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Zinc Oxide and Aloe Vera Gel Therapy Wound Care on Healing Diabetic Ulcers

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ABSTRACT

Background & Objective: Diabetic ulcers are a chronic complication of diabetes mellitus that are difficult to heal and carry a high risk of amputation. Wound healing in people with diabetes is often hampered by impaired circulation, neuropathy, and infection. Topical therapies such as *zinc oxide cream* And *Aloe Vera gel* They have been used to accelerate healing through different but complementary mechanisms. To determine the effectiveness of topical *zinc oxide cream* and *aloe vera gel* on the healing of diabetic ulcers based on recent research results. **Method:** Using the literature review method by searching for articles in the *PubMed, ScienceDirect, Google Scholar databases, Connected Papers, Research Gate* and *Research Square*, with publications spanning 2015–2025. Of the 25 articles found, 7 met the inclusion criteria. **Result:** *Aloe Vera gel* has been shown to be effective in accelerating the healing of diabetic ulcers by reducing wound assessment scores (*Bates-Jensen, Winner Scale*), increasing tissue regeneration, and shortening the inflammatory phase. *Zinc Oxide cream* has been shown to accelerate the transition from the inflammatory phase to the proliferative phase, protect wound tissue from bacterial colonization, and support collagen synthesis. Several preclinical studies combining *Aloe Vera* with *Zinc Oxide* nanoparticles have shown accelerated wound closure compared to single treatments. No serious side effects were found from the use of these two therapies. **Conclusion:** *Zinc oxide cream* and *aloe vera gel* are both effective in accelerating the healing of diabetic ulcers through complementary mechanisms. Both are safe, accessible, and affordable, making them potentially useful adjuvant therapies in healthcare settings.

Further research, including controlled clinical trials of a pure combination of the two therapies, is needed to confirm their effectiveness and safety.

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Introduction

Diabetes mellitus (DM) is a chronic metabolic disease or disorder with multiple causes and characterized by high blood sugar levels accompanied by impaired carbohydrate, fat, and protein metabolism due to insulin deficiency. Inadequate insulin action can be caused by impaired or insufficient insulin production in the beta cells of the pancreatic Langerhans system or by the body's cells failing to respond to insulin (WHO, 1999 in Novalia, 2022).

In general, according to the WHO (2023), there are 15 cases of type I diabetes mellitus in the world. 100,000 individuals per year suffer from IDDM. Three out of 1,000 children will suffer from IDDM by the age of 20. The incidence of type I diabetes in children varies widely. There are 61 cases per 100,000 children in China, and 41 cases per 100,000 children in Finland. These figures vary widely, especially depending on the living environment. There is a tendency for the incidence rate to increase the further away from the equator. Although IDDM incidence figures have not been found in Indonesia, they tend to be lower than in European countries.

Based on data from *the International Diabetes Federation* (IDF), it was found in 2019 that 463 million people worldwide suffer from diabetes mellitus, 98% of whom suffer from type 2 diabetes. It is estimated that this number will double by 2030. According to the Ministry of Health, the number of type 2 diabetes sufferers in Indonesia is quite high, namely 8.4 million people in 2010, and is estimated to continue to increase to 21.3 million people in 2030 (Handayani et al., 2021). According to Riskesdas (2023), the prevalence of DM in Indonesia reached 11.4%, and around 15–25% of patients with DM experience diabetic ulcers throughout their lives.

Banten is one of Indonesia's provinces with a high prevalence of diabetes mellitus. Data from the Banten region shows that 56,560 people suffer from diabetes mellitus. Diabetes mellitus is among the 20 most common diseases in Tangerang City. Based on health data in Tangerang City, the number of people with diabetes mellitus is 20,524. Tangerang City, as one of the provinces in Banten, has the highest prevalence of diabetes mellitus compared to other districts/cities, at 1.7% (Maulidina et al., 2025).

