

The Efficacy of Honey Compared to Silver Sulfadiazine in Pediatric Burn Wound Dressing in Superficial and Partial Thickness Burns

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Cite this paper as: Lubna Mahek, Afzaal Bashir, Zubair Shoukat, Faryal Iqbal, Nabila Talat, (2025) The Efficacy of Honey Compared to Silver Sulfadiazine in Pediatric Burn Wound Dressing in Superficial and Partial Thickness Burns. *Journal of Neonatal Surgery*, 14 (32s), 8999-9004.

ABSTRACT

Background: Children often get burn injuries, with partial-thickness and superficial burns being the most common kind. Timely and effective wound management is essential to reduce complications, accelerate healing, and minimize scarring.

Objectives: To compare the efficacy of honey versus silver sulfadiazine in dressing superficial and partial-thickness burns in pediatric patients.

Study Design & Setting: This was a comparative interventional study conducted at the Paediatric surgery unit 1 the Children Hospital and University of Child Health Sciences Lahore from Feb 2024 to July 2024.

Methodology: Children with burns that were either superficial or partial-thickness and involving less than 20% TBSA were divided into two equal groups. The patients' ages ranged from 1 to 12 years. Honey dressings were given to Group A, while 1% silver sulfadiazine dressings were given to Group B. Time to wound healing, discomfort during dressing changes, infection rates, and dressing changes were all factors that were evaluated in this study. The data were examined with SPSS version 25, and a significance level of $p < 0.05$ was deemed.

Results: The honey group showed significantly faster wound healing (9.3 ± 2.1 vs. 13.7 ± 3.4 days; $p < 0.001$), lower pain scores, reduced infection rates (8.3% vs. 23.3%; $p = 0.026$), and fewer dressing changes compared to the SSD group.

Conclusion: Compared to silver sulfadiazine, honey is superior for treating children's superficial and partial-thickness burns. It offers faster healing, better comfort, and reduced infection risk, making it a suitable alternative in pediatric burn care

Keywords: Burns, Children, Dressing, Honey, Pain, Silver sulfadiazine, Wound healing

1. INTRODUCTION

Burn injuries are a significant global public health issue, particularly among children, who are at a higher risk due to their underdeveloped motor skills, natural curiosity, and dependency on adults for safety.^{1,2} Globally, burn injuries account for an estimated 180,000 deaths annually, with the vast majority occurring in low- and middle-income countries.³ Pediatric burns, especially superficial and the majority of burn patients admitted to hospitals have partial-thickness burns. These injuries can result in prolonged hospital stays, infections, psychological trauma, and long-term scarring if not appropriately managed.⁴

For quite some time, silver sulfadiazine (SSD) has been the gold standard when it comes to managing burn wounds using topical antimicrobials. It is widely used due to its broad-spectrum antibacterial activity against Gram-positive and Gram-

negative bacteria, including *Pseudomonas aeruginosa*, which is frequently associated with burn wound infections.⁵ However, recent studies have raised concerns regarding delayed wound healing, keratinocyte and fibroblast cytotoxicity, as well as the potential for microbial resistance linked to SSD usage. In addition, SSD requires frequent dressing changes, which can be painful and distressing for pediatric patients.⁶

In contrast, honey, an ancient natural remedy, has regained attention in recent decades as an alternative burn dressing due to its remarkable wound healing and antimicrobial properties.⁷ Honey's high sugar concentration, low pH, and the presence of hydrogen peroxide contribute to its bacteriostatic and bactericidal effects.⁸ Furthermore, it has been shown to reduce inflammation, debride necrotic tissue, and promote granulation and epithelialization. Honey is also known to minimize scarring, improve patient comfort, and reduce the frequency of dressing changes, making it especially suitable for use in children.⁹ For both partial-thickness and superficial burns, honey has shown promise in a number of clinical investigations investigating its usage in wound treatment. Some studies have shown that honey had more positive effects on wound healing, infection rates, and cosmetic results than SSD. Additionally, honey is more cost-effective and widely available in many low- and middle-income countries where healthcare resources may be limited.¹⁰⁻¹³

Despite the increasing body of evidence favoring honey in burn care, SSD remains the more commonly used agent in many clinical settings. This discrepancy may be attributed to limited awareness, variable quality of honey preparations, and the lack of standardized protocols for its application. As such, there is a compelling need for further comparative studies focusing specifically on pediatric patients, who present unique physiological and psychological considerations in wound care. By evaluating key parameters such as wound healing time, pain scores, incidence of infection, and overall treatment outcomes, this study seeks to provide evidence-based guidance for clinicians in choosing the most effective, safe, and child-friendly dressing material.

