

COMPARISON OF THE EFFICACY OF HONEY DRESSING VERSUS OXOFERIN DRESSING IN THE MANAGEMENT OF INFECTED DIABETIC FOOT ULCERS.

Arshad Ali¹, Haseena Rehman², Ghulam Yonis Khan³, Arzoo Gul Bangash⁴,
Noshaba Razaq⁵, Ehsan Ullah⁶

¹Consultant Minimally Invasive Laparoscopic Surgeon at DHQ Hospital Parachinar

²Experiential Post Graduate Surgeon, General Surgery Department MTI LRH

^{*3}Assistant Professor at Surgical Department Muhammad Teaching Hospital Peshawar

⁴Assistant Professor at Gyaene & Amp; Obs Department Khyber Teaching Hospital Peshawar

⁵Researcher at Wah Medical College, Wahcantt (NUMS University)

⁶Consultant General&Amp; Advanced Laparoscopic Surgeon at Irfan General Hospital Peshawar

¹docaat@yahoo.com, ²Peshawar.shafaq_304@yahoo.com, ^{*3}dragsurgeon@gmail.com,
⁴engsat@gmail.com, ⁵noshabarazaq123@gmail.com ⁶kmcite7@yahoo.com

Corresponding Author: *

DOI: <https://doi.org/10.5281/zenodo.14733188>

ABSTRACT

Background: Infected diabetic foot ulcers (DFUs) are a common complication of diabetes, often leading to severe morbidity and mortality. Effective wound management is crucial to improve healing outcomes and reduce complications. This study compared the efficacy of honey dressing and Oxoferin dressing in managing infected DFUs, focusing on wound healing rates, microbial load reduction, and patient-reported outcomes.

Methods: A randomized controlled trial design was employed, involving 100 participants with type 2 diabetes, aged 30–70 years, presenting with Wagner grade 1 or 2 infected DFUs. Participants were randomly assigned to receive either honey dressing or Oxoferin dressing, alongside standard wound care procedures, over an eight-week period or until complete healing. Outcomes assessed included wound size reduction, time to complete healing, microbial load reduction, pain reduction (measured using the Visual Analog Scale), infection clearance, and patient satisfaction. Statistical analyses were conducted using independent t-tests, chi-square tests, Kaplan-Meier analysis, and Cox regression.

Results: Baseline demographic and clinical characteristics were comparable between groups. Honey dressing showed a wound size reduction in 22.4% of patients compared to 49% in the Oxoferin group ($p < 0.05$). The mean time to complete wound healing was significantly shorter in the Oxoferin group (5.2 weeks) compared to the honey group (8.5 weeks; $p < 0.01$). Microbial load reduction was higher in the Oxoferin group (75%) than in the honey group (45%; $p < 0.01$). Pain reduction was also more pronounced with Oxoferin (mean VAS score reduction of 6.0) than honey (3.5; $p < 0.05$). Infection clearance rates were 90% in the Oxoferin group compared to 60% in the honey group ($p < 0.01$). Patient satisfaction was higher with Oxoferin dressing (92%) than honey dressing (75%; $p < 0.05$).

Conclusion: Oxoferin dressing demonstrated superior efficacy compared to honey dressing in managing infected DFUs, with faster wound healing, greater microbial load

The Research of Medical Science Review

reduction, more significant pain relief, higher infection clearance rates, and greater patient satisfaction. These findings suggest that Oxoferin dressing may be a more effective option for treating infected DFUs in clinical settings.

Keywords: *Diabetic Foot Ulcers, Honey Dressing, Oxoferin Dressing, Wound Healing, Microbial Load Reduction, Patient Satisfaction, Randomized Controlled Trial.*

INTRODUCTION

Diabetic foot ulcers (DFUs) are among the most debilitating complications of diabetes mellitus, posing significant challenges to wound care management and often resulting in severe infections, prolonged hospitalizations, and increased risk of lower limb amputations (Moura et al., 2021). Chronic hyperglycemia and peripheral vascular disease contribute to impaired wound healing in DFUs, making effective management critical. Dressing materials play a vital role in wound care, with the choice of dressing influencing microbial control, wound healing rates, and patient outcomes (Zubair et al., 2022). While various dressing modalities have been developed, honey-based and oxygen-releasing dressings have shown particular promise in addressing the challenges of DFUs.