DM wounds are very difficult to heal and can lead to amputation if not properly treated. Therefore, developing effective wound therapies is a crucial focus in nursing practice. As science advances, various topical wound therapies have been developed. One promising approach is the combination of *zinc oxide* and *aloe vera gel.*

Zinc cream/zinc oxide can relieve rashes and other minor skin irritations. *Zinc cream* or *zinc oxide* has minimal side effects when applied topically to diabetic foot wounds. *Zinc oxide* is known to have antiseptic and anti-inflammatory properties, as well as accelerate tissue regeneration. Meanwhile, *aloe vera* contains bioactive compounds such as aloesin and glucomannan, which stimulate collagen production, increase angiogenesis, and accelerate wound epithelialization (Lubis et al., 2023) .

Aloe vera *(Aloe vera L.)* is a plant familiar to Indonesians. In some countries, aloe vera is often used as a first aid measure for injured body parts (cuts and burns). Aloe vera contains many active substances that are very useful in accelerating wound

healing because they contain, among others, glucomannan, lignin, vitamin A, vitamin C, enzymes, and amino acids that are very important for cell regeneration. Aloe vera stimulates epidermal growth factors, increases fibroblast function, and the formation of new blood vessels, thus accelerating wound healing and closure (Atik & Iwan AR, 2020) .

Although the effectiveness of *Zinc Oxide* and *Aloe Vera* has been studied separately, scientific studies on the effectiveness of both in combination in accelerating the healing of diabetic ulcer wounds are still limited, especially in the context of primary care in Indonesia. Therefore, the researcher is interested in compiling this Final Scientific Paper with the title "Effectiveness of Wound Care with *Zinc Oxide and Aloe Vera Gel Therapy* on Healing Diabetic Ulcer Wounds" as a scientific contribution in the development of evidence-based nursing practice.

Objective

To determine the effectiveness of topical therapy using *Zinc Oxide cream* and *Aloe Vera gel* on healing diabetic ulcers based on the results of recent research.

Method

The data used is secondary data taken from relevant scientific literature through academic databases. Articles were selected from seven major databases **:** *PubMed* **,** *Science Direct* **,** *Google Scholar, Connected Papers, Research Gate, Research Square,* with Search criteria: publication period 2015–2025 (maximum last 10 years for books), 2020–2025 (maximum last 5 years for journals), minimum number of articles 10 journals, with at least 5 international, language journals English and Indonesian, which have information related to the effectiveness of wound care with *Zinc Oxide* and *Aloe Vera Gel therapy* on healing diabetic ulcer wounds.

The inclusion criteria in this study were diabetic foot ulcer patients, Topical *Zinc Oxide* and *Aloe Vera Gel,* Standard care or herbal therapy, Standard care or herbal therapy, quasi-experimental, systematic review, meta-analysis, *in vivo* and *in vitro,* and Indonesian and English languages .

A total of 7 articles from journals or sources were used in accordance with the inclusion criteria. The articles were obtained from 25 journals from various sources.

Results

TABLE 1. Journal Results and Analysis

No	Writer	Year	Volume, Number	Title	Method (Design, Sample/Subject, Variables, Instrument, Analysis)	Research result	Data base
1.	Diksha Manhas, Udayabanu Malairaman	2025	Volume 8, number 2	*Exploring the Potential of Aloe vera Hydro-Alcoholic Leaf Extract for Topical Diabetic Wound Healing Treatment*	- Design: experimental, in vivo and in vitro - Subject: type 2 diabetes wounds - Variable: *Aloe vera hydro-alcoholic leaf extract* (AVHE) - Sample: zebrafish - Instruments: cell-based experimental tests and animal models - Analysis: Statistical analysis was performed using *IBM SPSS Statistics* 20. Data are presented as mean ± standard deviation (SD) and analyzed using the χ-test. Significant differences between groups were determined at the $P < 0.005$ level.	This study demonstrates AVHE's potential in accelerating wound healing, possibly stemming from its ability to regulate and synchronize various phases of wound healing, reduce oxidative stress, prevent microbial infection, and exert hypoglycemic effects. Furthermore, these findings demonstrate AVHE's efficacy in stabilizing red blood cell membranes, suggesting its potential anti-inflammatory properties. AVHE demonstrated improved wound closure, achieving a remarkable closure rate of 57.03% at a concentration of 0.1 mg/mL compared to untreated cells (10.01%) in an in vitro scratch	PubMed

