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ORIGINAL

Alternative treatment of diabetic foot: results of topical honey use in elderly patients

Tratamiento alternativo del pie diabético: resultados del uso tópico de miel en pacientes de la tercera edad

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ABSTRACT

Diabetic foot is one of the most severe complications of diabetes mellitus and remains a leading cause of non-traumatic amputations worldwide. This condition significantly affects patients' quality of life, places a heavy burden on healthcare systems, and compromises the functional autonomy of those affected. In this context, the present study aimed to evaluate the effectiveness of topical honey application in the healing process of ulcers in insulin-dependent elderly patients diagnosed with diabetic foot. The study employed an observational and experimental approach, involving a sample of 20 individuals treated between September 2022 and June 2023. Regular wound dressings using honey were applied in both clinical and home settings, and variables such as wound evolution, overall patient condition, and blood glucose stability were analyzed. Results showed significant improvement in 85% of cases, including reduced exudate, tissue regeneration, and progressive epithelialization, without adverse effects or metabolic alterations. Honey proved to be a safe, cost-effective, and efficient therapeutic alternative, capable of being integrated into conventional treatment plans in settings with limited access to advanced medical technologies. These findings highlight the importance of promoting further research and the development of clinical protocols that include natural products as a valid option in the comprehensive management of diabetic foot.

Keywords: diabetic foot; honey; wound healing; diabetes mellitus.

RESUMEN

El pie diabético representa una de las complicaciones más graves de la diabetes mellitus, siendo una de las principales causas de amputaciones no traumáticas a nivel mundial. Esta condición afecta la calidad de vida de los pacientes, genera una alta carga para los sistemas de salud y compromete la autonomía funcional de quienes la padecen. En este contexto, la presente investigación tuvo como objetivo evaluar la eficacia del uso tópico de miel de abeja en el proceso de cicatrización de úlceras en pacientes adultos mayores insulinodependientes con diagnóstico de pie diabético. El estudio se desarrolló con un enfoque observacional y experimental en una muestra de 20 personas atendidas entre septiembre de 2022 y junio de 2023. Se aplicaron curaciones regulares con miel en entornos clínicos y domiciliarios, y se analizaron variables como la evolución de la herida, el estado general del paciente y la estabilidad de la glucemia. Los resultados evidenciaron una mejora significativa en el 85% de los casos, con reducción del exudado, regeneración del tejido y avance progresivo hacia la epitelización, sin efectos adversos ni alteraciones metabólicas. La miel demostró ser una alternativa terapéutica segura, económica y eficaz, capaz de integrarse a tratamientos convencionales en contextos donde el acceso a tecnologías sanitarias avanzadas es limitado. Estos hallazgos sugieren la necesidad de promover investigaciones adicionales y desarrollar protocolos clínicos que incluyan productos naturales como opción válida en el manejo integral del pie diabético.

Palabras clave: pie diabético; miel de abeja; cicatrización; diabetes mellitus.

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INTRODUCTION

Diabetes mellitus has become established among the chronic non-communicable conditions with the highest prevalence and impact globally. Its effects, far from being limited to metabolic alterations, manifest as disabling complications, among which the progressive deterioration of the lower extremities stands out, a situation that frequently culminates in amputations. In this context, it has been demonstrated that amputations in people with diabetes are up to 12 times higher than those caused by physical trauma, which reveals the magnitude of the impact [1-4].

This article aims to analyze the therapeutic potential of bee honey as an adjuvant in the healing of diabetic foot ulcers, assessing its capacity to promote tissue regeneration without causing alterations in blood glucose levels. Its use offers a safe and viable alternative that contributes to improving functional mobility and the general well-being of affected patients by accelerating healing times and reducing the risk of infections [5-7].

The progression of this complication is related to the deterioration of peripheral circulation, resulting from damage to blood vessels caused by sustained hyperglycemia. This phenomenon compromises tissue oxygenation in the extremities, hindering healing and weakening the body's local defenses against external aggressions [8,9]. In this scenario, diabetic foot is positioned among the most serious complications of diabetes, with an estimated prevalence between 3% and 4% worldwide [10,11].

According to the World Health Organization, nearly 180 million people currently have diabetes, and this figure is projected to double if effective preventive measures are not implemented [4]. This trend highlights the urgent need for timely and sustained public health interventions.

Epidemiological studies indicate that approximately 15% of individuals with diabetes will develop lower extremity ulcers, and that a third of these cases will result in amputations, representing a leading cause of disability and dependency in older adults [12,2]. In the Ecuadorian context, the burden of this disease has experienced a sustained increase, reflected not only in growing mortality but also in disability-adjusted life years and the economic losses associated with the treatment of its complications.