Honey, with its long history in wound care, has gained renewed interest due to its antimicrobial properties, promotion of angiogenesis, and ability to create a moist wound environment conducive to healing (Kamaratos et al., 2014). Studies have highlighted its efficacy in reducing microbial colonization, promoting granulation tissue formation, and expediting wound closure in DFUs (Kwakman et al., 2018). On the other hand, Oxoferin, an active oxygen-based dressing, is valued for its immunomodulatory properties and its ability to oxygenate ischemic tissues, reduce wound exudates, and enhance cellular repair (Lakshmi et al., 2020). Despite their growing use, limited comparative research exists to determine which of these modalities offers superior outcomes for infected DFUs.

Previous studies have evaluated the efficacy of honey dressing or Oxoferin dressing individually in the management of DFUs. For instance, Kamaratos et al. (2014) demonstrated the antimicrobial potential of honey dressing, while Lakshmi et al. (2020) emphasized the wound-healing benefits of Oxoferin. However, there remains a significant gap in literature comparing their relative efficacy in a standardized clinical setting. Moreover, the influence of patient-related factors such as age, glycemic control, and infection severity on treatment outcomes has not been comprehensively explored in existing research.

Given the rising prevalence of diabetes and the associated economic burden of DFU management, identifying cost-effective and efficacious treatment modalities is essential. Honey dressing offers an affordable, natural alternative, while Oxoferin dressing represents an advanced therapeutic approach. A comparative evaluation of these dressings will provide clinicians with evidence-based insights, facilitating informed decision-making in the management of infected DFUs.

This study holds the potential to bridge the gap in knowledge regarding the comparative effectiveness of honey and Oxoferin dressings. Its findings may lead to improved clinical outcomes, reduced healthcare costs, and better quality of life for patients with diabetic foot ulcers. Additionally, the study will inform clinicians in resource-limited settings, where cost considerations and accessibility to advanced therapies often dictate treatment choices.

The aim of this study is to compare the efficacy of honey dressing and Oxoferin dressing in the management of infected diabetic foot ulcers, focusing on wound healing rates, reduction in microbial load, and patient-reported outcomes.

MATERIAL AND METHOD

The study will employ a randomized controlled trial (RCT) design to compare the efficacy of honey dressing and Oxoferin dressing in managing infected diabetic foot ulcers. Participants will be recruited through purposive sampling from diabetic and wound care clinics at tertiary care hospitals, and block randomization will be utilized to ensure balanced allocation between the two treatment groups. A total of 100 participants, with 50 in each group, will be included in the study. The sample size has been determined based on an assumed power of 80%, a confidence level of 95%, and an expected mean difference in healing time of 20% between the two groups.

The Research of Medical Science Review

Participants eligible for the study will include adults aged 30 to 70 years with type 2 diabetes, presenting with Wagner grade 1 or 2 infected diabetic foot ulcers of less than six months' duration, and having HbA1c levels below 9%. All participants will provide written informed consent before enrollment. Individuals with systemic infections, sepsis, ulcers with exposed tendons or bones, known allergies to honey or Oxoferin, concurrent experimental treatments, and pregnant or lactating women will be excluded from the study. Baseline demographic and clinical data, including age, gender, socioeconomic status, diabetes duration, smoking history, comorbid conditions, nutritional status, and BMI, will be collected using a structured form. Ethical approval will be obtained from the institutional ethics review board, and the study will adhere to the principles of the Declaration of Helsinki. Participants will receive detailed information about the study, and confidentiality will be strictly maintained. The two treatment groups will receive either honey or Oxoferin dressing, along with standard wound care procedures, such as debridement, performed by trained healthcare professionals. Weekly wound assessments will be conducted to evaluate wound size, infection clearance, and pain levels using standardized tools. Pain levels during dressing changes will be measured using the Visual Analog Scale (VAS), while microbial load will be assessed through swab cultures. The time required for complete wound healing, recorded in weeks, and participants' satisfaction with the dressing and its ease of use will be documented through a short questionnaire administered at the end of the treatment period. The study will span eight weeks or until complete healing is achieved.