						assay performed on McCoy cells. In vivo assessments included the evaluation of AVHE's potential to induce caudal fin regeneration in zebrafish, which demonstrated a significant improvement of 60% within 7 days post-amputation. Collectively, these findings highlight the therapeutic potential of topical application of AVHE for the advancement of treatments targeting diabetic foot ulcers (Manhas & Malairaman, 2025) .	
2.	Hasanain Adel Alawadi, Kamyab Andarzbakhsh, Ali Rastegari, Zohreh Mohammadi, Mehdi Aghsami,	2024	Volume 2024, Article ID 6024411	*Chitosan–Aloe Vera Composition Loaded with Zinc Oxide Nanoparticles for Wound Healing: In Vitro and In Vivo Evaluations*	- *Design* : in vitro and in vivo - *Subject* : diabetic wounds - Variable: *Chitosan–Aloe Vera Zinc Oxide Nanoparticles* - Sample: Three-week-old male Wistar rats (weighing between 70 and 100 g) - Instruments: Experiments and observations - Analysis: The results were analyzed using t-test and	Reports have shown that ZnO NP and *Aloe Vera Gel* both have the potential to accelerate wound healing in diabetics, namely collagen deposition and epithelialization (Alawadi et al., 2024) .	PubMed

	and Fatemeh Saadatpour				ANOVA (significance level set at 0.05)		
3.	Maya Atsfiatun, Dwi Astuti, Fida Dyah Puspasari	2025	Vol. 2 No. 1 January 2025 Edition	Wound Care With *Aloe Vera Gel* In Patients With Diabetic Ulcers	- Design: descriptive case study research - Subject: diabetic ulcer - Variables: Aloe vera gel, wound care, diabetic ulcers - Sample: one respondent who has diabetes mellitus with wounds on his feet, aged over 30 years and the patient is willing to be a respondent. - Instruments: The case study instruments used were observation sheets and interview sheets. The wound assessment instrument used the Winner Scale wound observation sheet. - Analysis: descriptive analysis	The results of wound care with *aloe vera gel* in patients with diabetic ulcers carried out for 2 weeks every 2 days concluded that there was a decrease in the wound assessment score in wound A, there was a decrease of 15, namely from the initial score of 25 to 10 and wound B decreased by 12 from the initial score of 29 to 17 in the final score. This proves that aloe vera gel is effective in the healing process of diabetic ulcers (Maya Atsfiatun et al., 2025) .	Google Scholar
4.	Sarinah Sri Wulan, M. Khalid Fredy Saputra, Fadil Muhammad	2024	Volume 4, No. 1	The effectiveness of giving aloe vera on the growth of wound tissue in diabetes mellitus patients	- Design: Qualitative descriptive research with a case study approach to nursing care - Subject: diabetic ulcer - Variables: Diabetes Mellitus; Aloe Vera; Wound Healing.	Before being given aloe vera intervention on the first day, subject 1 with a score of 45, subject 2 with a score of 46 measured by *Bates Jensen,* the wound was still approaching *wound degeneration,* but after being given 7	Google Scholar

					- Sample: two people suffering from diabetes mellitus who have diabetic wounds. - Instruments: informed consent sheet, permit letter, observation sheet, 50 grams of aloe vera for each treatment, wound care tools, and standard implementation procedures. - Analysis: qualitative descriptive with a case study approach to nursing care	treatments for 14 days, the wound in subject 1 with a score of 18, subject 2 with a score of 19, which means the wound experienced quite good *wound regeneration* . Administration of aloe vera has been proven effective in healing and growth of wound tissue in diabetes mellitus patients (Wulan et al., 2024) .	
5.	Muhammad Rafli Ramadhani, Exda Hanung Lidiana	2023	Vol. 1, No. 4	Application of *Aloe Vera Gel* to Heal Diabetic Ulcer Wounds at Rasika Wound Clinic, Gunungkidul	- Designs: Descriptive case study - Variables: Aloe Vera, Diabetic Ulcers - Sample: Total sampling - Instrument: *Bates-Jensen Wound Assessment Tool observation sheet.* - Analysis: the application was carried out every 2 days for 6 times using the *Bates-Jensen Wound Assessment Tool.*	The results of the score assessment before the application of the aloe vera gel on respondent 1 were 32 points in the wound degeneration category and on respondent 2, the score was 21 points in the wound degeneration category. After the application of the aloe vera gel, the score on respondent 1 was 21 points in the wound degeneration category,	*Connected paper*