The Pan American Health Organization has reported that, between 2000 and 2019, the standardized rate of years lived with disability (AVD) attributable to diabetes was 1,5% in men (IC 95%: 1,5%-1,6%) and 1,3% in women (IC 95%: 1,2%-1,4%), which confirms its growing and concerning nature in the region [13]. This trend is clearly observed in Ecuador, where diabetes constitutes a leading cause of non-traumatic amputations [14,15].

To assess the local impact of this pathology, high percentages of amputations have been documented in patients with diabetic foot, which evidences the chronicity and recurrence of the clinical condition [1]. Likewise, institutional reports indicate a high demand for care due to diabetes-associated podiatric complications in hospitals in the country, confirming the growing incidence of this condition [14,15].

In this context, various studies have proposed the use of honeybee honey as an adjuvant treatment in the healing of chronic wounds, particularly due to its antibacterial, anti-inflammatory, and wound-healing properties. Honey acts as an osmotic barrier that inhibits microbial growth, while promoting angiogenesis and epithelial regeneration [16-21].

Furthermore, systematic reviews have demonstrated that its use promotes healing without significant adverse effects, making it a safe therapeutic option even in patients with diabetes [5,6,22]. Clinical studies also support its efficacy in reducing healing time in diabetic foot ulcers and reducing lesion size [23,24].

From a comprehensive therapeutic perspective, it is indispensable to design and implement public policies that promote the prevention of diabetic foot, encouraging self-care, strict glycemic control, periodic podiatric evaluation, and access to innovative and low-cost treatments [10,11,25]. Current evidence supports the inclusion of this natural resource in primary care clinical protocols, especially in regions with economic constraints and high prevalence of diabetes.

In sum, diabetic foot represents a constant threat to the physical and emotional integrity of people with diabetes, as well as an economic burden for health systems. Given this scenario, the implementation of safe and effective alternative therapies becomes relevant, with bee honey being a promising option that should continue to be evaluated in controlled clinical contexts.

METHODS

This study adopted a mixed approach with a predominance of qualitative and quantitative

techniques, structured under an observational and experimental design. It was developed with the purpose of evaluating the effectiveness of the topical use of bee honey in ulcer healing in patients diagnosed with diabetic foot. The research was carried out over a period between September 2022 and June 2023, covering both private clinical settings and home-based interventions.

The sample consisted of 20 older adults with a confirmed diagnosis of insulin-dependent diabetes mellitus and the presence of ulcerous lesions in the lower limbs characteristic of diabetic foot. Inclusion criteria included insulin dependence, age over 60 years, willingness to receive wound care with natural honey, and informed consent to participate in the study. Patients with severe infectious comorbidities, known allergies to bee products, or infectious processes requiring urgent surgical intervention were excluded.

During the study, periodic applications of bee honey were performed on the lesions, following standardized hygiene and infection control protocols. Dressings were performed three times per week, recording at each session the size, depth, appearance, and progression of the wound. Detailed follow-up of the healing process was conducted, identifying the progressive reduction of the lesion, tissue regeneration, the appearance of signs of improvement, and the absence of complications.

The variables considered for the analysis included the age of the participants, the degree of diabetic foot involvement, the progression of healing based on the use of bee honey, the number of sessions required to observe visible improvement, and the presence or absence of adverse effects. Likewise, blood glucose levels were monitored before and after treatment, in order to confirm that topical application of the product did not cause metabolic alterations.

The study was organized into three phases. In the diagnostic phase, the initial clinical conditions of each participant were identified. The intervention phase included the controlled application of honey to the ulcers, under strict supervision. Finally, in the evaluation phase, the progress and results obtained were recorded, allowing the establishment of patterns of effectiveness of the natural treatment used.

Data collection was carried out through direct observation, photographic records, clinical notes, and structured follow-up forms. Subsequently, the information obtained was systematized and processed using descriptive statistical tools, which made it possible to identify trends, common behaviors, and individual responses to treatment. This methodology sought to generate useful evidence on the therapeutic value of bee honey in the context of comprehensive diabetic foot care, with special attention to vulnerable and low-income populations.

RESULTS

After the systematic application of bee honey to diabetic foot ulcers, a favorable progression was observed in most participating patients. Of the 20 insulin-dependent older adults who comprised the sample, 85% presented a significant reduction in lesion size and depth over a period of 4 to 6 weeks. A total of 10% showed partial improvement, with slower healing, while the remaining 5% showed no notable changes during the observation period, mainly due to associated factors such as lack of adherence to treatment or severe vascular complications.

