The Effect of Modern Dressing Using Mix Cadexomer Iodine Hydrogel on Wound Healing Process in WCC Pati

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Abstract. Diabetes mellitus is a chronic metabolic disorder due to the pancreas not producing enough insulin or the body cannot use insulin produced effectively. The purpose of this study was to determine whether there is an effect of modern dressing using cadexomer iodine hydrogel mix on the process of DM wound healing in WCC Pati. This type of research uses quasi-experiment with pre-test post test control group design. The sample of this study was 22 people, data collection using the Bates Jansen Wound Assessment Tool. Analysis using the Mann Whitney U Test statistical test. The results of the study showed that the p value of the intervention group was smaller than the p value of the control group so that the administration of the cadexomer iodine mix hydrogel was more influential in the process of DM wound healing compared to the control group that was only given the hydrogel.

1. Introduction
Diabetes mellitus is a chronic metabolic disease caused by the pancreas not producing enough insulin or not being able to use the required insulin effectively. Insulin is a hormone that regulates blood sugar balance. Concentration occurs in the blood or hyperglycemia [14].

IDF's last estimate was that there were 382 million people living with diabetes in the world in 2013. By 2035 that number is expected to increase to 592 million people. It is estimated that of the 382 million people, 175 million people have not been diagnosed, so that they are threatened to progressively develop into unconscious and uncomplicated complications[14]. In 2015 Indonesia was ranked seventh in the world for the highest prevalence of diabetes in the world along with China, India, the United States, Brazil, Russia and Mexico with an estimated number of people with diabetes of 10 million[11].. Diabetes with complications is the third highest cause of death in Indonesia [14].

The percentage of deaths due to diabetes in Indonesia is the second highest after Sri Lanka. The prevalence of people with diabetes in Indonesia shows a tendency to increase from 5.7% (2007) to 6.9% (2013). RI Riskesdas Data (2018) in Central Java Province the incidence of DM aged ≥ 15 years has increased from 1.5 % in 2013 to 2.0% in 2018. Riskesdas RI data (2013) in Pati Regency the incidence of DM ≥ 15 years of age reached 1.2% based on doctor's diagnosis and based on doctor's diagnosis or symptoms reached 1.6%.[13].

Prolonged high blood sugar levels in people with DM can cause various kinds of complications if they do not get handled properly. Complications that often occur include vascular abnormalities,
retinopathy, nephropathy, neuropathy and diabetic foot ulcers. Diabetic foot ulcers are classified as chronic wounds that are difficult to heal. Tissue damage that occurs in diabetic foot ulcers caused by neurological (neuropathy) and vascular disorders in the legs. The disorder does not directly cause diabetic foot ulcers, but begins with a mechanism of decreasing pain sensation, changes in foot shape, leg muscle atrophy, callus formation, decreased blood flow that carries oxygen and nutrients to the tissues [28].

In patients with DM with diabetic ulcers, perfusion repair is absolutely necessary because it will be very helpful in transporting oxygen and blood to the damaged tissue. If the peripheral perfusion of the wound is good, the wound healing process will also be good. The adequate distribution of oxygen to all layers of cells is the most important element in the process of wound healing [28]. Nurses have an important role in repairing diabetic foot injuries. The nurse's role here is to treat the wound well and to assess and evaluate the perfusion of the injured tissue. Wound management with wound bed preparation has stages which are abbreviated with TIME (principle equal to 3 M) namely; tissue management, infection or inflammation control, moisture balance, and edge of wound [8].

Currently, wound care techniques have developed a lot, where wound care has used a more modern dressing. The principle of modern wound care management is to maintain and maintain a moist wound environment to improve the wound healing process, maintain tissue fluid loss and cell death [12].

Humid environment will provide support for epithelial movement and facilitate wound closure. The choice of a good dressing will support wound healing by providing a moist and continuous environment [23]. Wound care that is covered with modern dressings has a faster healing rate compared to that covered with gauze. Modern dressings are able to maintain a moist environment that is balanced with the wound surface, choosing the right dressing can maintain moisture such as films, hydrogels, hydrocolloids, foams, alginates, and hydrofibers [12].

Hydrogels are mostly made of carboxymethylcellulose or starch polymers and 80-90% water. They are available in sheet or amorphous gel form and are used to rehydrate dry necrotic tissue or dry wrinkles. These hydrogels function to maintain the wound in a humid atmosphere, protect the wound from trauma and prevent the wound from risk of infection, able to absorb exudates but minimally; as a primary or secondary dressing, support autolysis to remove necrotic or slough tissue [12].

