Jurnal Keperawatan *Priority*, Vol 9 No.1, Januari 2026
ISSN 2614-4719

# Application of Zinc Cream as an Adjunct Therapy to Enhance Wound Healing in Diabetic Foot Ulcers

**Lily Putri Marito[1*], Rafika Nur Siregar[2], Rostini[3]**
[1,2,3]Sekolah Tinggi Ilmu Kesehatan Malahayati Medan
*Email: lilyputrimarito@gmail.com*

## ABSTRACT

Diabetic foot ulcer is one of the most serious complications in individuals with diabetes mellitus, resulting from peripheral neuropathy, impaired vascularization, and chronic infection, which collectively delay the wound healing process. Proper wound management is essential to prevent severe outcomes such as amputation. Methods: This study employed a case study design to provide an in-depth clinical description of wound healing progression in patients with stage 4 diabetic foot ulcers. Purposive sampling was used to select three patients treated at Asri Wound Care Center Medan. Zinc cream was applied as an adjunct therapy for six weeks, with treatment administered twice weekly. Wound healing was evaluated using the Bates-Jensen Wound Assessment Tool (BWAT) and clinical observations. Results: All patients demonstrated observable improvements in BWAT scores, with reductions from 37 to 22, 40 to 26, and 39 to 24, respectively. Clinical observations indicated improved wound healing indicators, including increased granulation tissue, reduced exudate, and enhanced epithelialization. Conclusion: The application of zinc cream as an adjunct therapy may support the wound healing process in patients with stage 4 diabetic foot ulcers. However, due to the limited sample size and the absence of a control group, the findings should be interpreted cautiously, and further studies with larger samples and comparative designs are recommended.

**Keywords**: **zinc cream, diabetic foot ulcer, wound healing**

## INTRODUCTION

Diabetes mellitus is an increasing global public health concern. The number of individuals living with diabetes has risen substantially in recent decades, and many remain undiagnosed or inadequately treated. Diabetes can lead to serious complications, including blindness, kidney failure, cardiovascular disease, and lower-extremity amputation. The World Health Organization reports that more than 346 million people worldwide are affected by diabetes, contributing to approximately 6.7 million deaths annually. In Indonesia, the prevalence of diabetes among individuals aged 20–79 years is estimated at 10.6%, placing the country among those with the highest diabetes burden globally (Kementerian Kesehatan RI, 2023; World Health Organization, 2024).

Diabetic foot ulcer (DFU) is one of the most serious complications of diabetes, contributing to increased morbidity, mortality, and economic burden. It is estimated that approximately 15–25% of individuals with diabetes mellitus will develop diabetic foot ulcers at least once during their lifetime, making DFU a major cause of diabetes-related hospitalization and lower-extremity amputation. DFU management is often prolonged and may result in amputation if not properly treated. Delayed treatment is a major factor contributing to the high risk of amputation. Therefore, effective interventions to prevent and treat DFU are essential (Lopez et al., 2025; NCD Risk Factor Collaboration, 2024).

In Indonesia, including North Sumatra Province, the number of individuals with diabetes continues to rise. Data show that fewer than half of patients receive proper healthcare, and many seek medical attention only when their wounds have progressed to severe stages. Limited access to specialized wound care services, delayed treatment-seeking behavior, and variations in clinical practice contribute to suboptimal DFU management in local healthcare settings. This condition worsens wound healing outcomes and prolongs recovery time. In North Sumatra Province, only 30.22% of patients received diabetes-related treatment within the past two years, while many others did not undergo adequate medical evaluation (International Diabetes Federation, 2024; Kementerian Kesehatan RI, 2023).

Asri Wound Care Center Medan is a healthcare facility specializing in the management of patients with diabetic wounds. Within the last two months in 2024, 40 cases of diabetic foot ulcers have been recorded at this center. The increasing number of diabetes cases and DFU risk factors in urban areas such as Medan underscores the urgent need for effective, accessible, and evidence-based wound care interventions in local clinical practice.

