

The Effect of Sigprocare HOCl 0.01% on TIME Management (Tissue Management, Inflammation Control, Moisture Balance, Epithelial Edge) of Diabetic Mellitus Ulcer in Bukittinggi West Sumatra Province, Indonesia 2024

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Abstract

Diabetes mellitus is a chronic disease caused by high levels of glucose in the blood, as well as accompanying metabolic disorders. One of the main factors causing diabetes mellitus wounds is lifestyle, including the consumption of high-sugar foods. This research aims to determine the effect of using Sigprocare HOCl 0.01% on the wound healing process of diabetes mellitus in Bukittinggi City. The method used was quantitative research with a Quasi-Experimental design and a One Group Pretest-Posttest approach. The population in this research were all patients with indications of diabetes mellitus wounds in Bukittinggi City, and the research was conducted from February to June 2024. The research sample amounted to 10 respondents who were selected purposively. Data were analyzed univariately and bivariately using the BWAT (Bates-Jensen Wound Assessment Tool) observation sheet and wound care SOP with Sigprocare HOCl 0.01%. The results of univariate analysis showed that the average diabetes mellitus wound score before Sigprocare HOCl 0.01% was 35.3, and after treatment the average dropped to 25.7. The results of bivariate analysis showed a significant effect of using Sigprocare HOCl 0.01% in the wound healing process of diabetes mellitus with a P value $(0.000) \leq \alpha (0.05)$. The implication of this research shows that Sigprocare HOCl 0.01% is effective in helping the healing process of diabetes mellitus wounds, so it is hoped that respondents can apply its use and maintain wound hygiene to accelerate recovery.

Keywords: Diabetes Mellitus, Wound Healing, Sigprocare HOCl 0.01%.

INTRODUCTION

Diabetes mellitus is a disease that causes death in the world (Tao et al., 2024). Diabetes mellitus is a chronic disease caused by high blood sugar levels, which is accompanied by metabolic disorders (Pikula et al., 2024).

According to data from the World Health Organization (WHO) 2016 shows 70% of the total deaths in the world, which is around 425 people and more than half of the disease burden is caused by diabetes. As much as 90% - 95% of the incidence of diabetes is type 2 diabetes, while cases of type 2 diabetes are preventable. According to the International of Diabetic Federation that there has been an increase in cases of Diabetes Mellitus in the

world from 2017 there was an increase in cases of Diabetes Mellitus to 425 million cases, the global prevalence rate of people with diabetes mellitus in Southeast Asia in 2017 was 8.5%.

The results of the 2018 Basic Health Research (Riskesmas) nationally showed that the prevalence of diabetes mellitus was 2.0%, increasing from 1.5% in 2013 to 2.0% in 2018. The prevalence of diabetes mellitus based on blood sugar measurements in the population aged ≥ 15 years who live in urban areas is 10.6% (Fabiana Meijon Fadul, 2019).

Almost all provinces in Indonesia experienced an increase in Diabetes Mellitus cases. The 4 provinces with the largest increase in prevalence were DKI Jakarta (3.4%), DI Yogyakarta (3.1%), East Kalimantan (3.1%), and North Sulawesi (2.6%) while the provinces with the highest prevalence of 0.9% were Riau, DKI Jakarta, Banten, Gorontalo and West Papua. According to the Consensus (2018) the prevalence of Diabetes Mellitus in the population aged ≥ 15 years is 10.9%. West Sumatra has a DM prevalence of 1.13% in 2018, where West Sumatra is ranked 21st out of 34 provinces in Indonesia (Indonesian Ministry of Health, 2018). According to the West Sumatra Provincial Health Office (2018), the number of DM cases in West Sumatra in 2018 was 37,063 cases (Handaya, 2016). Bukittinggi City is one of the cities in West Sumatra Province.

The prevalence of Diabetes Mellitus in Bukittinggi City ranks 9th out of 19 cities / districts in West Sumatra where the first order is Pariaman, Padang Panjang, Padang, Sawahlunto, Padang Pariaman, Payakumbuh, Tanah Datar, and Dharmasraya (Handaya, 2016).

Patients with diabetes mellitus can experience several complications together or there is one dominating problem, which includes vascular disorders, diabetic retinopathy, diabetic neuropathy and diabetic ulcers (Simamora et al., 2020). Wounds can be optimally resolved if wound management is done properly. Some of the methods used in diabetes mellitus wound care include wound cleansing, debridement, and dressing (Adquisiciones et al., 2019).

