



Moist Wound Healing Using Virgin Coconut Oil (VCO) Ointment to Improve Skin and Tissue Integrity in Type 2 Diabetes Mellitus Patients

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ABSTRACT

Introduction: Type 2 Diabetes Mellitus (T2DM) is a major global health concern frequently complicated by diabetic foot ulcers, which require effective wound care to prevent infection and accelerate healing. Moist Wound Healing (MWH) and Virgin Coconut Oil (VCO) have been recognized as complementary therapies that may enhance skin and tissue integrity. This study aimed to assess the effectiveness of combining MWH and VCO ointment on wound healing and pain reduction in a patient with a diabetic ulcer.

Methods: This case study involved a T2DM patient presenting with a grade IV diabetic ulcer on the right foot. The intervention consisted of MWH combined with VCO ointment, administered three times at three-day intervals. Wound healing was evaluated using the Bates-Jensen Wound Assessment Tool (BWAT) to measure skin and tissue integrity, while pain intensity was assessed using the Numerical Rating Scale (NRS).

Results: After three intervention sessions, notable improvements were observed. The BWAT total score decreased from 60 to 29, reflecting substantial tissue regeneration. The presence of healthy granulation tissue increased from 90% to 96%, indicating enhanced wound bed recovery. Additionally, the patient's pain score decreased from 5 (moderate) to 2 (mild) on the NRS scale.

Conclusion: The application of Moist Wound Healing combined with VCO ointment demonstrated effectiveness in improving skin and tissue integrity, enhancing granulation tissue formation, and reducing pain in a T2DM patient with a diabetic ulcer. This intervention shows potential as part of comprehensive wound care management; however, further studies with larger samples and extended observation periods are needed to strengthen these findings.



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INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterized by persistent hyperglycemia due to impaired insulin secretion, insulin action, or both (Care & Suppl, 2025). This condition results in progressive damage to vital organs such as the heart, kidneys, eyes, blood vessels, and peripheral nerves. Globally, diabetes has become a major public health burden and is categorized as one of the most significant non-communicable diseases (NCDs). Recent global estimates indicate a substantial rise in diabetes prevalence, with approximately 589 million adults living with diabetes in 2021, projected to increase by 45% by 2050. Of all cases, 90–95% are identified as Type 2 Diabetes Mellitus (Sun H, Saeedi P, 2021).

Southeast Asia and the Western Pacific regions contribute nearly half of the global diabetes burden, with China, India, and Pakistan having the highest prevalence (Sun, 2022). Indonesia currently ranks fifth worldwide, with an estimated 19.47 million individuals living with diabetes. National reports indicate increasing trends in diabetes prevalence, influenced by lifestyle changes, dietary patterns, low physical activity, and rising obesity rates. Based on national health data, the prevalence of diabetes in Indonesia has reached 8.5%, with T2DM representing the majority of diagnosed cases (Duncan, 2025) (Sun H, Saeedi P, 2021).

At the regional level, the burden of diabetes is also evident. Bau-Bau City Hospital recorded 204 diabetes cases in 2023 and 199 cases in 2024, with 50 and 45 diabetic ulcer cases respectively during the same period (Bau-Bau City Hospital, 2024). Uncontrolled diabetes often leads to chronic complications, including cardiovascular disease, nephropathy, neuropathy, and diabetic ulcers. Diabetic ulcers are characterized by open wounds accompanied by tissue damage, and when not managed properly, they may progress to infection, ulceration, and gangrene. Effective wound care is therefore essential to prevent further complications (Kim, 2023).

Moist Wound Healing (MWH) has emerged as a recommended modern approach in wound management, offering advantages such as maintaining optimal moisture, enhancing epithelialization, supporting autolysis, reducing infection risk, and improving patient comfort. Evidence suggests that MWH is more effective than traditional dry wound care methods in facilitating tissue regeneration. In diabetic ulcers, wound healing is influenced by factors such as hyperglycemia, neuropathy, infection, and inappropriate wound care practices. Thus, selecting an appropriate wound management strategy is critical for optimal healing outcomes.