Cadexomer iodine functions to deliver iodine Iodosorb which can penetrate the cell walls of microorganisms and interfere with protein and nucleic acid structure and synthesis. Cadexomer iodine is an anti-microbial that has shown its ability to fight microbial biofilms and is effective against methicillin resistant staphylococcus aureus (MRSA) [16].

Research conducted by Nuracmah Elly (2007) titled Differences in Effectiveness of Wound Care Using Honey with Metronidazole on Malodor Levels and Number of Malignant Wound Exudates in Hospital X Researchers concluded that treatment of malignant wounds with honey was more effective compared to metronidazole on the level of malodor according to patients and nurses after day 6 treatment of malignant wounds. However, treatment of malignant wounds with honey or metronidazole has not been effective in reducing the number of exudates after the 6th day of treatment of malignant wounds [18].

The results of a preliminary study conducted by researchers in October 2018, there were 6 patients with diabetic ulcer at Wound Care Center (WCC) Pati who were undergoing treatment. This WCC practice provides modern wound dressing and is performed by competent nurses, who are marked by attending modern wound care training. The service system can be done by visiting directly at the practice site or with home care (care is carried out at the patient's home). From the results of the preliminary study, researchers observed the process of wound healing in patients undergoing routine wound care. Measuring the patient's wound healing progress, 3 patients with III-IV degree of wound after being given a cadexomer iodine mix hydrogel showed accelerated changes in the color of the wound to red, whereas 3 patients treated with a wound using hydrogel alone changed the color of the wound base more slowly to turn red. Based on this background researchers are interested in researching "The Effect of Modern Dressing Using Cadexomer Iodine Hydrogel Mix on the Process of Wound DM Wound Treatment in WCC Pati".
2. Method

This type of research is a quasi-experimental study with a pre-test posttest control group design research design. In this design, the experimental group was treated while the control group was not. In both treatment groups pre-test was started, and after the treatment was given measurements were taken again (post-test). In this study the subjects were divided into two groups: the group that uses modern wound care techniques and the control group that uses conventional wound care. Wound assessment was carried out on day 1 wound care and evaluated on day 10. Data collection was performed using the Bates Jansen Wound Assessment Tools instrument.

In this study, researchers used a cross sectional research approach. The population in this study was in February - March 2019 all DM wounded patients receiving wound care at the WCC (Wound Care Center) Pati practice. The sampling technique used in this study is non probability sampling with a purposive sampling approach. The sample in this study amounted to 22 people by taking into account the inclusion and exclusion criteria:

2.1 Inclusion Criteria

Inclusion criteria in this study include:
- Patients with diabetes mellitus accompanied by DM wounds / diabetic foot ulcers who undergo wound care using a cadexomer iodine hydrogel mix at the WCC (Wound Care Center) practice site Pati
- Never received a combination of modern dressing treatment with cadexomer iodine hydrogel mix before
- Getting antibiotic therapy
- Composite consciousness and able to communicate well
- Do not smoke
- Patients are willing to be respondents and follow the study until the end.

2.2 Exclusion Criteria

Patients who experience worsening conditions in the middle of the treatment period so as to cause inaccurate assessment of the wound, for example clients who are required to undergo amputation; the client does not follow the study until the end.

Data collection tools used in this study in the form of data collection is done by using the Bates Jansen Wound Assessment Tools and questionnaire instruments to determine the wound condition and characteristics of respondents.

Analysis in this study uses the Mann Whitney U Test statistical test.

3. Result and discussion

3.1 DM Wound Healing Process in the Control Group

3.1.1 Frequency Distribution of the Process of Healing DM Patients Before In the Control Group in WCC (Wound Care Center) Pati February - March 2019 (n = 11)

| Healing Process | Frequency | Percentage (%) |
|-----------------|-----------|----------------|
| Ugly            | 0         | 0              |
| Enough          | 11        | 100            |
| Well            | 0         | 0              |
| Total           | 11        | 100            |
3.1.2 Frequency distribution of the process of healing DM patients after the control group in WCC (Wound Care Ceter) Pati in February - March 2019 (n = 11)

| Healing Process | Frequency | Percentage (%) |
|-----------------|-----------|----------------|
| Ugly            | 0         | 0              |
| Enough          | 11        | 100            |
| Well            | 0         | 0              |
| Total           | 11        | 100            |

Based on the table above in the control group before and after the DM recovery process was obtained for respondents, all of them were quite as many as 11 (100%) respondents.