2. MATERIALS AND METHODS

Following institutional review board permission, this comparative interventional study took place at the Children's Hospital and the University of Child Health Sciences at Lahore's Paediatric Surgery Unit 1 from Feb 2024 to July 2024. The study included 120 children enrolled using non-probability consecutive sampling who were 1–12 years old and had burns that were superficial or partial thickness and affected less than 20% of their total body surface area (TBSA). The sample size of 120 was calculated using OpenEpi software, with a power of 80%, confidence level of 95%, and expected difference of 20% in wound healing rates between honey and silver sulfadiazine-treated groups based on prior published data.¹³

Patients with co-morbidities such as diabetes mellitus, immune-compromised status, infected burns at presentation, full-thickness burns, chemical or electrical burns, or those requiring surgical grafting were excluded from the study. Every single participant's parent or legal guardian gave their informed consent. Two groups of sixty patients each were formed after enrolment. Group A received honey dressings, while Group B received silver sulfadiazine (1%) dressings. Honey used was sterile, medical-grade honey prepared under standard aseptic conditions. After gentle cleansing of the wound with normal saline, the allocated dressing agent was applied in a uniform layer over the burn area, covered with sterile gauze, and secured with a bandage. Dressings were changed every 24 hours under standard aseptic technique.

Patients were closely monitored for clinical parameters including wound healing time (defined as complete epithelialization), pain during dressing (assessed using age-appropriate visual analog or FLACC scale), signs of infection, and any adverse reactions. Daily wound assessments were carried out by trained medical staff, and outcomes were recorded in structured proformas. Systemic antibiotics were only administered when clinically indicated. The primary outcome was the mean number of days it took for the wound to heal. Secondary outcomes included incidence of wound infection, pain score during dressing change, and frequency of dressing changes required until complete healing.

The data were examined with SPSS version 25. The mean $\pm$ standard deviation of quantitative factors including age, healing duration, and pain levels were used to compare them using independent sample t-tests. Data were provided as frequencies and percentages for categorical variables such as gender and infection status. When applicable, a chi-square test was used for analysis. For statistical purposes, a p-value below 0.05 was deemed significant.

3. RESULTS

The mean age of children in the honey group (Group A) was 6.1 ± 2.5 years, while in the silver sulfadiazine (SSD) group (Group B) it was 6.3 ± 2.8 years ($p = 0.674$). The gender distribution was also comparable between the groups, with males constituting 60.0% in Group A and 56.7% in Group B ($p = 0.714$). The mean total body surface area (TBSA) affected by burns was similar between both groups (11.2% in Group A vs. 11.5% in Group B; $p = 0.718$). Most burn injuries were caused by scalds in both groups (73.3% in Group A and 70.0% in Group B). These results confirm that both groups were demographically and clinically comparable at baseline in table 1. Table 2 illustrates mean healing time in the honey-treated group was significantly shorter (9.3 ± 2.1 days) compared to the SSD group (13.7 ± 3.4 days), with a p-value of <0.001 .

Pain assessment during dressing changes is shown in Table 3. On dressing day 1, the mean pain score in Group A was 6.1 ± 1.2 , significantly lower than Group B which had a mean score of 7.4 ± 1.1 ($p < 0.001$). The trend continued on day 3 ($4.5 \pm$

1.3 vs. 6.1 ± 1.4) and day 5 (2.7 ± 1.1 vs. 4.9 ± 1.2), all with statistically significant differences ($p < 0.001$). Infection rates observed in each group are presented in Table 4. A significantly lower proportion of children in the honey group developed wound infections (8.3%) compared to those in the SSD group (23.3%), with a p-value of 0.026. In table children in the honey group required significantly fewer dressing changes (mean 7.2 ± 1.8) than those in the SSD group (mean 11.1 ± 2.7), with a p-value of <0.001 .

