. So that, H_0 was accepted, which means that this variable did not significantly influence the duration of the wound healing process. There were 3 variables that did not significantly influence the duration of the wound healing process, the regression test was repeated by removing 1 variable with the highest variable $p\text{-value}$, namely drug consumption. In Model 2, it explained that the drug consumption variable was excluded in the model, because from the calculation results for each variable nothing had changed more

than 10%. In model 3, the mobilization variable was excluded from the modeling because it had a $p\text{-value} > 0.25$, therefore the linear regression testing was again carried out. After the linear regression test was carried out by removing the mobilization variable, changing the coefficient B of comorbidities was 57.1% and 57.0%. Thus the mobilization variable was not excluded and was maintained in the multivariate model. From the results of the analysis, it turned out that there was no more $p\text{-value} > 0.25$. Thus the search for variables included in the model had been completed. Finally, the final modeling was carried out.

4.4 Final Model

TABLE 4. Final Modeling Results

Variabel	Final Model				<i>R square</i>
	<i>Koefisien B</i>	<i>SE</i>	<i>t</i>	<i>p-value</i>	
Type of Dressing	2,845	1,423	1,999	0,053	0.571
Age	-0,191	0,095	-2,012	0,052	
Concomitant Diseases	4,099	2,095	1,956	0,058	
Nutritional status	2,252	1,951	1,154	0,256*	
Mobilization	0,595	2,291	0,260	0,797*	

After conducting the analysis, the coefficient of determination (R Square) showed a value of 0.571. The regression model obtained 57.1% of the variation in the dependent variable on the duration of the wound healing process. The p-value = 0.0001 was at 5% alpha. So, we could state that the regression model fits (fit) the existing data. And it was supported by autocorrelation assumptions and homoscedasticity assumptions been fulfilled. It also got through the collinearity test. Then the regression equation obtained was:

$$\begin{aligned} \text{Duration of the wound healing process} = & \\ & 6.16 + 2.85 \text{ types of dressings} - 0.19 \text{ age} \\ & + 4.1 \text{ comorbidities} + 2.25 \text{ nutritional status} \\ & + 0.6 \text{ mobilization} \end{aligned}$$

- a. A kind of dressing with long the process of healing wounds sustained in the research be made known that the use of the silver dressings more effective against the long process of healing of wounds in patients with the foot ulcer retinopathy rata-rata long the process of healing the wounds of day as opposed to the use of type 9,14 dacc dressings .Long the process of healing the wound in a foot retinopathy essentially the same with long the healing process of injuries in general , but the process of healing ulcer feet retinopathy requires more time in particular because there are various fase-fase penyulit as infection in injuries and wounds that have planned in a state of chronic. Patients treat with the show positive results of antimicrobial silver in 2 week infeksiyanya in time. Speed in kill bacteria is very important bacteria breed rapid [12]
- b. The age of with long process of healing of wounds suffered human physiological changes dramatically declining rapidly 45. years after age. The process of healing of wounds would be longer along with an increase in the age of factors that influence is the sum of elastin has declined and the regeneration process collagen had been cut resulting from decreased. Cell metabolism aging causes skin cells reduced from a fall in a liquid vascularity in the skin and reduced fat glands increasingly reduce. Skin elasticity no skin elastic will reduce the ability of cellular regeneration when the wounds and begin closing so it can slow down a healing wound. The elderly is going on reduced bodily functions so as to slow down time. healing of wounds [9].
- c. Comorbidities such with long the healing process comorbidities such often affecting

wound healing wound disease is diabetes, heart, kidney and disorders veins.The condition of the disease heavier work in improving the cells wound as oxygen and nutrients will obstructed to the wound it is collaboration so doing to overcome the cause and penyulit during the healing process wound.Cell heavy work affecting circulation old wound so the healing process would be the longer than good circulation. Circulation can cause oksigenisasi abnormal narrowing of decline due to, narrowing of lack of blood volume has caused that will lead to phase constricting and declines in the availability of oxygen and nutrients for healing of a wound [9].

- d. The nutritional status with long process of healing wounds based on the characteristics of the nutritional status , consistent with the calculated the body (bmi) mathematical formula that is expressed as weight in kilograms divided by the square of height in meters. Mobilization of the healing process wound disorder with long movement can obstruct blood flow from and to peripheral. The blood disturbed can be caused by pressure or friction due to foreign matter, this occurred in the case capillaries that may lead to death a tissue local.So that their functions circulation in runs well, especially pembuluh blood turning or a vein on the lower extremity then required movement or mobilization [11]
- e. Consumption drug with long the healing process wound ulcer feet retinopathy is wound open that is dipermukaan the skin or lining ledir that could be the invasion by germs so that could cause infection and requires treatment with antibioti .The incident inaccuracy election antibiotic can cause ulcers that is not immediately recover so that can have a patients .The results of research conducted with a headline evaluate the use of antibiotics in people with diabetes mellitus type 2 with complications ulcer / gangrene in in-patient installation rsud dr Moewardi Surakarta 2015 said that the results evalusai according to the accuracy of the use of antibiotics that is 100% right an indication , 100 % right patients , 42 % right medicine , and 61.9 right doses. [13]

5. CONCLUSION

The average duration of the wound healing process was the fastest was to use a type of silver dressing with the fastest day of 3 days and a maximum of 19 days. The average age of the respondents was 51.60 years old. It showed that all respondents were categorized as elderly. The majority

of respondents had comorbidities, as many as 25 (59.5%). The majority of the respondents' nutritional status was poor, namely 32 respondents (76.2%). The majority of respondents did not mobilize as many as 24 (57.1%) and the majority of respondents took drugs as many as 32 respondents (76.2%).

There was an average difference between the duration of the wound healing process between Silver therapy and DACC. There was a correlation between age, comorbidities, nutritional status, mobilization, and taking medicine with the duration of the wound healing process in diabetic foot ulcer patients at the Bekasi District Health Service. The type of silver dressing was more effective against the duration of the wound healing process compared to the DACC dressing type. The most dominant variable affecting the duration of the wound healing process was comorbidities after being controlled by factors confining nutritional status and mobilization.

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