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TRIGONA HONEY FOR INFECTION CONTROL AND WOUND HEALING IN DIABETIC FOOT ULCERS: A CASE REPORT

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Abstract

Diabetes-related foot ulcer (DFU) is a chronic complication of diabetes mellitus that is frequently accompanied by infection and carries a high risk of lower-limb amputation. Effective infection control and continuous monitoring of wound progression are critical determinants of therapeutic success. Trigona honey has been reported to possess antibacterial and anti-inflammatory properties that may support wound healing. Case presentation a 47-year-old man with a five-year history of type 2 diabetes mellitus presented with a Wagner grade 2 DFU on the left toe following trauma. The ulcer exhibited signs of severe infection, including erythema, pain, and purulent exudate. Laboratory findings revealed leukocytosis and elevated blood glucose levels. The patient received systemic antibiotic therapy in combination with standard wound care, including cleansing, debridement, and topical application of Trigona honey using gauze dressings. Dressings were changed every 24–96 hours depending on wound condition. Results over a 30-day treatment period, there was a gradual reduction in infection status and progressive improvement in wound healing, characterized by decreased inflammation and the formation of healthier granulation tissue. However, prolonged use of Trigona honey during the proliferative phase was associated with maceration and hypergranulation around the wound. Conclusion trigona honey, when used as an adjuvant therapy, is effective in controlling infection and promoting wound healing during the early phase of DFU. Continued application should be reassessed if signs of maceration or hypergranulation occur, and treatment strategies should be adjusted according to the wound-healing phase to optimize clinical outcomes.

Keyword: *DFU; infection; wound healing; Trigona honey*

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BACKGROUND

Diabetes-related foot ulcer (DFU) is one of the most serious complications of diabetes mellitus and represents a major cause of morbidity, hospitalization, and lower-limb amputation worldwide (1). The global prevalence of DFU among patients with diabetes is estimated to range between 6–10%, with a substantially higher burden observed in low and middle-income countries (2). In Indonesia, DFU remains a significant public health concern, contributing to prolonged treatment duration, increased healthcare costs, and reduced quality of life among affected patients (3,4).

Infection is a critical factor that complicates the healing process of DFU and often determines clinical outcomes. Infected DFUs are associated with delayed wound healing, increased risk of systemic infection, and higher rates of amputation (5). Therefore, early identification and effective control of infection are essential components of DFU management. The International Working Group on the Diabetic Foot (IWGDF) and the Infectious Diseases Society of America (IDSA) classification system is widely used to assess the severity of infection and to guide therapeutic decision-making in clinical practice (6).

In addition to infection control, comprehensive wound assessment is crucial for monitoring healing progress and guiding treatment strategies. The DMIST tool—comprising Depth, Moisture, Infection/Inflammation, Size, and Tissue type—provides a structured and systematic approach to evaluating wound status over time. This tool allows clinicians to capture dynamic changes in wound characteristics beyond simple measurements of wound size, thereby offering a more holistic assessment of the healing process (7).

Honey has long been used as a topical agent in wound care due to its antimicrobial, anti-inflammatory, and wound-modulating properties (8,9). Trigona honey, derived from stingless bees, has gained increasing attention because of its high phenolic content and strong antibacterial activity (10). Several studies have demonstrated its potential benefits in reducing bacterial load and inflammation in chronic wounds, including DFU. However, evidence regarding its phase-specific effects during the wound healing process remains limited (11,12).

This case report aims to describe the clinical course of an infected DFU treated with topical Trigona honey as an adjuvant therapy. The progression of infection and wound healing was evaluated using the IWGDF/IDSA classification and the DMIST tool. By integrating these assessment tools, this report seeks to provide insight into the role of Trigona honey in infection control and wound healing progression, as well as to highlight the importance of reassessing topical therapy according to the wound healing phase.