Impaired wound healing in diabetic patients often occurs due to prolonged inflammation, impaired angiogenesis, delayed epithelialization, and reduced granulation tissue formation. These pathophysiological conditions disrupt the normal progression of the wound healing phases, resulting in chronic and non-healing wounds. Zinc is one of the promising interventions due to its essential role in wound healing, including collagen synthesis, immune regulation, cell proliferation, and antimicrobial activity. Previous studies have demonstrated that zinc contributes to wound healing by modulating inflammatory responses, enhancing epithelialization, supporting granulation tissue formation, and improving immune defense mechanisms. In patients with

diabetes, impaired zinc metabolism and increased oxidative stress may further delay wound healing, highlighting the potential benefit of topical zinc as an adjunct therapy.

Various zinc formulations have been investigated; however, research findings are not always directly applicable to routine clinical practice in Indonesia. Current DFU management in Indonesia commonly includes wound debridement, infection control, moisture balance, and the use of conventional or modern wound dressings. The limited availability of controlled clinical studies and locally relevant evidence regarding zinc use in DFU management represents a significant research gap. This gap between scientific evidence and local clinical practice motivated the authors to describe the wound healing response following the application of zinc cream as an adjunct therapy in patients with stage 4 diabetic foot ulcers treated at Asri Wound Care Center Medan.

## METHODS

This study utilized a case study design, a descriptive research method focusing on individuals, small groups, or real-life situations. In nursing, this design describes the application of nursing care, clinical interventions, or therapeutic responses (Polit & Beck, 2022). This study employed a descriptive case study design to examine the application of zinc cream as an adjunct therapy in promoting wound healing in patients with diabetic foot ulcers. This design was selected to allow in-depth observation of clinical wound healing progression in a real-world care setting where controlled comparative studies were not feasible. The study was conducted at Asri Wound Care Center Medan, a specialized facility for chronic wound management.

Participants were selected using purposive sampling based on predefined criteria. Inclusion criteria were patients diagnosed with diabetes mellitus, presenting with stage 4 diabetic foot ulcers, aged 40 years and above, and receiving routine wound care at the center. Exclusion criteria included severe coagulation disorders, known allergy to zinc cream components, use of other topical agents that could interfere with wound healing, and severe comorbid conditions affecting wound recovery. Three patients met these criteria and were included. Given the exploratory nature and small sample size, the findings are presented descriptively without inferential statistical analysis.

All participants received standardized wound care according to the clinic's protocol, including wound cleansing and appropriate dressing selection. Zinc cream was applied as an adjunct therapy twice weekly for six weeks. Wound healing outcomes were assessed using the Bates-Jensen

Wound Assessment Tool (BWAT), which evaluates multiple indicators of wound healing, including granulation tissue, exudate, and epithelialization. Assessments were conducted at baseline and after the intervention period.

## RESULTS

This section outlines the respondents' demographic profiles, baseline wound conditions, and the progression of healing as measured by BWAT throughout the intervention period.

**Table 1. Respondent Characteristics**

| Respondent | Age | Gender | Stage |
|---|---|---|---|
| Respondent 1 | 49 years old | Male | 4 |
| Respondent 2 | 52 years old | Male | 4 |
| Respondent 3 | 56 years old | Female | 4 |

Based on Table 1. the characteristics of the respondents show that all three individuals were over 40 years of age, consisting of two males and one female. In addition, all respondents presented with wounds at the same stage, namely stage 4.

