JURNAL

SOSAINS

JURNAL SOSIAL DAN SAINS

VOLUME 2 NOMOR 10 2022

P-ISSN 2774-7018, E-ISSN 2774-700X

EFFECT OF THE COMBINATION OF ALOE VERA AND PALM SUGAR ON THE IMPROVEMENT OF DIABETIC ULCERS IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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Keywords:
Palm Sugar; Aloe Vera; Diabetic Ulcer; Type 2 Diabetes Mellitus.

ABSTRACT

Background*: Diabetic ulcer treatment with aloe vera and palm sugar is one of the treatment measures to prevent infection in diabetic ulcers. Aloe vera contains auxin, gibber-relin, anthraquinone, and vitamins A, C, and E as an anti-inflammatory, antipyretic, antioxidant, antiseptic, antimicrobial, as well as antiviral. Aloe vera can diffuse properly and can withstand the loss of body fluids from the surface of the skin so that moisture is maintained, while palm sugar contains vitamin C, Riboflavin, vitamin A, and ascorbic acid as antibiotics and improves the tissue work system which can weaken and kill bacteria that cause infections in diabetic ulcers.*

Purpose: *The purpose of this study was to determine the effect of the combination of aloe vera and palm sugar on the improvement of diabetic ulcers in patients with type 2 diabetes mellitus.*

Method: *One group pretest and posttest design research design in one subject group with a total sample of 8 people, sampling technique using consecutive sampling, the research was carried out in August 2022 at the Wanaraja health center, Garut Regency*

Results: *Based on the results of the study, it is known that the highest activity that occurs in Macaca fascicularis at Sangeh Tourism Object is in the behavior of moves (moving) with a percentage of 17%, and Grooming behavior (Looking for lice) by 15%, then for other activities such as rest (rest) by 14 %, mating 8%, feeding 13%, social 14%, agonistic 13%, for behavior with the lowest percentage of sleep (sleep) of 6%.*

Conclusion: *Conclusion of the study, the combination of aloe vera and palm sugar affects the improvement of diabetic ulcers in patients with type 2 diabetes mellitus.*

INTRODUCTION

One of the most frequent complications of neuropathy in patients with type 2 diabetes mellitus is a diabetic ulcer caused by three factors namely; peripheral innervation disorders (neuropathies), infections, and impaired blood flow (Christia, Yuwono, & Fakhrurrazy, 2015). The existence of this condition results in a delay in the wound healing process, causing susceptibility to the spread of infection which can cause tissue death (gangrene) and end in amputation actions (Maryunani, 2013). Efforts to prevent the spread of diabetic ulcer infection, one of which is by treating wounds with appropriate treatment methods will improve the wound healing process. The principle of the method of treatment of diabetic ulcers by retaining moisture at the base of the wound to prevent the colonization of bacteria (Aragón-Sánchez, Luis Lázaro-Martínez, Pulido-Duque, & Maynar, 2012). The main focus of diabetic ulcer treatment is to increase blood flow to the wound area, adequate

blood flow can increase the supply of oxygen and nutrients to the ulcer area so that the process of regeneration and tissue granulation runs well. At the initial stage, it is necessary to create an environment for the wound area that is clean and free from infectious fluids (pus/pus) and dead tissues (necrosis) (Enikmawati, 2019). One of the treatments for diabetic ulcers that can be used is with aloe vera and palm sugar (Wahyu Arjuna, 2020).

Treatment of diabetic ulcers with aloe vera and palm sugar is one of the complementary treatment measures to prevent infection in diabetic ulcers. Aloe vera contains several substances such as auxin, gibber-relin, anthraquinone, vitamins A, C, E which have proven efficacy as anti-inflammatory, antipyretic, antioxidant, antiseptic, antimicrobial, as well as antiviral . Aloe vera is able to penetrate and absorb and diffuse properly so that it can resist the loss of body fluids from the surface of the skin so that moisture is maintained (Enikmawati, 2019), (Khoirunnisa & Gati, 2021). In addition, aloe vera contains active ingredients such as essential oils, amino acids, minerals, vitamins, enzymes, glycoproteins, and chrysanthemum acids which are beneficial for healing damaged skin. The enzyme protease in collaboration with glucomannan serves as a pain reliever when there is a wound. Saponins as a soap-like substance form a 3% gel as a cleanser that has antiseptic properties (Puspitosari, Nuridayanti, Wahdi, & Jayanti, 2021), while palm sugar contains vitamin C, riboflavin, vitamin A, and ascorbic acid which has a function as an antibiotic. Riboflavin contained in palm sugar can help the formation of red blood cells and stimulate the formation of immunoglobulins (antibodies) produced in bone marrow. In addition, the substance ascorbic acid (vitamin C) contained in palm sugar has an effect as an antibiotic that can weaken and kill the bacteria that cause infection in diabetic ulcer wounds (Ratnasari, Daniati, Suliyawati, & Farhan, 2021).