Things that must be considered in wound healing are tissue, which will be debrided if the tissue is non-viable, infection, which is managed with bacterial control, moisture balance by managing exudate and choosing the right dressing, and edge advancement (TIME) (Wintoko & Yadika, 2020). TIME consists of various strategies that can be performed on various types of wounds. This method aims to prepare the wound bed from infection, foreign bodies, or dead tissue to bright red with a good epithelialization process.

One of the basic components in wound management is wound washing. In diabetes mellitus wounds with biofilms, the 3M procedure is carried out by washing, removing dead tissue, and changing the dressing (Nurlany et al., 2021). One antiseptic liquid that can be used as a solution for wound washing is sigprocare HOCl 0.01%. Sigprocare HOCl 0.01% is a series of sanitizing products containing Hypochlorous Acid (HOCl) where this content is a natural germ-killing substance produced by neutrophils, white blood cells that help fight germs that enter the body and hypochlorous acid does not cause the skin to become dry and irritated.

The advantage of sigprocare is that the hypochlorous acid content is only 0.01% and it will not cause trauma, is environmentally friendly and does not cause delayed healing

of the wound. In addition, sigprocare can also be used to compress wounds or infections and reduce infection faster because HOCl is a microbial that can be used for the wound, and can remove biofilm. Sigprocare can be given to all wound conditions such as accident wounds, burns, diabetic wounds, and other types of wounds.

Based on research the application of diabetes mellitus wound care with hypochlorous acid at the pucangsawit health center, it was found that wound care carried out as many as 3x treatments with hypochlorous acid can reduce and reduce the risk of infection in the wound (Mahendra, 2022).

Based on the above background, the purpose of this research is to analyze the effect of using Sigprocare HOCl 0.01% in the wound healing process of diabetes mellitus in Bukittinggi City. The benefit of this research is to provide empirical evidence regarding the effectiveness of Sigprocare HOCl 0.01% in diabetes mellitus wound care, so that it can be a reference for medical personnel in applying more effective and environmentally friendly wound care methods. In addition, the results of this research are expected to provide guidance for patients and families regarding proper management of diabetic wound care, and contribute to the development of diabetic wound therapy in the health sector.

RESEARCH METHOD

This research uses quantitative methods with quasi-experimentation using an approach with One Group Pretest-posttest Design without Control Group. This research was conducted in Bukittinggi City in February-June 2024. The population in this research were patients who indicated diabetes mellitus in Bukittinggi City in 2024. The sample in this research were 10 people without a control group. These 10 respondents were given diabetes mellitus wound washing with sigprocare HOCl 0.01% for 6x within 14 days and measured by BWAT (Bates-Jensen Assessment Tools) sheet.

RESULT AND DISCUSSION

Table 1. Frequency distribution of respondent characteristics

Characteristics	f	%
Gender		
Male	5	50
Female	5	50
Age		
Pre-elderly (45-59 years)	4	40
Elderly (≥ 60 years)	6	60

From table 1, it can be seen that of the 10 respondents, half were male, namely 5 people (50%) and half were female, namely 5 people (50%). In terms of age, most respondents were in the elderly age category with a total of 6 people (60%).

Univariate Analysis

Table 2. Average wound healing diabetes mellitus before being given sigprocare HOCl 0.01%

Variable	N	Mean	SD	Min-Max
Before given sigprocare HOCl 0.01%	10	35,3	7,088	27-46

From table 2, it can be seen that the average wound healing of diabetes mellitus before being given 0.01% HOCl sigprocare is 35.3 with a standard deviation of 7.088 and a minimum value of 27 and a maximum value of 46.

Table 3. Average wound healing in diabetes mellitus after being given 0.01% HOCl sigprocare

Variable	N	Mean	SD	Min-Max
After being given sigprocare HOCl 0.01%	10	25,7	6,584	17-38

From table 3, it can be seen that the average wound healing of diabetes mellitus after being given 0.01% HOCl sigprocare is 25.7 with a standard deviation of 6.584 and a minimum value of 17 and a maximum value of 38.

Bivariate Analysis

Table 4. Normality test results of mean healing diabetes mellitus wounds before and after administration of sigprocare HOCl 0.01%

Treatment	Pvalue	Keterangan
Before given sigprocare HOCl 0.01%	0,267	Normal
After being given sigprocare HOCl 0.01%	0,471	Normal

The normality test results for the average data of diabetes mellitus wound healing before being given sigprocare HOCl 0.01% obtained $P_{value} (Shapiro-Wilk) = 0.267 > \alpha (0.05)$ (Normal Data) and $P_{value} (Shapiro-Wilk)$ after being given sigprocare HOCl 0.01% = 0.471 $> \alpha (0.05)$ (Normal Data). Due to the normal distribution of the two data, the appropriate further test to test the average difference in diabetes mellitus wound healing before and after being given sigprocare HOCl 0.01% is the *Paired Samples T-Test*.