### Implementation of the Intervention and Nursing Care

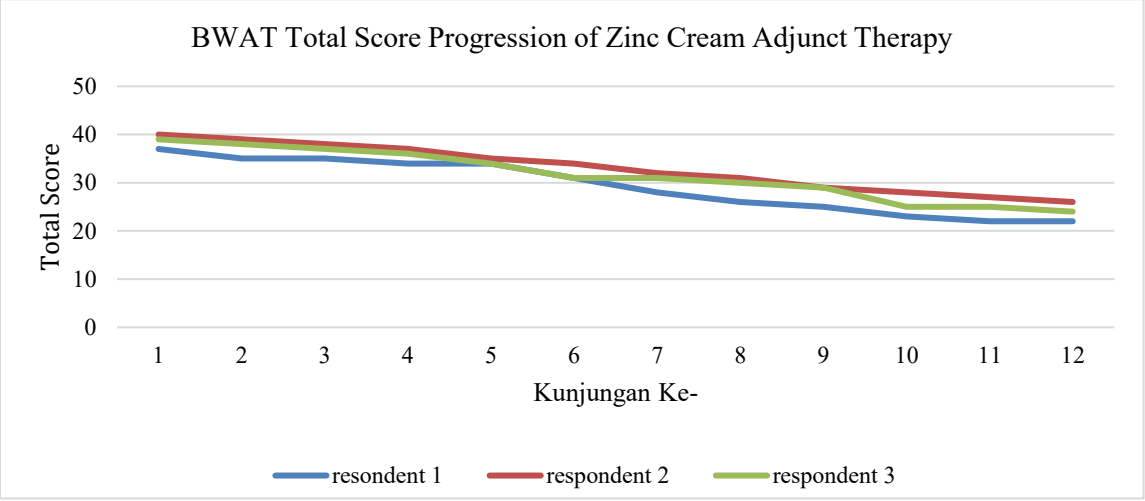


Figure 1. BWAT score progression over 12 visits for three respondents.

The graph shows a progressive decrease in BWAT total scores across the 12 wound care visits for all three respondents. Respondent 1's score decreased from 37 at the initial visit to 22 at the twelfth visit. Respondent 2 showed a reduction from 40 to 26, while Respondent 3's score declined from 39 to 24 over the same period. The continuous reduction in scores indicates an improvement in

overall wound status during the treatment period, with each respondent demonstrating a downward trend from the first to the final visit.