Table 1: Demographic Characteristics of Study Participants (n = 120)

Variable	Category	Group A (Honey) (n = 60)	Group B (Silver Sulfadiazine) (n = 60)	p-value
Mean Age (years)	Mean $\pm$ SD	6.1 ± 2.5	6.3 ± 2.8	0.674
	1 – 6	33 (55.0%)	35 (58.3%)	0.714
	7 – 12	27 (45.0%)	25 (41.7%)	
Gender	Male	36 (60.0%)	34 (56.7%)	0.714
	Female	24 (40.0%)	26 (43.3%)	
Burn Type	Scalds	44 (73.3%)	42 (70.0%)	0.682
	Flame	16 (26.7%)	18 (30.0%)	
Mean TBSA Burn	Mean $\pm$ SD	11.2 ± 4.1	11.5 ± 4.3	0.718

Table 2: Comparison of Wound Healing Time Between Groups

Variable	Group A (Honey) (n = 60)	Group B (SSD) (n = 60)	p-value
Mean Healing Time (days)	9.3 ± 2.1	13.7 ± 3.4	<0.001

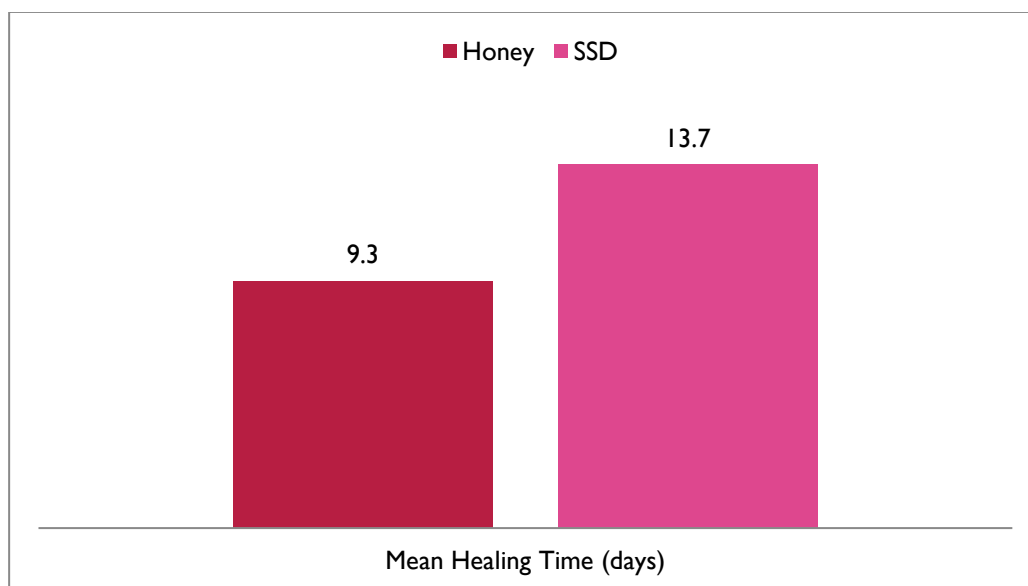


Figure 1: Comparison of Wound Healing Time Between Groups

Table 3: Pain Scores During Dressing Change

Dressing Day	Group A (Honey)	Group B (SSD)	p-value
Day 1	6.1 ± 1.2	7.4 ± 1.1	<0.001
Day 3	4.5 ± 1.3	6.1 ± 1.4	<0.001
Day 5	2.7 ± 1.1	4.9 ± 1.2	<0.001

Table 4: Incidence of Wound Infection

Infection Status	Group A (Honey) (n = 60)	Group B (SSD) (n = 60)	p-value
Infected	5 (8.3%)	14 (23.3%)	0.026
Not Infected	55 (91.7%)	46 (76.7%)	

Table 5: Number of Dressing Changes Until Healing

Variable	Group A (Honey) (n = 60)	Group B (SSD) (n = 60)	p-value
Mean Number of Dressings	7.2 ± 1.8	11.1 ± 2.7	<0.001

4. DISCUSSION

Burn injuries are common among children and constitute a significant health issue, particularly in low- and middle-income nations. Superficial and partial-thickness burns, if not treated appropriately, may lead to infection, delayed healing, and scarring.¹⁴ Silver sulfadiazine (SSD) is widely used for burn wound care but may delay epithelialization and cause cytotoxicity. Honey, a natural agent, has shown promising antibacterial and wound healing properties. It promotes rapid healing, reduces pain, and minimizes dressing frequency.^{12,13} This study compares the efficacy of honey and SSD in pediatric burn wound management.