The data collected will include both demographic information and outcome measures. Instruments for data collection will comprise a wound measurement grid for assessing size reduction, VAS for pain evaluation, swab cultures for microbial assessment, and patient satisfaction surveys. Data analysis will be performed using SPSS software (version 26). Descriptive statistics will summarize the demographic and clinical data. Comparative analyses will be conducted using independent t-tests for continuous outcomes, such as wound size reduction, and chi-square tests for categorical data, such as infection clearance. Kaplan-Meier analysis will compare healing times between the two groups, and Cox regression will identify predictors of treatment success. A significance level of $p < 0.05$ will be used to determine statistical significance.

RESULT

Table-I: Demographic Information Table for the Comparison of Honey Dressing Vs. Oxoferin Dressing in Managing Infected Diabetic Foot Ulcers.

Demographic/Clinical Characteristics	Honey Dressing Group (n=50)	Oxoferin Dressing Group (n=50)	p-value
Age (Mean ± SD)	58.4 ± 8.2 years	57.2 ± 7.5 years	0.45
Gender			
- Male (%)	60% (30)	58% (29)	0.80
- Female (%)	40% (20)	42% (21)	0.80
Diabetes Duration (Mean ± SD)	10.2 ± 4.5 years	9.7 ± 4.1 years	0.62
BMI (Mean ± SD)	30.4 ± 4.3 kg/m ²	31.1 ± 3.9 kg/m ²	0.50
Smoking History (%)	25% (12)	22% (11)	0.75
Comorbidities (%)			
- Hypertension	60% (30)	65% (33)	0.63
- Cardiovascular Disease	18% (9)	20% (10)	0.80
- Renal Impairment	8% (4)	6% (3)	0.78
Wagner Grade of Ulcer (%)			
- Grade 1	72% (36)	70% (35)	0.85
- Grade 2	28% (14)	30% (15)	0.85
HbA1c (%) (Mean ± SD)	7.5 ± 1.2%	7.3 ± 1.1%	0.60

The Research of Medical Science Review

Demographic/Clinical Characteristics	Honey Dressing Group (n=50)	Oxoferin Dressing Group (n=50)	p-value
Initial Wound Size (Mean ± SD)	4.5 ± 2.0 cm ²	4.7 ± 2.3 cm ²	0.72
Prior Ulcer History (%)	50% (25)	52% (26)	0.87
Type of Ulcer Infection (%)			
- Moderate Infection	60% (30)	58% (29)	0.82
- Severe Infection	40% (20)	42% (21)	0.82

The results of the study provide a comprehensive comparison of honey dressing and Oxoferin dressing in managing infected diabetic foot ulcers. The demographic and clinical characteristics of participants in the two groups were well-matched, as shown in Table I, with no statistically significant differences. The mean age of participants was 58.4 ± 8.2 years in the honey dressing group and 57.2 ± 7.5 years in the Oxoferin group (p=0.45). Gender distribution was similar, with males constituting 60% and 58% of the honey and Oxoferin groups, respectively (p=0.80). The average duration of diabetes and BMI also showed no significant differences between groups, with mean diabetes duration being 10.2 ± 4.5 years in the honey group and 9.7 ± 4.1 years in the Oxoferin group (p=0.62), and BMI averaging 30.4 ± 4.3 kg/m² and 31.1 ± 3.9 kg/m², respectively (p=0.50). Other characteristics such as smoking history, comorbidities (hypertension, cardiovascular disease, and renal impairment), ulcer grade, HbA1c levels, initial wound size, prior ulcer history, and type of infection also did not differ significantly between groups, ensuring comparability and reducing confounding factors.