3.2 Wound DM Treatment Process in the Intervention Group

3.2.1 Frequency Distribution of the Process of Healing DM Patients Before the Intervention Group in WCC (Wound Care Ceter) Pati in February - March 2019 (n = 11)

| Healing Process | Frequency | Percentage (%) |
|-----------------|-----------|----------------|
| Ugly            | 0         | 0              |
| Enough          | 11        | 100            |
| Well            | 0         | 0              |
| Total           | 11        | 100            |

3.2.2 Frequency distribution of the process of healing DM patients after the intervention group in WCC (Wound Care Ceter) Pati in February - March 2019 (n = 11)

| Healing Process | Frequency | Percentage (%) |
|-----------------|-----------|----------------|
| Ugly            | 0         | 0              |
| Enough          | 11        | 100            |
| Well            | 0         | 0              |
| Total           | 11        | 100            |

3.3 Bivariate Analysis

Based on the table above shows that the results of the man whitney U test of the intervention group obtained p value is 0.000 (p <0.05) then Ho is rejected and Ha is accepted, which means that there is an influence of modern cadexomer mix hydrogel dressing on the wound healing process. The results of the Mann Whitney U Test in the control group showed that the p value was 0.001 (p <0.005), so Ho was rejected and Ha was accepted, which means there was an untreated effect on DM wound healing at WCC (Wound Care Center) Pati.
4. Discussion

4.1 The Process Of Healing DM Patients In Prior Intervention Groups

Based on the results of the study, the DM wound healing process in the intervention group before sufficient results were obtained, as many as 11 (100%) respondents. The results showed that the wound of patients before in the control group the majority of wound sizes <36 cm 6 (54.5%) respondents, depth maximum grade III wounds 6 (54.5%) respondents, Goa 2-4 cm 5 (54.4%) respondents, soft sticky and there is a fake black scar tissue (black eschar) 6 (63.6%), the number of tissues necrosis 50-75% 7 (63.6%) of respondents, moderate number of exudates 6 (63.6%) of respondents, light granulation tissue 50% 5 (54.5%) respondents, epithelialization tissue 25-50% 5 (45.5%) respondents. Then the majority did not smoke 7 (63.6%) respondents, without comorbidities 11 (100%). These results indicate that the patient's wound in the intervention group before entering the regeneration category. In addition, patients with DM injuries immediately seek treatment at local health facilities, whether doctors, nurses, midwives, or hospitals through outpatient care or post hospitalization, but have not received good wound care. According to researchers, DM wound patients should be treated with a modern dressing of cadexomer iodineagar mix hydrogel to get good wound care results.

This is in line with the theory of the NHSH Senior Management Team (2013) that the process of wound healing depends on how the wound is managed, surgical techniques such as inadequate skin closure, rough handling have been proven to delay healing, the use of antiseptics, hypochlorites and antibiotics that are not appropriate, improper use of dressings causes maceration and subsequent damage. Conversely, if the wound surface is too dry, the cells will become dry and may die causing further delay. Failure to provide proper pressure relief will contribute to tissue damage[17].

4.2 The Process of Healing DM Patients in the Intervention Group After

Based on the results of the study, the DM wound healing process in the intervention group after getting enough results or regeneration, as many as 11 (100%) respondents. The results can be shown the results of wound assessment where the majority of wound sizes <16 cm8 (72.7%) of respondents, the depth of the wound maximum grade 2 10 (90.9%) respondents, Goa <2 cm 6 (54.5%) respondents, shlough non-sticky and easily removed 6 (54.5%) respondents, total necrosis tissue <25% 10 (90, 9%) respondents, total moist exudate 10 (90.9%), bright granulation tissue 100% 7 (63.6%), epithelial tissue 75-100% 11 (100%). These results show patients in the intervention group after the results obtained an increase in wound regeneration from a value of 497 decreased to 273. These results indicate that patients' wounds in the intervention group after in the regeneration category. According to researchers this is due to the time used research or observation of wounds only 10 days while DM wounds are categorized as chronic wounds.
This is in accordance with the opinion of Boateng (2015) injuries are classified as acute and chronic. Acute wounds can heal in a limited amount of time, show no complications, and are marked by sudden loss of skin integrity (injury). Chronic injuries are tissue injuries that do not heal within 12 weeks and often recur. The wound healing phase consists of inflammation, proliferation, and renovation [4].