The mean wound healing time in the honey group was 9.3 ± 2.1 days compared to 13.7 ± 3.4 days in the SSD group ($p < 0.001$), which is in line with the results of Mualde et al. (2019), who reported a significantly shorter epithelialization time in the honey group (10 ± 4 days) versus 12 ± 6 days with SSD ($p < 0.05$).¹⁷ Similarly, Diamond et al. (2020) found healing times ranging from 11.41 ± 3.95 to 18.1 ± 2.3 days in the honey groups, compared to 15.25 ± 5.92 to 32.6 ± 3.6 days in the SSD groups (p -values < 0.05), further supporting our observed superiority of honey in reducing healing duration.¹⁹

Our results also showed a significantly lower infection rate in the honey group (8.3%) versus the SSD group (23.3%, $p = 0.026$), which is consistent with the findings of Osman et al. (2022), who reported a pooled odds ratio of 10.80 (95% CI: 5.76–20.26; $p < 0.00001$) favoring honey in rendering wounds sterile by day 7.¹⁴ Likewise, Khan et al. (2015) found that 68% of patients treated with honey became culture-negative within one week, compared to only 44% in the SSD group.¹⁸ This pattern is also echoed by Liche et al. (2018), who demonstrated a significant reduction in bacterial colonization by day 10 with honey ($p = 0.026$), reinforcing our data.²⁰

Regarding pain control, our study showed that pain scores were significantly lower in the honey group at each assessment point, with progressive decline over dressing days (Day 1: 6.1 ± 1.2 vs. 7.4 ± 1.1 ; Day 3: 4.5 ± 1.3 vs. 6.1 ± 1.4 ; Day 5: 2.7 ± 1.1 vs. 4.9 ± 1.2 ; all $p < 0.001$). These findings are similar to those of Mashhood et al. (2017), where patients treated with honey experienced complete pain relief by 3 weeks, while those treated with SSD required up to 4 weeks.¹⁶ Khan et al. (2015) also reported a shorter mean time to pain relief in the honey group (12 days) compared to 16.8 days in the SSD group. In terms of dressing frequency, our patients treated with honey required significantly fewer dressings (7.2 ± 1.8) than those treated with SSD (11.1 ± 2.7 ; $p < 0.001$), which is in agreement with Aziz et al. (2017), who concluded that honey accelerates wound healing and reduces treatment burden.²¹ The reduced dressing frequency observed in our study not only enhances patient comfort but also supports evidence from Wiguna et al. (2024) emphasizing honey's practicality and affordability in resource-constrained settings.²³

Our findings of honey being a more effective and cost-efficient alternative to SSD are further reinforced by Malik et al.

(2010), who noted faster healing with honey (13.47 ± 4.06 vs. 15.62 ± 4.40 days; $p < 0.0001$) and lower *Pseudomonas* colonization (6 vs. 27 patients).¹⁵ Additionally, Boekema et al. (2024) reported enhanced epidermal regeneration with honey-based products, especially against *P. aeruginosa*, aligning with our observed antimicrobial benefits.²²

This study was conducted in a controlled hospital setting with consistent treatment protocols. It directly compares two widely used topical agents in pediatric burn care using a statistically adequate sample. Pain, healing time, and infection rates were objectively monitored. However, the study was limited to a single center, which may affect generalizability. The short follow-up duration did not assess long-term cosmetic outcomes. Also, variability in burn depth assessment may have influenced healing rates.

5. CONCLUSION

Compared to silver sulfadiazine, honey is superior for treating children's superficial and partial-thickness burns. It offers faster healing, better comfort, and reduced infection risk, making it a suitable alternative in pediatric burn care. It also required fewer dressing changes, enhancing patient comfort. Honey can be considered a cost-effective and child-friendly alternative in burn wound management.

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