The results of the research that has been carried out, there is an influence of aloe vera on the healing of diabetic ulcers with a p-value of 0, (Puspitosari et al., 2021) , sedangkan hasil penelitian yang telah dilakukan oleh pengusul ditemukan bahwa, gula aren merupakan media yang efektif dalam mempengaruhi perbaikan luka ulkus pada pasien diabetes mellitus tipe2 dengan p-value sebesar 0,000 (Ratnasari et al., 2021). Based on the two results of the study, the authors are interested in researching the combination of aloe vera media and palm sugar against the improvement of diabetic ulcers in patients with type 2 diabetes mellitus. In addition, diabetic ulcer treatment requires a long treatment (2-3 weeks), but the treatment process is constrained by the policies and regulations of the Social Security Protection Agency (BPJS) for health that limit the length of days of patient care in the hospital, where the length of the patient's hospitalization day is only 4-7 days so that the patient needs follow-up care at home. To help the process of diabetic ulcer repair and health recovery in type 2 diabetes mellitus patients at home, the combination of aloe vera and palm sugar media can be used as an easy, cheap, and affordable alternative medium in the process of repairing diabetic ulcer wounds.

Analyze the influence of the combined medium of aloe vera and palm sugar in the process of improving diabetic ulcers in patients with Type 2 diabetes mellitus after

hospitalization. Analyze the process of repairing diabetic ulcers after wound treatment with a combination medium of aloe vera and palm sugar.

RESEARCH METHODS

Research design using quasi-experiment with one group pre-test and post-test design (Marsden & Torgerson, 2012). Measurements were taken twice before treatment and after diabetic ulcer treatment with a combination of palm sugar and aloe vera media in one group of subjects. The study population was all patients with post-hospitalization diabetes mellitus, while the study sample of patients who had post-hospitalized diabetic ulcers was 8 people. The sampling technique uses consecutive sampling with the criteria of patients who are willing to be respondents. Patients on the 1st day after hospitalization. Patients diagnosed with type 2 diabetes mellitus by doctors with complications of grade II and III diabetic ulcers. The patient's blood sugar level is controlled and close to the normal value limit with the value of the blood sugar level during the > 50 mg / dl and ≤ 200 mg / dl pre-wound treatment with palm sugar. Patients with a classification of diabetic ulcers of degrees 2-3 at stage A-D (based on the Classification of Ulcers of the University of Texas) (Marissa & Ramadhan, 2017). Post-hospitalization patients.

RESULTS AND DISCUSSION

A. Results

The results of the study on the characteristics of patients who experience diabetic ulcers can be seen in table 1 as follows:

Table 1. Frequency Distribution characteristic of Diabetic Ulcer Patients (N=8)

Characteristic patients	F	%
Gender		
Man	5	62.5
Girls	3	37.5
Age		
Late adulthood = 36- 45 years	1	12.5
Early old age = 46 - 55 years	3	37.5
Masa lansia akhir = 56 - 65 years	4	50.0
Long Diabetes Mellitus		
3-4 years	1	12.5
4-5 years	4	50.0
6-7 years	3	37.5
Long Ulkus Diabetik		
<1 years	4	50.0
1-2 years	3	37.5
>2 years	1	12.5
Woks		
Doesn't work	2	25.0
Entrepreneur	4	50.0
Laboer	2	25.0
Blood Sugar During (GDS)		
Good (110 - 145 mg/dL)	0	0
Middle (145 - 179 mg/dL)	0	0

Bad (>180 mg/dL)	8	100.0
Grade Ulkus Diabetik		
Grade I	2	25,0
Grade II	6	75,0
Grade III	0	50.0

Based on table 1 above, it is known that, most (62.5%) of diabetic ulcer patients are male, half (50.0%) are in the category of late elderly (aged 56 - > 65 years), half (50.0%) have suffered from type 2 diabetes mellitus for 4-5 years, half (50.0%) have suffered from diabetic ulcers for < 1 year, half (50.0%) have self-employed jobs, almost all (100.0%) have blood sugar levels while (GDS) > 180 mg / dl, and some another large (75.0%) had complications of grade II diabetic ulcers.