METHODS

Study Design

This study is a single-case report describing the clinical course of a patient with an infected DFU who received topical Trigona honey as an adjuvant therapy. The case was observed prospectively during routine wound care visits, with systematic assessment of infection status and wound healing progression.

Wound Assessment

Wound healing progress was evaluated at every visit using the DMIST tool (7), which assesses five key wound characteristics. Infection severity was classified according to the IWGDF/IDSA classification system (6). These tools were used to monitor dynamic changes in wound condition throughout the treatment period.

Therapeutic Intervention

Wound care procedures followed the clinic's standard wound care protocol, including wound cleansing and debridement. The wound was irrigated with normal saline, with soap added when the wound appeared dirty or malodorous. Debridement was performed as clinically indicated, and sharp debridement was applied to remove necrotic and slough tissue when present. Trigona honey was used as a topical adjuvant therapy. Sterile gauze was soaked with Trigona honey and applied directly to the wound bed after cleansing and debridement. The dressing was changed every 24–96 hours, depending on the wound condition and exudate level.

Ethical Consideration

Written informed consent was obtained from the patient for the publication of this case report and accompanying clinical images. The case report was conducted in accordance with the principles of the Declaration of Helsinki.

RESULT AND DISCUSSION

Case Presentation

A 47-year-old man diagnosed with type 2 diabetes mellitus was treated with oral antihyperglycemic

medication. The duration of diabetes mellitus was five years. He presented to the clinic with a Wagner grade 2 DFU on the left toe that had developed over the past week. The ulcer was caused by trauma. The tissue surrounding the wound showed signs of inflammation, including redness, pain, and purulent exudate. Local infection was identified at the initial examination. Severe infection was confirmed during the first assessment. Intravenous ceftriaxone 1 g and metronidazole 500 mg were administered for one week. Ceftriaxone was given twice daily, and metronidazole three times daily. Subsequently, oral cefixime 200 mg and metronidazole 500 mg were prescribed for four weeks. Cefixime was given twice daily, and metronidazole three times daily. The patient's body mass index (BMI) was 19.53 kg/m², hemoglobin level was 12.1 g/dL, albumin 3.5 g/dL, leukocyte count 22.40 × 10^3/µL, blood glucose level 202 mg/dL, monofilament test results were abnormal, and the ankle-brachial index (ABI) was 1.10.

Figure 1. Clinical Progression of DFU Healing on Days 0 to 30

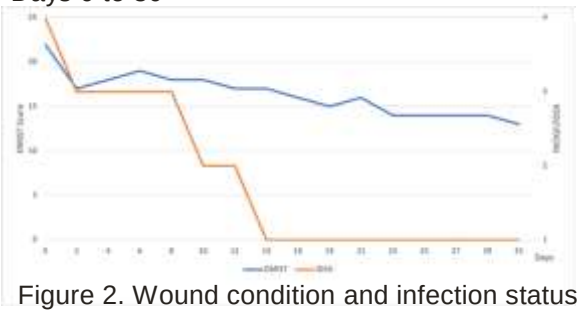

Figure 2. Wound condition and infection status with Trigona honey over 30 days.

Discussion

This case report aimed to illustrate the role of Trigona honey as an adjuvant topical therapy in infection control and wound healing progression in DFU, using the IWGDF/IDSA classification to assess infection status and the DMIST to monitor wound development. The principal findings of this case demonstrated a gradual improvement in infection status and wound characteristics, consistent with changes in IDSA and DMIST scores throughout the observation period.

Based on the wound progression chart, IDSA scores indicated a progressive reduction in infection severity following the administration of standard therapy combined with Trigona honey. Initially, the infection was classified as severe, characterized by evident local inflammatory signs and abnormal systemic parameters. Over time, the infection shifted toward a milder grade, reflecting improved infection control. This improvement aligns with the principle that reduction of bacterial burden and inflammation is a prerequisite for the initiation of the proliferative phase of wound healing.