Virgin Coconut Oil (VCO) has gained attention as a supportive topical therapy in wound care due to its moisturizing, anti-inflammatory, and antimicrobial properties (Susanti, 2023). VCO contains lauric acid, oleic acid, and vitamin E, which play roles in maintaining skin hydration, promoting epithelialization, and protecting tissues from oxidative stress (Rahayu et al., 2024). Several studies have demonstrated that VCO enhances granulation tissue formation, fibroblast proliferation, and neovascularization, making it a promising adjunct in diabetic wound care. However, despite its potential benefits, conventional wound care methods remain commonly used in many healthcare facilities, including Bau-Bau City Hospital. Therefore, this study aims to evaluate the effectiveness of combining Moist Wound Healing therapy with VCO ointment in improving tissue integrity and supporting wound healing in a patient with a diabetic ulcer.

METHOD

This study employed a descriptive approach with a case study design through the implementation of nursing care for a patient with Type 2 Diabetes Mellitus (T2DM) presenting with a diabetic ulcer. One patient meeting the inclusion criteria diagnosed with T2DM and experiencing impaired skin and tissue integrity was selected as the study subject. The patient received three wound care interventions, each administered once every three days in the morning.

The intervention consisted of Moist Wound Healing (MWH) combined with Virgin Coconut Oil (VCO) ointment. This method aims to maintain a moist wound environment to support optimal epithelialization, prevent tissue damage during dressing changes, and reduce pain. The VCO ointment used in this study was Darusyifa brand, with a volume of approximately 125 ml. Both MWH and VCO ointment were applied consistently across all three treatment sessions.

Assessment of skin and tissue integrity was conducted using the Bates-Jensen Wound Assessment Tool (BWAT). This instrument evaluates several wound parameters including size (length × width), depth, wound edges, tunneling or undermining, necrotic tissue type, exudate type and amount, skin color surrounding the wound, peripheral edema, peripheral induration, and epithelialization. Pain levels were measured using the Numerical Rating Scale (NRS), which quantifies pain intensity from 0 (no pain) to 10 (worst pain). Granulation tissue development

was also evaluated as an indicator of wound healing progression following the application of MWH and VCO ointment.

RESULTS

The research was conducted using a medical surgical nursing assessment format related to skin and tissue integrity in patients with Type 2 Diabetes Mellitus. The main complaint felt by the client at this time was a wound on the right foot. The results of the physical examination on Mr. L showed that Blood Pressure was 123/71 mmHg, Pulse 116 times per minute, Respiration 30 times per minute, and Body temperature 37.4°C, general condition was weak, level of consciousness (GCS) apathetic 7-8. The client had previously experienced Type 2 Diabetes Mellitus and had undergone post-debridement on the diabetic ulcer wound on the right foot.

On physical examination, a diabetic ulcer was found on the calf/fibula down to the lateral ankle of the right leg with stage four wound, the size of the wound was 20 cm long and 12.5 cm wide. The edges of the wound were visible, fused with the base of the wound, the depth of the wound was 4 cm, with a purulent exudate type. The amount of exudate that came out was relatively small, and the skin around the wound showed a reddish color, granulation tissue type 90%, necrotic 0%, epithelialization 0%, pain scale 5 (moderate). The patient had undergone post-op debridement at Siloam Hospital.

Nursing problems include impaired skin and tissue integrity caused by peripheral neuropathy, indicated by tissue and/or skin damage. To address this issue, interventions are designed to restore skin and tissue integrity. One therapy offered is Moist Wound Healing and Virgin Coconut Oil (VCO) ointment. The plan is to apply the treatment three times every three days in the morning.

Table 1. Evaluation of the application of Moist Wound Healing wound care and Virgin Coconut Oil (VCO) ointment on skin and tissue integrity based on tissue damage.