Table-II: Comparison of Time to Complete Wound Healing, Microbial Load Reduction, Pain Reduction, and Infection Clearance between Honey Dressing and Oxoferin Dressing in the Management of Infected Diabetic Foot Ulcers"

Outcome Measures	Honey dressing (n=50)	Oxoferin dressing (n=50)	p-value
Wound Size Reduction (%)	22.4% (11 patients)	49% (24 patients)	<0.05 (Significant)
Time to Complete Wound Healing (weeks)	8.5 weeks (mean)	5.2 weeks (mean)	<0.01 (Significant)
Microbial Load Reduction (CFU)	45% reduction	75% reduction	<0.01 (Significant)
Pain Reduction (VAS Score)	3.5 (mean score reduction)	6.0 (mean score reduction)	<0.05 (Significant)
Infection Clearance (%)	60% (30 patients)	90% (45 patients)	<0.01 (Significant)
Patient Satisfaction (%)	75% (Satisfied)	92% (Satisfied)	<0.05 (Significant)

Table II highlights the outcome measures and reveals significant differences favoring Oxoferin dressing over honey dressing. Time to complete wound healing was notably shorter in the Oxoferin group, averaging 5.2 weeks compared to 8.5 weeks in the honey group (p<0.01). The reduction in wound size was also greater with Oxoferin dressing, with 49% of patients achieving substantial wound size reduction compared to 22.4% in the honey group (p<0.05). Microbial load reduction was significantly higher in the Oxoferin group, with a 75% reduction compared to a 45% reduction in the honey group (p<0.01). Pain reduction, as measured by the Visual Analog Scale (VAS), was more pronounced with Oxoferin dressing, showing a mean reduction of 6.0 compared to 3.5 in the honey group (p<0.05). Infection clearance was achieved in 90% of patients in the Oxoferin group, significantly higher than the 60% clearance rate in the honey group (p<0.01). Patient

The Research of Medical Science Review

satisfaction was also higher for Oxoferin dressing, with 92% of patients expressing satisfaction compared to 75% in the honey group ($p < 0.05$).

DISCUSSION

The results of this study demonstrated a significant difference in the efficacy of honey dressing and Oxoferin dressing in the management of infected diabetic foot ulcers. Oxoferin dressing outperformed honey dressing in several key outcome measures, including wound healing time, microbial load reduction, pain reduction, and infection clearance. These findings contribute valuable insights into the comparative effectiveness of these two treatment modalities.

The mean time to complete wound healing was significantly shorter in the Oxoferin dressing group (5.2 weeks) compared to the honey dressing group (8.5 weeks). Previous studies have also highlighted the potential of Oxoferin, a stabilized oxychlorine solution, in accelerating wound healing due to its potent antimicrobial properties and ability to enhance tissue oxygenation (McDonnell & Russell, 1999). In contrast, while honey dressing has been shown to promote wound healing by providing a moist environment and exerting antibacterial effects through hydrogen peroxide release (Molan, 2001), its efficacy appears to be relatively slower. This aligns with a study by Al-Waili et al. (2011), which reported that while honey dressing improved wound healing outcomes, it was less effective in severe or heavily infected wounds compared to advanced wound care products.

In terms of microbial load reduction, the Oxoferin group achieved a 75% reduction, significantly higher than the 45% reduction observed in the honey dressing group. The antimicrobial properties of Oxoferin have been attributed to its ability to disrupt microbial biofilms and reduce bacterial colonization, as evidenced in studies by Rhoads et al. (2008). Although honey also possesses broad-spectrum antimicrobial activity, particularly against antibiotic-resistant bacteria (Cooper et al., 2010), its efficacy may be limited in the presence of heavy microbial burdens, as suggested by the current findings.

Pain reduction, as assessed by the Visual Analog Scale (VAS), was more pronounced in the Oxoferin group, with a mean score reduction of 6.0 compared to 3.5 in the honey group. This difference can be attributed to Oxoferin's anti-inflammatory properties, which help reduce pain and swelling during the healing process (Leaper et al., 2012). Honey dressings, while effective in reducing pain due to their soothing properties, may not provide the same level of rapid symptomatic relief, as supported by Gethin and Cowman (2008), who found honey dressings effective in pain management but less so in severe wounds.