Changes in DMIST scores during the observation period further reflected the wound's response to the interventions provided. The reduction in the Infection/Inflammation component was followed by improvements in other parameters, including wound bed tissue type and wound edge condition, indicating a gradual transition from the inflammatory phase to the proliferative phase. These findings underscore the value of comprehensive wound monitoring using DMIST, which enables identification of clinical changes not always captured by wound size alone.

The integration of declining IDSA scores and improving DMIST scores in this case suggests that infection control plays a pivotal role in creating a wound environment conducive to healing. Trigona honey, known for its antibacterial and anti-inflammatory properties, is presumed to have contributed to reducing local inflammation and supporting the formation of healthier granulation tissue. This observation is consistent with previous reports highlighting the potential of Trigona honey in DFU management, both in infection control and wound bed preparation (8,11,12)

Beyond infection control, the dynamics of DMIST scores also reflected improvements in granulation tissue quality and wound edge integrity, which are critical indicators of successful chronic wound management. These improvements suggest that Trigona honey, as an adjuvant therapy, not only targets microbial eradication but also modulates the overall wound environment.

An integrated assessment using the IWGDF/IDSA classification and the DMIST tool offers a more comprehensive evaluation of wound response to therapy. This approach enables a more precise characterization of the relationship

between infection control and wound healing progression of DFU.

Nevertheless, the findings of this case also emphasize the importance of considering the wound healing phase in the use of Trigona honey. During the early stage of treatment, particularly within the first week, Trigona honey showed significant effectiveness in reducing signs of infection and tissue inflammation, as reflected by improvements in IDSA scores and the infection/inflammation component of DMIST. These effects are consistent with the antibacterial and anti-inflammatory properties of honey, which reduce microbial burden and create a more controlled wound environment.

Conversely, once granulation tissue became more dominant, continued application of Trigona honey in this case was associated with increased maceration around the wound and a tendency toward hypergranulation. Excessively moist wound environments are known to trigger maceration and disrupt epithelialization, potentially delaying wound closure (13,14). Moreover, prolonged inflammation may contribute to impaired maturation of granulation tissue (15).

Based on these findings, Trigona honey is recommended primarily as an adjuvant therapy during the early phase of infected DFU. If clinical monitoring reveals signs of maceration or hypergranulation, continuation of honey therapy should be reconsidered and replaced with alternative dressings more suitable for supporting the proliferative and epithelialization phases.

This study is limited by its single-case design without a comparative group, which restricts generalizability.

CONCLUSION

This case report demonstrates that the use of Trigona honey as an adjuvant topical therapy in DFU with infection provides tangible benefits, particularly during the early phase of treatment. Evaluation revealed a progressive reduction in infection status accompanied by gradual improvements in wound healing, including decreased inflammatory signs and the formation of healthier granulation tissue.

The integration of improved infection status and wound progression underscores the pivotal role of infection control in creating a wound environment conducive to healing. Trigona honey, with its antibacterial and anti-inflammatory properties, contributes to reducing microbial burden and supports the transition of the wound from the inflammatory phase to the proliferative phase.

However, continued application during the proliferative phase may lead to maceration and hypergranulation. Therefore, therapeutic strategies should be adjusted according to wound conditions to optimize clinical outcomes.

RECOMENDATION

An integrated assessment using the IWGDF/IDSA classification and the DMIST tool is recommended to guide clinical decision-making in the management of infected DFU. Trigona honey should be considered as an adjuvant topical therapy primarily during the early phase of infection, particularly within the first week of treatment. Ongoing use should be regularly re-evaluated, and Trigona honey is not recommended to be continued when signs of increased maceration or hypergranulation are observed; in such cases, transitioning to alternative dressings more appropriate for the proliferative and epithelialization phases is advised. Further prospective studies with larger sample sizes and comparative designs are recommended to clarify the phase-specific effectiveness of Trigona honey in the management of DFU

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