Skin and Tissue Integrity	1st Examination (BAST Score)	Inspection 2nd (BAST Score)	Inspection the 3rd (BAST Score)
Network Damage	60 There is necrosis (dead tissue)	31 The healing process is ongoing. The wound shows signs of improvement such as new tissue growth.	29 The healing process is ongoing. The wound shows signs of improvement such as new tissue growth.

Changes in wound condition were found after the first treatment was administered, which was measured on the 3rd day after the intervention.

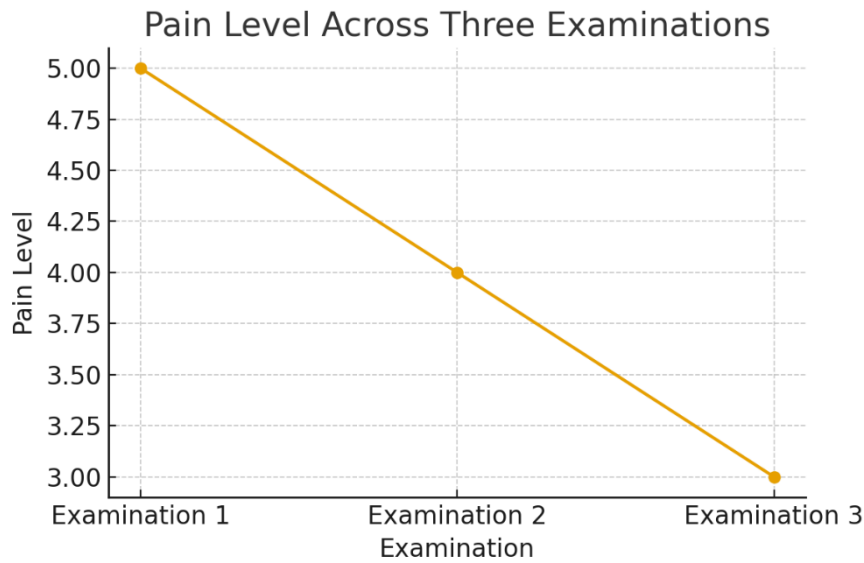


Figure 1 Evaluation of the application of Moist Wound Healing wound care and Virgin Coconut Oil (VCO) ointment on pain levels

Table 2. Evaluation of the application of Moist Wound Healing wound care and Virgin Coconut Oil (VCO) ointment on Granulation Tissue

Skin and Tissue Integrity	1st Examination	Inspection 2nd	Inspection the 3rd
Granulation or tissue growth	3 Bright red granulation tissue, filling >25% to <75% of the wound bed	3 Bright red granulation tissue, filling >25% to <75% of the wound bed	2 Bright red, healthy granulation tissue fills 75–100% of the wound bed and/or there is excessive tissue growth.

Granulation or tissue growth appears to increase after the third wound care treatment.



Figure 2 First treatment: Wound length: 20 cm; Wound width: 12.5 cm, visible damage

Tissue/skin (tissue regeneration score 33), Granulation appears in the wound at around 90% (Figure 2a). Second treatment: A diabetic ulcer appears on the right foot, Wound length: 20 cm. Wound width: 12.5 cm, tissue/skin damage appears to be decreasing (tissue regeneration

score 31), granulation appears to be present in the wound at 95%), skin layer damage appears to be decreasing from score 7 to grade 2 (figure 2b)



Figure 3 Third treatment: Wound length: 19 cm

Figure 3. Wound image in the third treatment Third treatment: Wound length: 19 cm, Wound width: 12 cm, tissue/skin damage was still found (tissue regeneration score 29) Granulation was seen in the wound 96%, skin layer damage appeared to have decreased (score 6 degree 2) score category 4

DISCUSSION

The results of this case study demonstrate that the combination of Moist Wound Healing (MWH) wound care and Virgin Coconut Oil (VCO) ointment provides significant improvements in wound healing outcomes among patients with Type 2 Diabetes Mellitus experiencing diabetic ulcers. After three treatment sessions, the BWAT tissue damage score decreased substantially from 60 to 29, indicating active tissue regeneration. Granulation tissue development also improved, with wound bed filling increasing from 90% to 96%. Pain levels decreased from moderate (score 4) to mild (score 2), accompanied by a reduction in redness around the wound. These findings align with previous literature stating that moist wound healing accelerates epithelialization and enhances wound recovery by maintaining an optimal moist environment for cellular growth (Basri et al., 2021).