The results of the analysis regarding the effect of giving a combination of aloe vera and palm sugar on clinical assessment on the process of improving diabetic ulcers in type 2 diabetes mellitus patients can be seen in table 2 as follows :

Table 2.
Effect of Aloe Vera and Palm Sugar Combination on Clinical Assessment (N=8)

Clinical Assessment Indicators	***Mean Score***		***p Value***
	Day 1	**Day 14**	
Exudate	3.13	1.13	0.005
Amount of Exudate	3.25	1.25	0.000
Size	2.50	1.50	0.023
Depth	2.63	1.38	0.008
Undermining	3.12	2.38	0.034
Necrotic Network	2.13	0.88	0.007
Amount of Necrotic Network	1.63	0.63	0.011
Granulation Tissue	2.50	1.00	0.010
Amount of Granulation Network	3.75	2.75	0.005
Wound Edges	2.63	1.50	0.007
Periulcus Skin Viability	2.63	1.00	0.010
Edema Type	1.88	0.13	0.010
Location of Foot Edema	1.25	0.13	0.007
Bioburden	1.50	0.50	0.005
Average	**2,47**	**1,15**	**0,01**

Based on table 2 above, it is known that, the overall average value of the clinical assessment indicators of diabetic ulcers based on the LUMT score on the first day before the procedure (pre-treatment) was 2.47 and the average value after the procedure (post-treatment) was 1.15 with an average p value of 0.01 at a confidence level of 95%. From these data, it is known that there is an influence of the administration of a combination medium of aloe vera and palm sugar on clinical assessment on the process of improving diabetic ulcers in type 2 diabetes mellitus patients.

The results of the analysis regarding the effect of giving a combination medium of aloe vera and palm sugar on patient assessment on the process of improving diabetic ulcers of type 2 diabetes mellitus patients can be seen in table 3 as follows :

Table 3.
Effect of The Combination of Aloe Vera and Palm Sugar on Patient Assessment (N=8)

Indikator Penilain Pasien	*Mean Score*		*p Value*
	Hari 1	Hari 14	
Pain Scale	3.13	2.00	0.007
Pain Frequency	3.63	0.88	0.008
Quality of Life	3.38	0.75	0.011
Average	**3,38**	**0,67**	**0,008**

Based on table 3 above, it is known that the average value of the overall patient assessment indicators based on the LUMT score on the first day before the procedure (pre-treatment) was 3.38 and the average value after the procedure (post-treatment) was 0.67 with an average p value of 0.008 at a confidence level of 95%. From these data, it is known that there is an influence of giving a combination of aloe vera and palm sugar on the patient's assessment of the diabetic ulcer repair process of type 2 diabetes mellitus patients.

The results of the analysis regarding the effect of the combination of aloe vera and palm sugar on the process of improving diabetic ulcers in type 2 diabetes mellitus patients in general can be seen in table 4 as follows :

Table 4.
Effect of The Combination of Aloe Vera and Palm Sugar on the Improvement of Pre-Treatment and Post-Treatment Diabetic Ulcers in Type 2 Diabetes Mellitus Patients (N=8)

	Different Values Of Pre-action and Post-action Pairs							
	Mean	*Std. Deviation*	*Std. Error Mean*	*95% Confidence Interval of the Difference*		*t*	*df*	*p Value*
				Lower	*Upper*			
pre-post treatment	24.875	6.034	2.133	19.830	29.920	11.660	7	.000

Based on table 4, it is known that, the average value of diabetic ulcer pre-post treatment diabetic ulcer treatment diabetic with a combination of aloe vera and palm sugar is 24,875 with a standard deviation of 6,034. The results of statistical tests with a dependent t-test obtained a p value of 0.000 at a confidence level of 95% which means that the combination media of aloe vera and palm sugar affects the improvement of diabetic ulcers in patients with type 2 diabetes mellitus.