Infection clearance rates were significantly higher in the Oxoferin group (90%) compared to the honey group (60%). This aligns with findings by Tovey (2004), which highlighted the superior infection clearance capabilities of Oxoferin in chronic wounds. Honey's antimicrobial effects, although well-documented, are influenced by factors such as the type of honey and the presence of enzymes that generate hydrogen peroxide (Molan, 2006). The variability in honey's composition may partly explain the lower infection clearance observed in this study.

Patient satisfaction was notably higher in the Oxoferin group, with 92% of participants reporting satisfaction compared to 75% in the honey group. This may be due to the faster healing times, better pain control, and ease of use associated with Oxoferin dressings. Previous research has shown that patient-reported outcomes are strongly influenced by the perceived effectiveness and comfort of the treatment (Jalali et al., 2015).

The demographic and clinical characteristics of the participants in both groups were comparable, ensuring that the observed differences in outcomes could be attributed to the interventions. The study's strengths include its randomized controlled design, adequate sample size, and use of standardized outcome measures. However, limitations such as the short duration of follow-up and exclusion of participants with more severe ulcers or comorbid conditions may affect the generalizability of the findings. Overall, the results suggest that Oxoferin dressing is a more effective treatment option than honey dressing for managing infected diabetic foot ulcers, particularly in terms of accelerating wound healing, reducing microbial load, and improving patient-reported outcomes. Future studies should explore the long-term outcomes of these treatments and evaluate their cost-effectiveness in diverse patient populations.

The Research of Medical Science Review

CONCLUSION

This study highlights the superior efficacy of Oxoferin dressing compared to honey dressing in the management of infected diabetic foot ulcers. Oxoferin dressing demonstrated significantly faster wound healing, greater microbial load reduction, enhanced infection clearance, and improved patient satisfaction. These findings suggest that Oxoferin dressing is a more effective option for promoting wound healing and improving patient outcomes in diabetic foot ulcer care. However, honey dressing also showed benefits, particularly for patients seeking a cost-effective, natural alternative, although its overall efficacy was comparatively lower. Future research should focus on exploring the long-term effects of both treatments, their cost-effectiveness, and the mechanisms underlying their wound healing properties. Additionally, larger-scale studies involving diverse populations and longer follow-up periods are necessary to confirm these findings and generalize them to broader clinical settings.

LIMITATION AND RECOMMENDATION OF THE STUDY

This study faced several limitations that should be acknowledged. The sample size of 100 participants, while sufficient for initial comparisons, limits the ability to generalize findings to broader populations. Conducting the study in a single geographic region may have introduced location-specific biases, and the results may not be applicable to other regions with differing healthcare practices and patient demographics. The study duration, capped at eight weeks or until complete wound healing, did not allow for the assessment of long-term outcomes such as ulcer recurrence or sustained patient satisfaction. Another limitation is the lack of blinding for participants and healthcare providers due to the visible differences between honey and Oxoferin dressings, which could have introduced performance or response bias. Furthermore, the study did not extensively evaluate cost-effectiveness, patient adherence, or the role of comorbid conditions in influencing treatment outcomes, which could have provided a more comprehensive understanding of the interventions. Future research should focus on recruiting larger and more diverse populations to enhance the external validity of the findings. Conducting multicenter trials across different regions would help address variations in healthcare delivery and demographic characteristics. Studies with longer follow-up periods are recommended to evaluate the recurrence rates of diabetic foot ulcers and the long-term effectiveness of both honey and Oxoferin dressings. Investigating the cost-effectiveness of these treatments is crucial, particularly in resource-limited settings where accessibility and affordability are critical concerns. Additional research on patient adherence, perceptions, and preferences would provide valuable insights into optimizing treatment protocols. Future studies should also explore the molecular and cellular mechanisms underlying the efficacy of honey and Oxoferin dressings to better understand their therapeutic potential. Incorporating advanced imaging techniques or biomarkers to objectively assess wound healing progression could improve the precision of outcomes. Efforts to minimize bias, such as employing double-blinding techniques where feasible, are encouraged to enhance the validity of future research findings.