Table 5. Mean difference in wound healing in diabetes mellitus before and after being given 0.01% HOCl sigprocare

Treatment	N	Mean	SD	Pvalue
Before given sigprocare HOCl 0.01%	10	35,3	7,088	0,000
After being given sigprocare HOCl 0.01%	10	25,7	6,584	0,000

Based on table 5, it is concluded that the research of 10 respondents obtained the average wound healing of diabetes mellitus before being given sigprocare HOCl 0.01%, namely 35.3 with a standard deviation of 7.088 and the average wound healing of diabetes mellitus after being given sigprocare HOCl 0.01%, namely 25.7 with a standard deviation of 6.584.

The results of the analysis using the *Paired Samples T-Test* test to analyze the difference in the average wound healing of diabetes mellitus before and after being given sigprocare HOCl 0.01% obtained $P_{value} (0.000) \leq \alpha (0.05)$ (H_0 rejected). This means that there is a difference in the average wound healing of diabetes mellitus before and after being given sigprocare HOCl 0.01% in Bukittinggi City.

Univariate Analysis

Mean diabetic wound healing before administration of sigprocare HOCl 0.01%

The results showed that the average wound healing score of respondents before being given sigprocare HOCl 0.01% was 35.3 with a standard deviation of 7.088 and the lowest score before intervening was 27 and the highest was 46.

People with diabetes tend to have a more difficult time healing wounds compared to other wounds. Like acute wounds, acute wounds will heal normally through the healing process over a period of time until integrity and anatomy are restored. For example, wounds that occur due to trauma to organs or tissues. Therefore, the healing process of diabetic wounds takes a long time and is not perfect. (Nurlany et al., 2021).

This is in line with research by (KIRANI, 2023) which conveys wound healing with hypochlorous acid in patients with diabetes mellitus is very effective for killing germs around the wound and shows that wound healing with hypochlorous acid is proven to be faster.

This research is in line with research conducted by (Roos, 2022) However, there are numerous studies supporting the effectiveness of hypochlorous acid (HOCl) in wound management, particularly in diabetic patients. For example, research shows that HOCl is effective in reducing bacterial biofilms and promoting faster wound healing, especially in diabetic foot ulcers. This solution, when applied consistently, has been shown to significantly reduce infection rates and improve wound healing outcomes.

The researcher's assumption is that the age factor is very influential on wound healing (Jalilian et al., 2020). If the patient is elderly, the healing will take longer than at a young age. In patients with diabetes mellitus, the healing will be longer and it is not certain that it can heal completely, in contrast to other wounds such as accidents, the healing will be faster. The dominant wound healing of respondents has reached the stage of lysing the epidermis and / or dermis layers and there are respondents who have reached the stage of the entire skin layer being lost with extensive deconstruction, damage to muscle and bone tissue. And there are also respondents who have reached the stage of epithelialization.

Wound healing in diabetes mellitus can be influenced by daily nutrition and blood sugar levels. In patients with diabetes mellitus to accelerate the wound healing process, it is necessary for patients to pay attention to nutrition during wound care, namely protein, because it can help repair damaged skin tissue and other body tissues.

Mean diabetic wound healing after administration of sigprocare HOCl 0.01%

The results showed that the average wound healing score of respondents after being given sigprocare HOCl 0.01% was 25.7 with a standard deviation of 6.584, and the lowest score was 17 and the highest was 38.

According to (Sari & Sari, 2020), the wound healing process takes place when the removal and disposal of necrotic tissue is successful. Sigprocare HOCl 0.01% is very effective if used in research, because in addition to being environmentally friendly, sigprocare HOCl 0.01% has moist/moist properties that are very good for wound healing.

This is in line with the research of (Sakarya et al., 2014) showing that there is an effect of hypochlorous acid or the content of sigprocare HOCl on wound care. The same research was conducted that hypochlorous acid has an effect in accelerating wound healing in patients with diabetic foot wounds in the Gombong Health Center area (Nurbaya et al., 2018).

According to the researcher's assumption from what has been discussed previously, Sigprocare HOCl 0.01% has proven to be effective in the treatment of diabetes mellitus wounds. Where from the results of several studies there is removal of necrotic tissue,

exudate in the wound, epithelialization and granulation. This can be measured by the BWAT (Bates-Jensen Wound Assessment) format. The BWAT sheet can be used to assess or measure wound healing. And the more often the implementation of wound care is carried out, the severity of diabetes mellitus wounds decreases, causing respondents' satisfaction to increase with the administration of sigprocare HOCl 0.01%. If the respondent is satisfied with the wound care provided by sigprocare HOCl on diabetes mellitus wounds, the respondent will use sigprocare HOCl 0.01% again and recommend it to others or those with diabetes mellitus related to the satisfaction that has been felt during the researcher's research.