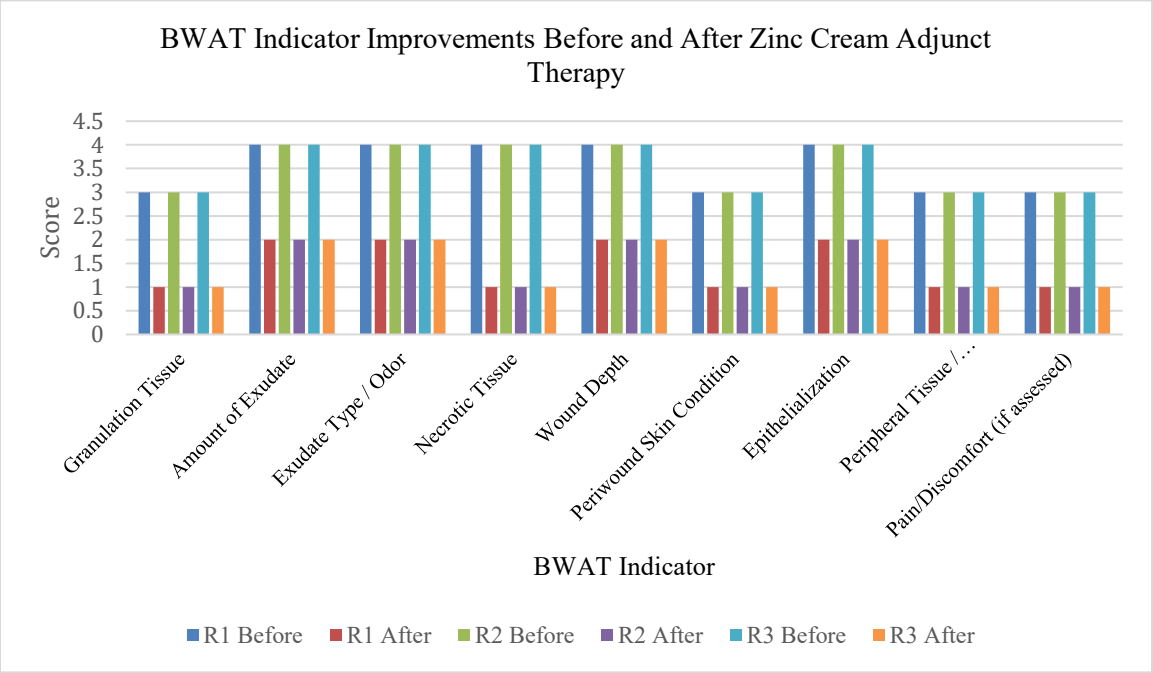


Figure 2. Changes in BWAT wound assessment indicators before and after zinc cream adjunct therapy, showing lower scores across all indicators at the final assessment for all three respondents.

The bar chart presents changes in BWAT assessment indicators before and after the application of zinc cream as adjunct therapy in the three respondents. Across all indicators, there is a visible decrease in scores from baseline to the end of the treatment period. Improvements were observed in granulation tissue, exudate characteristics, necrotic tissue, wound depth, periwound skin condition, epithelialization, and inflammatory signs. Each respondent demonstrated a reduction in scores on these indicators, reflecting a transition from more severe wound characteristics at the initial assessment to milder conditions at the final evaluation.

## DISCUSSION

Managing diabetic foot ulcers presents major clinical challenges due to impaired peripheral circulation, neuropathy, and chronic infection. Comprehensive wound care includes wound cleansing, infection control, debridement of necrotic tissue, moisture balance management, and appropriate dressing selection to promote tissue regeneration (Sidhu & Harbuzova, 2024). In this

study, zinc cream was applied as an adjunct therapy within a standardized wound care protocol rather than as a single treatment modality.

Consistent improvements in wound healing were observed across all three respondents following six weeks of treatment. The first respondent presented with a stage 4 diabetic foot ulcer on the dorsum of the foot measuring 18 × 12 cm with undermining and an initial BWAT score of 37. After the intervention period, the BWAT score decreased to 22, reflecting improvements in granulation tissue distribution, reduced exudate, and progressive epithelialization. These findings are consistent Abdissa et al. (2020), who reported that ulcers located on the dorsum of the foot often demonstrate better blood circulation than plantar ulcers, facilitating granulation tissue formation when appropriate wound care is applied.

The second respondent had a stage 4 ulcer located on the calcaneal region, characterized by deep tissue involvement, moderate to large exudate, and early granulation at the wound margins. The BWAT score decreased from 40 to 26 after six weeks of treatment. Improvements were noted in wound depth, granulation tissue formation, epithelialization, and periwound condition. These outcomes support findings by Daryago et al. (2021) who demonstrated that topical zinc oxide accelerates wound healing by modulating inflammatory responses and enhancing matrix metalloproteinase activity. The third respondent presented with a plantar foot ulcer measuring 7 × 8 cm with significant exudate and necrotic tissue, indicating an active inflammatory phase. After six weeks of treatment, the BWAT score decreased from 39, accompanied by improved granulation tissue formation and reduced exudate. Plantar ulcers are known to heal more slowly due to pressure and neuropathy; therefore, regular wound care combined with adjunctive zinc application likely contributed to improved wound healing outcomes (Sidhu & Harbuzova, 2024).

Recent clinical evidence further supports the therapeutic role of zinc in chronic wounds. A quasi-experimental clinical study in patients with diabetic foot ulcers demonstrated significant reductions in ulcer dimensions and improvements in tissue healing indicators following the application of zinc chitosan cream, suggesting both local and systemic benefit in the wound healing process (Tambunan & Parlaungan, 2024). Additionally, systematic review and meta-analysis concluded that zinc use may contribute to improved healing outcomes in chronic wounds, although evidence strength remains moderate due to sample size and methodological variability, suggesting the need for larger controlled studies (Lopez et al., 2025). Zinc's multifaceted role in wound healing

underscores its therapeutic potential, particularly in addressing chronic wounds effectively (Lebedeva et al., 2023). Experimental work has also explored zinc-based nanocomposites with antimicrobial and tissue-regenerative properties in diabetic wound models, reinforcing the mechanistic plausibility of zinc use in clinical care (Nagaiah et al., 2025).