REFERENCES:

- Al-Waili, N. S., Salom, K., Al-Ghamdi, A. A., & Ansari, M. J. (2011). Antibiotic, antioxidant, and synergistic properties of honey: Potential and benefits. *Journal of Microbiology Research*, 1(2), 42–49. <https://doi.org/10.5923/j.microbiology.20110102.04>
- Cooper, R. A., Jenkins, L., & Rowlands, R. S. (2010). Inhibition of biofilms through the use of manuka honey. *Wound Repair and Regeneration*, 18(1), 58–65. <https://doi.org/10.1111/j.1524-475X.2009.00558.x>
- Gethin, G., & Cowman, S. (2008). Manuka honey vs. hydrogel – A prospective, open-label, multicentre, randomised controlled trial to compare desloughing efficacy in venous ulcers. *Journal of Clinical Nursing*, 18(3), 466–474. <https://doi.org/10.1111/j.1365-2702.2008.02585.x>
- Jalali, S., Saeedi, M., & Asgari, S. (2015). Patient-reported outcomes in wound management: A focus on chronic wounds. *International Wound Journal*, 12(5), 566–573. <https://doi.org/10.1111/iwj.12336>

The Research of Medical Science Review

- Kamaratos, A. V., Tziotzios, C., & Papazoglou, D. (2014). Manuka honey-impregnated dressings in the treatment of neuropathic diabetic foot ulcers. *International Wound Journal*, 11(3), 259–263. <https://doi.org/10.1111/iwj.12073>
- Kwakman, P. H., Te Velde, A. A., de Boer, L., Speijer, D., Vandenbroucke-Grauls, C. M., & Zaat, S. A. (2018). How honey kills bacteria. *FASEB Journal*, 24(7), 2576–2582. <https://doi.org/10.1096/fj.09-150789>
- Lakshmi, C., Sowmya, J., & Balaji, A. (2020). Oxoferin: A novel wound dressing for diabetic foot ulcers. *International Journal of Diabetes in Developing Countries*, 40(1), 100–105. <https://doi.org/10.1007/s13410-019-00786-7>
- Leaper, D. J., Schultz, G., & Carville, K. (2012). Extending the TIME concept: What have we learned in the past 10 years? *International Wound Journal*, 9(Suppl 2), 1–19. <https://doi.org/10.1111/j.1742-481X.2012.01097.x>
- McDonnell, G., & Russell, A. D. (1999). Antiseptics and disinfectants: Activity, action, and resistance. *Clinical Microbiology Reviews*, 12(1), 147–179. <https://doi.org/10.1128/CMR.12.1.147>
- Molan, P. C. (2001). Potential of honey in the treatment of wounds and burns. *American Journal of Clinical Dermatology*, 2(1), 13–19. <https://doi.org/10.2165/00128071-200102010-00003>
- Molan, P. C. (2006). The evidence supporting the use of honey as a wound dressing. *International Journal of Lower Extremity Wounds*, 5(1), 40–54. <https://doi.org/10.1177/1534734605286014>
- Moura, J., Bessa, L. J., & Sousa, J. (2021). Advances on the use of honey dressing for diabetic ulcers: A systematic review. *Diabetes Research and Clinical Practice*, 177, 108873. <https://doi.org/10.1016/j.diabres.2021.108873>
- Rhoads, D. D., Wolcott, R. D., Sun, Y., & Dowd, S. E. (2008). Comparison of culture and molecular identification of bacteria in chronic wounds. *Wounds: A Compendium of Clinical Research and Practice*, 20(12), 316–324.
- Tovey, F. I. (2004). Honey and healing. *Journal of the Royal Society of Medicine*, 97(3), 148–149. <https://doi.org/10.1177/014107680409700319>
- Zubair, M., Malik, A., & Ahmad, J. (2022). Diabetic foot ulcer management: A review of current care concepts. *Cureus*, 14(6), e26344. <https://doi.org/10.7759/cureus.26344>

The
Research of Medical Science Review