4.3 The process of healing DM patients in the control group before
Based on the results of the study it was found that the control group before it was found that the DM wound healing process in all respondents was quite as many as 11 (100%) respondents. These results indicate that the wound of patients before in the control group the majority of wound size <36 cm 6 (54.5%) respondents, the maximum wound depth grade III 6 (54.5%) respondents, Goa <2 cm 5 (54.4%) respondents, shlough easily removed 5 (54.5%), the number of tissue necrosis 50-75% 7 (63.6%) respondents, the number of moderate exudates 7 (63.6%) respondents, light granulation tissue 50% 5 (45.5%) respondents, epithelialization network 25-50% 6 (54.5%) respondents. Then the majority did not smoke 10 (90.9%) respondents, without comorbidities10 (90.9%) and 1 person with CKD. These results indicate that the patient's wound in the control group before entering the category of regeneration.

4.4 The process of healing DM patients in the control group after
Based on the results of the study, it was found that the control group after it was found that the process of healing DM wounds in all respondents was enough as many as 11 (100%) respondents. These results indicate that the wound of patients after in the control group the majority of wound sizes <16 and <36 cm respectively 4 (36.4%) respondents, maximum wound depth grade 2 7 (63.6%) respondents, Goa <2 cm 7 (63.6%) of respondents, shlough non-sticky and easily removed 5 (45.5%) respondents, number of tissue necrosis 25-50% 7 (63.6%) respondents, number of exudates slightly 6 (54.4%), light granulation tissue 50% 7 (63.6%), epithelial tissue 50-75% 9 (81.8%) These results show patients in the control group after the results obtained an increase in wound regeneration from a value of 483 decreased to 383.

Based on the man whitney U test of the intervention group, the p value is 0,000 (p <0.05) then Ho is rejected and Ha is accepted, which means that there is an influence of the modern dressing of a cadexomer mix hydrogel dressing on the wound healing process. The Mann Whitney U Test results in the control group showed that the p value was 0.001 (p <0.005), so Ho was rejected and Ha was accepted, which means that there was no treatment effect on DM wound healing in WCC (Wound Care Center) Pati. From the test results above obtained by the intervention group the value of p value is 0.000 (p <0.005) and the control group is obtained value of p value 0.001 (p <0.005). The results can be concluded that the p value of the intervention group is smaller than the p value of the control group so that the administration of cadexomer iodine mix hydrogels has more influence in the process of DM wound healing compared to the control group that is only given hydrogels.

Based on the results of the study found the effect of using cadexomer hydrogel mix on the wound healing process. Based on these results it can be concluded that wound care with a modern dressing using cadexomer iodine mix hydrogels tends to accelerate the healing of patients' wounds rather than using hydrogels alone. This is consistent with the results of the study in which of the 11 respondents who were given the intervention process the wound healing is better. These results are consistent with the theory put forward by Gitarja,W (2014) holistic management of diabetic foot including: metabolic control, vascular control, infection control, wound control, pressure (mechanic) control, and education control. Infection control is knowledge about the types of microorganisms in ulcers, thus adjustments can be made to antibiotics that are used to keep in view the results of germ culture and resistance. In DM ulcers, the germicrobial pattern of bacteria found in combination with gram positive, gram negative, and anaerobic is generally found. Therefore, absolutely given broad-spectrum antibiotics. [8].
5. Conclusion

- The research results obtained wound healing process in the control group before or after the results obtained enough or regeneration that is 11 (100%) respondents.
- The research results obtained wound healing process in the intervention group before and after the results obtained enough or regeneration that is 11 (100%) respondents.
- There is an effect of modern cadexomer mix hydrogel dressing on DM wound healing process in the intervention group with p value is 0.000 (p <0.05)
- There is a modern effect of hydrogel dressing on the DM wound healing process in the control group with a p value of 0.001 (p <0.05) 5. The results of the study that the p value of the intervention group is smaller than the p value of the control group so that the administration of cadexomer iodine mix hydrogels is more influential in the process of DM wound healing compared to the control group that is given hydrogels with a p value of 0,000 (p <0.005) in the group intervention and p value of 0.001 (p <0.005) in the control group.

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