During the first week of intervention, most ulcers were in an advanced stage of necrosis or had signs of mild infection. From the second week onward, progressive formation of granulation tissue was observed, accompanied by reduced exudate and improvement in the overall appearance of the lesion. At the end of the sixth week, 70% of patients had healed wounds or were in the final stage of epithelialization, with no signs of infection or recurrence. The remaining 30% continued to have active ulcers but with a positive tendency toward recovery.

No adverse reactions related to the application of honey were recorded. In addition, monitoring of glucose levels showed no relevant alterations, which confirms the safety of the treatment. Regarding patient perception, the majority expressed satisfaction with the process, valuing both the effectiveness of the treatment and its accessibility.

Table 1. Evolution of the recovery process in patients with diabetic foot treated with bee honey (n=20)

Treatment week	General wound status	% of patients	Main observations
Week 1	Active ulcers, partial necrosis, exudate	100%	Mild infection, initiation of cleaning with honey
Week 2	Initial granulation tissue formation	85%	Reduction of exudate and foul odor
Week 3	Reduction in size and depth	75%	Increased skin oxygenation, decreased pain
Week 4	Notable progress in healing	70%	Dry wound, without signs of infection
Week 5	Epithelialization in progress	65%	Visible scarring, without additional complications
Week 6	Healed wound or partial closure	70%	Medical discharge in several cases, without apparent recurrence

DISCUSSION

The findings obtained in this study confirm the therapeutic potential of bee honey as an effective and accessible alternative in the treatment of ulcers in patients with diabetic foot. The clinical evolution observed in most participants reveals that this natural resource can contribute significantly to accelerating the healing process without compromising the patient's metabolic control, which represents an important advance compared with conventional methods of managing chronic wounds [5-7,22,23].

The fact that 85% of patients showed visible improvements from the second week of intervention highlights the antimicrobial, anti-inflammatory, and regenerative action of honey, already documented in other research [16-21]. This effect translates into a reduction in exudate, a decrease in pain, and the formation of granulation tissue, which are key indicators of healing progress [21,24]. Likewise, continuous follow-up made it possible to verify that, in 6 weeks, a high percentage of wounds reached an advanced state of epithelialization or even total closure, which directly impacts patients' quality of life by improving their mobility and reducing the risk of amputation.

It is relevant to note that no secondary complications or alterations in glucose levels were recorded, which confirms the safety of the topical use of honey, even in insulin-dependent patients. This aspect is crucial, given that among the main fears regarding alternative treatments is their possible interference with the homeostasis of the diabetic patient. The glycemic stability observed reinforces the feasibility of incorporating this strategy into comprehensive clinical protocols.

In addition, the home-based component of treatment represented an additional advantage. The ability to perform wound care outside the hospital setting facilitated therapeutic adherence, reduced associated costs, and promoted self-management in patients and their families. This aspect is particularly relevant in contexts such as Ecuador, where limited access to specialized services and scarce economic resources can hinder the continuity of conventional medical treatments [14,15].

Taken together, the results indicate that bee honey is not only a safe option but also an efficient, sustainable, and culturally accepted strategy that could be incorporated into primary care programs, especially in regions with high diabetes prevalence and limited health coverage. Nevertheless, further large-scale research with expanded samples is essential to validate these results and standardize application protocols to ensure long-term efficacy [22,25].

CONCLUSION

This research demonstrated that the topical use of bee honey is an effective therapeutic alternative in the treatment of diabetic foot ulcers in insulin-dependent older adult patients. Its regular application contributed significantly to the healing process, promoting the formation of new tissue, reducing the risk of infection, and accelerating recovery without altering blood glucose levels.

Treatment with honey proved to be safe, accessible, and adaptable in both clinical and home settings, which represents a considerable advantage for populations with limited resources or difficulties in accessing specialized health services. Furthermore, the positive perception among patients reinforces its acceptance and viability as a complement in comprehensive care programs for people with diabetes mellitus.

These results reinforce the need to promote therapeutic practices based on natural products and supported by scientific evidence, which can be integrated into health systems as cost-effective

strategies. Nevertheless, it is recommended that future studies expand the number of participants and the duration of follow-up in order to strengthen the external validity of the findings and establish more standardized clinical protocols.

In summary, treatment with bee honey represents a viable therapeutic option to reduce the incidence of severe complications of diabetic foot, such as amputations, and to improve the quality of life of patients in vulnerable settings.

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Methodology: Jhan Carlos Manuel Fernández Delgado.
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