Zinc contributes to wound healing through multiple biological mechanisms, including stimulation of fibroblast proliferation, collagen synthesis, angiogenesis, and epithelial cell migration, while also reducing local inflammation and oxidative stress. Collectively, these biological actions position zinc as a plausible therapeutic adjunct across the inflammatory, proliferative, and remodeling phases of wound healing (Lin et al., 2018). Furthermore, recent clinical evidence reinforces the therapeutic relevance of zinc in diabetic foot ulcer management. Dadfar et al. (2023) reported that zinc supplementation, when combined with ozone therapy, significantly accelerated DFU healing by enhancing vascular perfusion, modulating inflammatory responses, and improving cellular repair processes. Although ozone therapy was not included in the present study, the findings corroborate the biological plausibility of zinc's role, particularly its contribution to inflammatory control and tissue regeneration. The study also demonstrated a reduction in C-reactive protein (CRP), suggesting decreased systemic inflammation, which is consistent with the improvements observed in wound conditions in this case series. These findings are consistent with the study by Zhang et al. (2025), which demonstrated that zinc sulfate gel enhances wound healing through improved collagen fiber organization, balanced inflammatory modulation, and accelerated re-epithelialization. Their work showed that zinc facilitates wound bed remodeling and promotes faster granulation, supporting its role as a biologically active adjunct in chronic wound management.

Importantly, zinc cream in this study was used as an adjunct to standard wound care, including routine wound cleansing, appropriate moisture-retentive dressings, infection monitoring, and pressure management. Zinc was applied topically before dressing placement to support the wound bed environment, enhance granulation tissue formation, and accelerate epithelialization without replacing standard wound management practices. This combined approach reflects real-world clinical practice and supports the rationale for labeling zinc as an adjunct therapy rather than a primary intervention.

Despite the positive findings, this study has limitations, including a small sample size and the absence of a control group, which restrict the generalizability of the results. Therefore, the findings should be interpreted as preliminary evidence. Nevertheless, this study provides practical insight into the potential benefits of zinc cream as an affordable and accessible adjunct therapy for diabetic foot ulcer management in Indonesian clinical settings.

## CONCLUSION

This case study suggests that the use of zinc cream as an adjunct therapy may support the wound healing process in diabetic foot ulcers. Clinical improvements were observed across all three respondents over six weeks of treatment, as reflected by reductions in BWAT scores and visible progress in granulation tissue formation, exudate reduction, healthier periwound skin, and epithelialization. These findings are consistent with previous studies indicating that zinc contributes to tissue regeneration through fibroblast activation, collagen synthesis, angiogenesis, and modulation of inflammatory responses.

However, the strength of the evidence remains limited due to the small sample size and the absence of a control group, which restrict the generalizability of the results. Therefore, these outcomes should be interpreted as preliminary and not considered definitive proof of treatment effectiveness. Further research involving larger samples and controlled comparative designs is recommended to validate the clinical potential of zinc cream.

Within these limitations, zinc cream can be viewed as a safe, simple, and accessible adjunct therapy that may support moist wound healing in diabetic foot ulcer management, particularly in settings with limited resources.

## REFERENCES

Abdissa, D., Adugna, T., Gerema, U., & Dereje, D. (2020). Prevalence of diabetic foot ulcer and associated factors among adult diabetic patients on follow-up clinic at jimma medical center, Southwest Ethiopia, 2019: An Institutional-based cross-sectional study. *Journal of Diabetes Research*, 1–6. https://doi.org/10.1155/2020/4106383

Dadfar, R., Khorsandi, L., Goujani, R., Mousavi, S. F., & Aslani, Z. (2023). Therapeutic utilization of zinc supplementation concurrent with ozone therapy ameliorates diabetic foot ulcer and attenuates serum level of c-reactive protein-a case report study. In *case report*. https://pmc.ncbi.nlm.nih.gov/articles/PMC10012018/pdf/ABR-12-18.pdf

Daryago, A. A. A., Fitriani, Kartowigno, S., Aryani, I. A., Yahya, Y. F., Diba, S., & Stephanie, A.