						while on respondent 2, the score was 10 points in the *wound regeneration category*. Both respondents experienced a decrease in scores, indicating that the wound had undergone significant changes (Ramadhani & Lidiana, 2023) .	
6.	Irmayanti Lubis, Naziyah, Millya Helen	2023	VOLUME 5 NUMBER 10	The Effect Of *Zinc Cream Administration* On Diabetic Foot Wounds In The Healing Process In The Wound Proliferation Phase Of Diabetic Ulcer Patients At Wocare CENTER BOGOR	- Design: quasi-experimental and uses a pretest-posttest design. - Subject: Diabetic Foot Ulcers - Variables: Zinc Cream, Diabetic Foot Ulcers - Sample: Total sampling - Instrument: in the form of an observation sheet - Analysis: Using the *Wilcoxon test*	This study produced a p-value of 0.000 indicating a significant variation between the observation scores of the winner scale before and after the test. There was a difference in diabetic foot wounds before and after the application of zinc cream to diabetic foot wounds. This study is expected to serve as a reference, improve nursing services, and raise awareness of the impact of *zinc cream* on diabetic foot wounds during the proliferation phase of wound healing in	Google Scholar

						diabetic ulcer patients (Lubis et al., 2023) .	
7.	Dimas Dewa Darma, Siska Iskandar, Indaryani, Hendra Asev Marizon	2024	Vol. 7 No. 2.	*Zinc Oxide Dressings* on the Process Wound Healing in Diabetic Ulcer Patients at the Alfa Care Clinic in Bengkulu City	- Design: descriptive in the form of a nursing care case study consisting of assessment, nursing diagnosis, intervention, implementation, and evaluation. - Subject: diabetic ulcer - Variables: *Modern Hyaluronate Acid Dressing; Zinc Oxide* ; Diabetic Ulcer Wound Healing - Sample: 1 respondent at the Alfa Care Clinic, Bengkulu City. - Instrument: *Bates-Jensen Wound Assessment Tool wound assessment* obtained: total assessment (20) namely *Wound Generation condition* at the first meeting after 14 days of wound care using the Wound Form, there was a change in the assessment score to (13) which led to *wound generation condition.* - Analysis: descriptive in the form of a nursing care case study consisting of	Topical medication metcovazin rad containing hyaluronate acid and *zinc oxide* has been proven to cure Diabetic ulcer wounds with grade 2 with treatment 3 times for 14 days so that the results of wound nursing in nursing care for skin integrity damage are recommended for diabetic ulcer patients (Darma et al., 2024) .	Google Scholar

	assessment, nursing diagnosis, intervention, implementation, and evaluation.	

Discussion

Fact

Based on the results of a literature review of seven studies that met the inclusion criteria, whether using *Aloe Vera gel, Zinc Oxide cream* , or a combination with other ingredients (e.g., *chitosan* or *hyaluronate acid),* all showed improvements in the condition of diabetic ulcers after intervention. Reported improvements included increased tissue regeneration, changes in wound condition from the degeneration phase to the regeneration phase, decreased wound assessment scores, and increased epithelialization speed. *Aloe Vera gel therapy* was reported to be able to improve wound conditions by accelerating wound closure and shortening the inflammatory phase, allowing wounds to enter the proliferation phase more quickly. Meanwhile, *Zinc Oxide* showed a protective role in wound tissue and encouraged the formation of new collagen. Several studies combining *Aloe Vera* with *Zinc Oxide* nanoparticles or *hyaluronate acid* showed consistent results, namely accelerated healing compared to standard care. No studies in the literature sample reported negative effects or worsening of wound conditions due to the use of either therapy.