The process of implementing wound care using sigprocare HOCl 0.01% can be done in several ways, namely, sprayed into the wound and compressed into the wound. Wound dressing changes can be made depending on the condition of the wound and the comfort of the respondent.

Bivariate Analysis

Effect of Sigprocare HOCl 0.01% on diabetes mellitus wound healing

The results showed that the average wound healing score of respondents before being given sigprocare HOCl was 35.3 and the average wound healing score of respondents after 6 times given sigprocare was 25.7. There is a difference in the average wound healing score of respondents between before and after sigprocare HOCl 0.01% obtained $P_{value} (0.000) \leq \alpha (0.05)$ (H_0 rejected). This means that there is a difference in the average wound healing of diabetes mellitus before and after being given sigprocare HOCl 0.01% in Bukittinggi City.

Healing of diabetic wounds if they are large enough and occur for a long time may require a wound cleansing action, by cleaning the wound, dead tissue will be removed so that new tissue will develop and help wound healing and maintain wound hygiene. There are several methods used in diabetes mellitus wound care including debridement, dressing and cleansing. The current wound care method is using the TIME principle which consists of various strategies that can be performed on diabetes mellitus wounds to optimize wound healing. Where T *tissue management* (removing dead tissue in the wound), I inflammation or infection control (protecting or repairing damage to the wound) such as the presence of purulent, increasing and smelly discharge, M *moisture balance* (maintaining moisture in the wound) and E *epithelialization* (wound closure process) (Colin & Listiana, 2022).

This research is in line with research conducted by Maria et al (2019) that there is a wound healing process by administering hypochlorous acid and administering 0.9% NaCl in diabetes mellitus wound healing, the results of wound healing were 60% (9 respondents) with hypochlorous acid and wound healing as much as 40% (6 respondents) with NaCl administration (Nontji et al., 2021).

Healing of diabetic wounds if they are large enough and occur for a long time may require a wound cleansing action, with wound cleansing, dead tissue will be removed so that new tissue will develop and help wound healing and maintain wound hygiene.

According to the researcher's assumption, the effect of sigprocare HOCl 0.01% which contains hypochlorous acid in healing diabetes mellitus wounds is due to a decrease in the rereta score before and after being given sigprocare HOCl 0.01% is 35.3 to 25.7. The

decrease in the degree of diabetes mellitus wounds is caused by the administration of sigprocare HOCl 0.01% because HOCl is a microbial that can be used for these wounds and can remove biofilm. Sigprocare HOCl 0.01% contains hypochlorous acid which can accelerate wound healing because it functions to kill antigenic microbes such as bacteria, viruses, spores and fungi when the body is exposed to infection. In addition, the speed of wound healing is also influenced by age and wound width. Respondents with younger ages will experience faster wound healing than elderly respondents. This is because the cells owned by respondents with young age are more active in dividing and regenerating so that the wound healing process takes place faster than respondents with older ages, especially the elderly. In addition, the width of the wound also affects the speed of wound healing. The wider the wound, the more cells are needed to regenerate the wound and it takes longer to heal.

The administration of sigprocare HOCl 0.01% on diabetes mellitus wound healing has an effect on diabetes mellitus wound healing, it can be seen that there is a decrease in scores on BWAT sheets such as wound depth, wound edge color, exudate amount, necrotic amount. Wound healing with 0.01% HOCl sigprocare not only affects diabetes mellitus wounds but can also be used on other wounds such as burns, accident wounds.

CONCLUSION

Based on the results of research conducted on 10 respondents, it can be concluded that the use of Sigprocare HOCl 0.01% has a significant effect in accelerating the healing of diabetes mellitus wounds in Bukittinggi City. The average wound size before Sigprocare HOCl 0.01% was 35.3 with a standard deviation of 7.088, and after treatment, the wound size decreased to an average of 25.7 with a standard deviation of 6.584. This is evidenced by a p value of 0.000 which is smaller than α 0.05, indicating a significant effect of Sigprocare on wound healing. This research makes an important contribution to the future, especially in the development of diabetic wound care therapy. The use of Sigprocare HOCl 0.01% can be more widely adopted as an effective and environmentally friendly wound care alternative, especially in the management of chronic non-healing wounds such as those in patients with diabetes mellitus. Further research can explore the optimal dose, the most effective treatment duration, as well as the application of Sigprocare HOCl on a larger population scale. In addition, future research could examine the application of Sigprocare in other types of wounds or diseases, and evaluate its long-term effects on patients' quality of life.

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