(2021). Management of diabetic foot ulcers: Dermatology perspective. *Bali Dermatology and Venereology Journal (BDV)*, *4*(2), 23–27. https://doi.org/10.15562/bdv.v4i2.65

International Diabetes Federation. (2024). *IDF Diabetes Atlas 2025*. https://diabetesatlas.org/resources/idf-diabetes-atlas-2025/

Kementerian Kesehatan RI. (2023). *Survei Kesehatan Indonesia*. https://www.badankebijakan.kemkes.go.id/ski-2023-dalam-angka/

Lebedeva, S. A., Galenko-Yaroshevsky, P. A., Samsonov, M. Y., Erlich, A. B., Margaryan, A. G., Materenchuk, M. Y., Arshinov, I. R., Zharov, Y. V., Zelenskaya, A. V., Shelemekh, O. V., Lomsadze, I. G., & Demura, T. A. (2023). Molecular mechanisms of wound healing: the role of zinc as an essential microelement. *Research Results in Pharmacology*, *9*(1), 25–39. https://doi.org/10.18413/rrpharmacology.9.10003

Lin, P.-H., Sermersheim, M., Li, H., Lee, P. H. U., Steinberg, S. M., & Ma, J. (2018). Zinc in Wound healing modulation. *Nutrients*, *10*(1), 1–20. https://doi.org/10.3390/nu10010016

Lopez, E. A., Zand, N., Ojo, O., & Kochhar, T. (2025). Systematic review and meta-analysis of the effect of zinc on wound healing. *BMJ Nutrition, Prevention & Health*, 1–8. https://doi.org/10.1136/bmjnph-2024-000952

Nagaiah, H. P., Samsudeen, M. B., Augustus, A. R., & Shunmugiah, K. P. (2025). In vitro evaluation of silver-zinc oxide-eugenol nanocomposite for enhanced antimicrobial and wound healing applications in diabetic conditions. *Discover Nano*, *20*(1), 1–0. https://doi.org/0.1186/s11671-025-04183-0

NCD Risk Factor Collaboration. (2024). Worldwide trends in diabetes prevalence and treatment from 1990 to 2022: a pooled analysis of 1108 population-representative studies with 141 million participants. *The Lancet*, *404*, 2077–2093. https://doi.org/10.1016/S0140-6736(24)02317-5

Polit, D. F., & Beck, C. T. (2022). *Essentials of nursing research: Appraising evidence for nursing practice* (10th ed.). Wolters Kluwer. https://digrep.mchs.mw/items/7ce36ff3-fa53-48b0-b524-4be2e0b6580b

Sidhu, A. S., & Harbuzova, V. (2024). Emerging technologies for the management of diabetic foot ulceration : a review. *Frontiers in Clinical Diabetes and Healthcare*, *12*(5), 1–17. https://doi.org/10.3389/fcdhc.2024.1440209

Tambunan, S., & Parlaungan, J. (2024). Pengaruh zinc chitosan cream terhadap proses penyembuhan ulkus diabetikum pada pasien diabetes milletus tipe II. *Journal of Telenursing*, *6*(2), 1721–1729. https://doi.org/10.31539/joting.v6i2.10975

World Health Organization. (2024). *Diabetes*. 2024. https://www.who.int/news-room/fact-sheets/detail/diabetes?utm_

Zhang, Y., Wei, X., Xu, Y., Xia, W., Zheng, C. Y., Zhang, H., Chen, W., Xu, K., & Huang, Q. (2025). Zinc sulfate gel reshapes the wound microenvironment to promote full-thickness wound healing in mice. *Regenerative Therapy*, *28*, 582–590. https://doi.org/10.1016/j.reth.2025.01.022