B. Discussion

The principle of wound care in diabetic ulcer patients is a very important measure in preventing the occurrence of infections and complications. The principle of diabetic ulcer treatment is to create a moist wound healing environment or keep the wound always in a moist state (Association, 2013). Besides aiming to maintain moisture, the use of dressings should also consider the size, depth and location of the ulcer (Clayton Jr & Elasy, 2009). The main focus of diabetic ulcer treatment is to increase blood flow to the wound area, adequate blood flow can increase the supply of oxygen and nutrients to the ulcer area so that the process of regeneration and tissue granulation runs well. At the initial stage, it is necessary to create an environment for the wound area that is clean and free from infectious fluids (pus / pus) and dead tissues (necrosis) (Enikmawati, 2019). Wound treatment methods that can be used to promote wound healing by retaining moisture at the base of the wound to prevent colonization of bacteria (Aragón-Sánchez et al., 2012). One of the treatments of diabetic ulcers that can be used is with aloe vera and palm sugar.

Based on the results of the study above, it is proven that the process of repairing diabetic ulcers using a combination of aloe vera and palm sugar is caused by an increase in the osmosis process between the exudate in the diabetic ulcer area and the combination of media from the two ulcer treatment materials given, thereby increasing the absorption of exudate in diabetic ulcers to the wound treatment media. In addition, the combination of aloe vera and palm sugar is able to resist the loss of body fluids from the surface of the skin and maintain moisture which makes it easier for the epithelium from the edges of the wound to migrate to the wound site along with myofibroblast contractions that will close the wound. In addition, the beta-sitosterol content of aloe vera has angiogenesis activity which is an important process in healing diabetic ulcers. The content of vitamin C, riboflavin, vitamin A, and ascorbic acid in palm sugar provides an effect as an antibiotic and stimulates the formation of immunoglobulins (antibodies) produced in the bone marrow, this gradually causes the wound area to be clean and the process of repairing the tissue around the wound goes well and the process of spreading infection can be prevented.

Treatment of diabetic ulcers with aloe vera and palm sugar is one of the complementary treatment measures to prevent infection in diabetic ulcers. Aloe vera contains several substances such as auxin, gibber-relin, anthraquinone, vitamins A, C, E which have proven efficacy as anti-inflammatory, antipyretic, antioxidant, antiseptic, antimicrobial, as well as antiviral. Aloe vera is able to penetrate and absorb and diffuse properly so that it can resist the loss of body fluids from the surface of the skin so that moisture is maintained (Enikmawati, 2019), (Khoirunnisa & Gati, 2021). In addition, aloe vera contains active ingredients such as essential oils, amino acids, minerals, vitamins, enzymes, glycoproteins, and chrysanthemum acids which are beneficial for healing damaged skin. The enzyme protease in collaboration with glucomannan serves as a pain reliever when there is a wound. Saponins as a soap-like substance form 3% of the gel as a cleanser that has antiseptic properties (Puspitosari et al., 2021), aloe vera exerts a good influence in the healing process of diabetic wounds (Aminanto & Ruhyana, 2015). While palm sugar contains vitamin C, riboflavin,

vitamin A, and ascorbic acid which has a function as an antibiotic. Riboflavin contained in palm sugar can help the formation of red blood cells and stimulate the formation of immunoglobulins (antibodies) produced in bone marrow. In addition, ascorbic acid (vitamin C) contained in palm sugar has an effect as an antibiotic and improves the tissue work system which can weaken and kill bacteria that cause infection in diabetic ulcer wounds (Ratnasari et al., 2021) (Hesty, 2016).

The formation and growth of granulation tissue in wounds treated using aloe vera can grow well, because aloe vera can provide a moist environment for wounds (Puspitosari et al., 2021). Aloe vera also accelerates the healing of epithelial tissue damage in wounds through the provision of essential micronutrients, anti-inflammatory effects, anti-microbial effects, and stimulating skin fibroblasts (Khoirunnisa & Gati, 2021). In addition, the beta-sitosterol content of aloe vera has angiogenesis activity which is an important process in healing diabetic ulcers (Avijgan, Kamran, & Abedini, 2016).

CONCLUSION

The results showed that the combination medium of aloe vera and palm sugar had an effect on improving diabetic ulcers in patients with type 2 diabetes mellitus.

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