

Literature Review: Potency of Honey Use in Burn Management

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Abstract

One of the most fatal types of injuries is burns, which result in high death and disability rates. Many surgical procedures, prolonged hospital stays, intensive rehabilitation, and costly medical care are all associated with burn injuries. The objective of this study was to investigate the impact of honey on the healing process of burn wounds. The methodology employed in this study is a literature review. The target population for this study comprises journals specializing in the healthcare sector. Honey treatments for burns can yield positive outcomes. Honey has a low pH and possesses antibacterial properties. Among bacteria, *Staphylococcus aureus* is the most responsive to honey. The conclusion of the study is that honey can be utilized as a therapy for burns.

Keywords: honey, burn, treatment, management.

Abstrak

Salah satu jenis cedera yang paling fatal adalah luka bakar yang mengakibatkan tingginya angka kematian dan kecacatan. Banyak prosedur pembedahan, rawat inap yang lama di rumah sakit, rehabilitasi intensif, dan perawatan medis yang mahal semuanya berhubungan dengan luka bakar. Tujuan penelitian ini adalah untuk mengetahui pengaruh madu terhadap proses penyembuhan luka bakar. Metodologi yang digunakan dalam penelitian ini adalah tinjauan pustaka. Populasi sasaran penelitian ini terdiri dari jurnal-jurnal yang mengkhususkan diri pada bidang kesehatan. Perawatan luka bakar dengan madu dapat memberikan hasil yang positif. Madu memiliki pH rendah dan memiliki sifat antibakteri. Di antara bakteri, *Staphylococcus aureus* adalah yang paling responsif terhadap madu. Kesimpulan penelitian adalah madu dapat digunakan sebagai terapi luka bakar.

Kata Kunci: madu, luka bakar, pengobatan, penatalaksanaan.

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INTRODUCTION

Burn injuries lead to approximately 20,000 direct admissions or referrals to US burn centers every year (Kashefi & Dissanaik, 2016). There are various types of burn injuries, including thermal (such as scalds, flames, and cold), chemical, electrical, frictional, contact, and radiation burns (Toussaint & Singer, 2014). A high mortality and disability rate, numerous surgical procedures, prolonged hospital stays, intensive rehabilitation, and expensive medical care are all linked with burn injuries. Hospitals admit many burn patients who necessitate long-term care (Jaschke et al., 2020). An injury resulting from a burn or scald is categorized based on its depth and the area of the body affected. The warm and moist environment of burn wounds renders them more susceptible to infection, as bacteria thrive in such conditions (Schaefer & Szymanski, 2023).

Infections arising from burn wounds are associated with higher mortality rates, prolonged hospitalizations, and delayed wound healing. Some of the consequences of burn injuries on an individual include social isolation, reduced quality of life, physical deformities, loss of employment, and psychological trauma (Abdel Wahab et al., 2018).

The average cost of burn wound treatment for unhealed wounds over a 24-month period is approximately £40,577 per patient, as per statistics from the National Health Service (NHS)⁸. To ensure optimal burn wound dressing for every patient, it is imperative that the burn heals as quickly and effectively as possible (Guest et al., 2018).

There is extensive research on the benefits and content of honey in burn wound therapy, suggesting its potential as an alternative treatment. This article reviews findings from various journal sources and incorporates the latest relevant research.

METHODS

Descriptive research is the method that is used. The study's findings will provide light on the impact of treating burns with honey topical honey. The literature review is studied as the method. A literature review is an analysis that provides a description, summary, and critical assessment of academic works by surveying books, journals, and other materials that are pertinent to a specific topic, field of study, or theory (Ramdhani et al., 2014). This research was conducted in Palangka Raya from May to December 2023. The research was carried out by national and international journals originating from researchgate, Pubmed Central, Google Scholar databases. Backgrounds in this research are health field, particularly in skin medicine, nutrition, pharmacology, biology, and beauty, is represented in the publications used as references. Articles published in national and international journals between 2013 and 2023 make up the research sample. Nine articles that were closely related to the keywords used were chosen by the researchers from a variety of sources.