The improvement observed in this study is consistent with the principles of Moist Wound Healing, which has been shown to be more effective than traditional dry wound care techniques. MWH maintains wound moisture, facilitates autolytic debridement, promotes faster epithelialization, and reduces the risk of infection. Previous research confirms that MWH supports increased transforming growth factor $\beta 1$ (TGF- $\beta 1$), a key protein involved in cell proliferation and tissue repair (Nenoharan et al., 2020; Sa'diyah et al., 2019; Sari et al., 2020a). This technique also offers practical advantages, including easy application, adaptability to wound shape, and increased patient comfort during dressing changes (Maulana et al., 2021).

In addition to MWH, the use of Virgin Coconut Oil (VCO) ointment contributed meaningfully to wound healing outcomes. VCO has been shown to enhance epithelialization by maintaining wound moisture and reducing inflammation. The findings of this study support several previous studies that highlight the effectiveness of VCO in accelerating wound healing, promoting fibroblast proliferation, and enhancing TGF- β expression (Setiani, 2019; Sumah, 2020). The bioactive components of VCO such as saturated fatty acids, lauric acid, oleic acid, and vitamin E possess antimicrobial, anti-inflammatory, and antioxidant properties that help prevent infection and support cellular repair. These phytochemical

compounds provide additional protection against pathogen growth, contributing to accelerated healing (Febrianti, 2017; Situmorang & Yazid, 2021).

Despite these promising results, it is important to emphasize that MWH and VCO ointment should be integrated into a comprehensive diabetic wound management plan rather than used as standalone treatments. Factors such as glycemic control, nutritional status, peripheral circulation, presence of infection, and patient adherence play critical roles in determining wound healing outcomes. Inadequate management of these underlying factors could hinder the effectiveness of wound care interventions (Nurbaya et al., 2018; Yunus, 2015). Thus, the use of MWH and VCO should be supported by medical supervision, appropriate pharmacological therapy, and regular monitoring of systemic conditions to ensure optimal healing in diabetic ulcer patients (Mahendra, 2023; Sari et al., 2020b).

This study has several limitations that must be addressed. First, the short duration of observation limited to three treatment sessions prevents evaluation of long-term healing outcomes. Second, the study did not control important confounding factors such as blood glucose levels, nutritional intake, vascular status, and comorbid conditions. Third, no laboratory-based confirmation such as wound culture or histopathological examination was conducted to validate the observed tissue improvements. Future studies should involve larger sample sizes, longer follow-up periods, and strict control of prognostic factors such as glycemic control, nutritional assessment, and vascular evaluation (e.g., Ankle–Brachial Index) to strengthen scientific evidence regarding the effectiveness of MWH and VCO ointment in diabetic wound care

CONCLUSION

The combined application of Moist Wound Healing wound care and Virgin Coconut Oil (VCO) ointment three times (every three days) showed positive results in improving skin and tissue integrity. There was a decrease in tissue damage scores (based on BAST/BWAT), indicating a significant tissue regeneration process. Healthy granulation tissue was maintained and improved, with an increased wound bed filling percentage. This indicates that the intervention supports optimal new tissue formation. Furthermore, reduced pain indicates that this intervention also contributes to improving patient comfort.

Author Contribution: NF was responsible for designing the intervention, developing the study protocol, and participating directly in the implementation of the research. NM and NL served as the primary nursing care providers, delivering direct patient care throughout the intervention process. MS contributed to data analysis and interpretation of findings, as well as data collection and documentation. AH was responsible for preparing, organizing, and finalizing the research report to ensure that the study results were presented systematically and comprehensively.

Conflict of Interest: The authors declare that there is no conflict of interest related to the conduct, analysis, or publication of this research. The study was carried out independently without influence from any external parties.

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