Theory

Physiologically , the wound healing process consists of the inflammatory, proliferative, and maturation phases. Disruptions in the early phase, as often occurs in people with diabetes, can inhibit tissue regeneration and prolong healing time, according to Falanga et al. (2004) in (Setyowati, 2021) . *Aloe vera* contains active compounds such as glucomannan, aloesin, and vitamins C/E, which play a role in fibroblast stimulation, angiogenesis, and collagen synthesis. This mechanism aligns with the *moist wound healing theory* (Winter, 1962) in (Setyowati, 2021). which states that a moist wound environment rich in growth factors will accelerate epithelial cell migration. *Zinc Oxide* acts as an astringent and antimicrobial agent that can reduce bacterial colonization on the wound surface, while also being a cofactor in the activity of enzymes necessary for connective tissue formation. This theory is supported by the finding (Lubis et al., 2023) that the use of *zinc cream* on diabetic ulcers accelerates the transition from the inflammatory phase to the proliferative phase. Research on the combination of *Aloe Vera* + *Zinc Oxide* nanoparticles supports the theory of synergy, where *Aloe Vera* maintains moisture and stimulates regeneration, while *Zinc Oxide* provides physical protection and collagen stimulation. This is in line with the *adjunctive topical therapy model* used in modern wound care, where the combination of topical agents can provide additive or synergistic effects on healing outcomes (Alawadi et al., 2024) .

Researcher's Opinion

Based on a comparison of facts and theories, researchers believe that the use of *Aloe Vera gel* and *Zinc Oxide cream* has great potential as adjuvant therapy in the treatment of diabetic ulcers, particularly in primary care . First, in terms of effectiveness, both work through different but complementary mechanisms: *Aloe Vera* in stimulating tissue regeneration and hydration, *and Zinc Oxide* in protecting and stimulating collagen. Second, in terms of availability and cost, both are relatively easy to obtain and affordable, making them feasible for implementation in healthcare facilities with limited resources.

Randomized clinical trials using the pure combination of *Aloe Vera* + *Zinc Oxide* for diabetic ulcers. Most studies were conducted separately or in combination with other ingredients, making it difficult to determine the extent of each component's

contribution to the final outcome. Therefore, although literature data demonstrates consistent wound healing, further studies with more robust designs are needed to establish the long-term effectiveness and safety of this combination therapy.

Conclusion

Based on the results of a literature review of seven studies discussing the use of *Aloe Vera gel* and *Zinc Oxide cream* In the healing of diabetic ulcers, it can be concluded that:

1. *Aloe Vera gel* effectively accelerates the healing of diabetic ulcers through anti-inflammatory mechanisms, fibroblast stimulation, increased angiogenesis, and new collagen formation.
2. *Zinc Oxide cream* plays a role in wound protection, reducing bacterial colonization, and supporting the formation of connective tissue through its role as an enzyme cofactor in collagen synthesis.
3. Evidence from studies combining *Aloe Vera* with *Zinc Oxide* shows consistent results in accelerating tissue regeneration and repair. wound conditions, although most studies still use a combination with other additional ingredients.
4. The use of these two therapies is safe, relatively affordable, and easily accessible, so they have the potential It can be applied in primary care and home care as an adjuvant therapy. Although literature data supports the effectiveness of both therapies, randomized controlled clinical trials testing the pure combination of *Aloe Vera gel* and *Zinc Oxide cream* are needed to scientifically confirm their efficacy and safety.

Suggestions for further researchers

a. As a reference material for conducting *experimental research* with design *randomized controlled trial* which compared *Aloe Vera gel, Zinc Oxide cream* , and a combination of both on diabetic ulcers.
b. Include objective measures of success such as the *Bates-Jensen score* or *PUSH Tool*, as well as long-term evaluations to see the ongoing effects of healing.

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