RESULT AND DISCUSSION

Burn Categories

Our skin constitutes the largest organ system in our body, comprising sixteen percent, or nearly one-seventh, of our total body weight. Apart from facilitating sensory functions such as pain, touch, warmth, and pressure perception, the skin also functions as a protective barrier, regulates evaporation, moderates body temperature, and aids in waste elimination (Moniruzzaman et al., 2022).

According to the potential depth of injury to the dermis or epidermis, burn depth is classified into one of three types (Schaefer & Szymanski, 2023).

- First-degree, superficial burns are confined to the epidermis and are characterized by warmth, pain, redness, softness, and blanching upon touch. Typically, blistering does not occur. Sunburn serves as a common example.

- Burns of partial thickness (second degree) extend through the epidermis and reach the dermis. Variations exist in the depth within the dermis (deep versus superficial). Typically, extremely painful, these burns present as red, blistered, moist, tender, and blanch upon pressure. Exposure to hot liquids constitutes the most frequent cause in such instances.
- Full-thickness, third-degree burns penetrate through the dermis and epidermis, reaching the subcutaneous fat or deeper tissues. These burns lack blanching and may appear white or brown. Additionally, they typically cause minimal to no pain. They can result from exposure to hot liquids, superheated gases, or flames.

Honey And Burn Management

In burn treatment, it is imperative to effectively manage infection, oxidative stress, and inflammation. Additionally, providing optimal conditions for healing, including hydration, gel dressings, and/or implants, is crucial to prevent adverse effects. This review will focus on elucidating these key elements.

Inflammation

Cytokines, kinins, and other substances play a pivotal role in the successful healing of burn wounds (Rowan et al.,2015). In the process of burn wound healing, reepithelialization is preceded by the activation of keratinocytes and fibroblasts during the proliferative phase (Chen et al.,2016), is controlled by cytokines that are drawn in during the inflammatory stage. While this implies the critical involvement of inflammation in wound healing, hypertrophic scarring has also been linked to aberrant inflammatory pathways, and the use of anti-inflammatory medications may exacerbate symptoms and delay wound healing (Webster & Murphy,2019).

Inflammation is often accompanied by significant edema, which is induced by several factors, including vasodilation, extravascular osmotic activity, and increased microvascular permeability (shiffman & Low,2020).

Tumor necrosis factor-alpha (TNF- α), interleukin-6 (IL-6), and interleukin-1 beta (IL-1 β) also play significant roles in the inflammatory response (Tsurumi et al., 2016). These three cytokines are predominantly synthesized by activated macrophages and have been recognized as markers of the extent of tissue damage (Barayan et al.,2021). Improperly healed burn wounds can result in infection, and may even progress to sepsis, thereby increasing both mortality and morbidity rates (Vestby et al.,2020)

Its shown that the presence of monocytes and macrophages in the surrounding tissue cells may contribute partially to honey's wound-healing ability (Scepankova et al.,2021) The findings indicate that exposure to natural honeys can lead to the release of interleukin-6, tumor necrosis factor, and interleukin-1 β . Studies have demonstrated that honey exhibits mitogenic action on human B, T, and myeloid cells (Seremi et al.,2016).

Infection

There are several different causes of infection. The initial colonization and infection of burn wounds are predominantly caused by Gram-positive bacteria, mostly Staphylococci. These bacteria are observed within the first few days following the burn and are subsequently replaced by Gram-negative bacteria in the second week. Pseudomonas aeruginosa may emerge as the predominant isolate in burn wound colonization and infection after the second week of burns (Naqvi et al.,2014)

Studies have reported that the application of honey to infected burns can diminish infection and facilitate the healing process (Wadi,2022)

The antibacterial properties of honey, arising from its low pH, high osmolarity, and composition of both non-peroxide and hydrogen peroxide components, are accountable for its advantageous effects, alongside the presence of phytochemical components such as methylglyoxal (MGO). Bees produce honey containing hydrogen peroxide, the quantity of which is contingent upon the oxidation and catalase activity of

sugars obtained from flower pollen. This hydrogen peroxide exhibits antimicrobial properties. The antibacterial efficacy of the majority of honey varieties is ascribed to the generation of H₂O₂ (Almansaudi,2021).

Additionally, there are non-peroxide antibacterial factors known to exist. The antibacterial efficacy of honeys varies due to fluctuations in both peroxide and non-peroxide components, which are contingent upon the floral source and processing methodology. The minimum inhibitory concentration (MIC), which denotes the lowest concentration necessary to entirely impede growth, is employed to measure antimicrobial activity. Studies have demonstrated that *S. aureus* and *P. aeruginosa*, the bacteria frequently isolated from burns and wounds, exhibit sensitivity to the antimicrobial properties of honey (Taylor and Francis Group, 2014).

Oxidative stress

Multiple studies have evaluated the benefits of employing honey dressings for burn patients. Through a biochemical investigation conducted by Nagane et al., it has been demonstrated that honey dressings expedite the healing process by reducing the oxidative stress state (Sopandi,2013).

Honey potentially aids in the prevention of burn injuries due to the presence of the enzyme catalase, which exhibits antioxidant properties. Furthermore, honey's nutritional composition, comprising fructose and glucose, augments the local nutrient supply, potentially facilitating the process of epithelialization. Moreover, the proliferation of granulation tissue and the healing of wounds are notably facilitated by the concentration of vitamin C and antioxidants. Studies have indicated that honey reduces reactive oxygen intermediates (ROIs), potentially mitigating tissue damage induced by activated macrophages during the healing process. In this study, it has also been demonstrated that natural honey can diminish reactive oxygen intermediates (ROIs). Moreover, honey can deactivate free iron, which catalyzes the formation of free radicals generated by hydrogen peroxide. In essence, honey contributes to alleviating oxidative stress by curtailing the production of free radicals (Taylor and Francis Group, 2014).

Moisture

It has been established that topical application of honey can effectively diminish infection and establish a granulating wound bed devoid of debris. Its high viscosity forms a physical barrier that appears to be advantageous, expediting wound healing by fostering a moist environment (Scepankova et al.,2021).

Furthermore, honey does not adhere to the skin upon topical application. Considering the ease of removing honey gauze and the absence of discomfort during dressing changes, honey serves as a suitable covering for burns in burn treatment, owing to its accessibility (Taylor and Francis Group, 2014).

Gel Dressing

Rat experiments (Maghsoudi & Moradi,2015), reveal that a honey hydrogel dressing significantly hastened the rate of burn wound healing, as evidenced by a greater reduction in wound size, particularly observed at 21- and 28-days post-burn. Microscopic analysis revealed that wounds treated with honey hydrogel dressings exhibited a significant acceleration of skin healing and enhanced epithelialization compared to other experimental groups. Histopathological studies indicated that, in contrast to other dressings, honey hydrogel substantially reduced the inflammatory response on day 7. Furthermore, wounds treated with honey hydrogel displayed advanced collagen synthesis, capillary development, and granulation tissue production. The hydrogen peroxide generated by honey could potentially be responsible for the early onset of granulation tissue formation observed in wounds treated with honey hydrogel. Honey offers a "slow-release delivery" mechanism for maintaining safe concentrations of hydrogen peroxide. At low concentrations, hydrogen peroxide can stimulate angiogenesis and fibroblast proliferation (Salva et al.,2023).

Grafting

A study discovered that patients with burns who additionally received donor skin experienced a favorable outcome. Researcher Subrahmanyam has demonstrated that honey effectively heals burns with reduced scarring and depigmentation, surpassing the healing rate of traditional dressings in both superficial and partial thickness burns. Honey is utilized to maintain wound moisture, prevent infection, and expedite epithelialization. Moreover, honey application resulted in decreased pain and increased patient comfort (Maghsoudi & Moradi, 2015).

A randomized clinical trial demonstrated that the application of medicinal honey was an effective therapy for connecting the graft to the underlying tissue (Ahangar., 2023). In general, medicinal honey-based treatments can assist patients dealing with burn wound issues, offering not only safety and cost-effectiveness but also reducing the duration of patient care required.

CONCLUSION

Controlling inflammation, infection, and oxidative stress is imperative for effectively treating burn wounds. Honey is able to stimulate angiogenesis and proliferation of fibroblasts in burn wounds so that honey can be an alternative therapy for treating burn wounds. The use of honey is ultimately low cost, able to reduce pain, and safe. It is hoped that in the future it can be used by future researchers regarding the use of honey as an alternative therapy for burns

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