

Healing of Burns in Children: Which is the better Agent, Honey or Silver Sulphadiazine?

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Abstract

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Background: Burns constitute a major cause of childhood trauma. There is a need for inexpensive and more effective alternative healing agents, especially in developing countries.

Objectives: To compare the rates of healing of burns dressed with either silver sulphadiazine (SSD) or crude undiluted honey and compare the relative costs of both modes.

Methods: The study was carried out at the Wesley Guild Hospital, Ilesa. Twenty seven children with comparable partial thickness burns were prospectively studied for healing of their burn injuries. They were randomly allotted to two treatment groups of dressing with either SSD or crude undiluted honey. The burns sites were assessed clinically on the 3rd, 7th and 21st days for sloughs, exudates, eschars, granulation tissue and epithelialisation. The duration of hospitalisation for each child as well as the quantity and costs of the dressing agents were also documented.

Results: Honey-treated burns demonstrated quicker healing with faster wound granulation and epithelialisation. The duration of hospital stay was significantly shorter in patients treated with honey than in those treated with SSD ($t = 3.06$, $p = 0.005$). Direct cost of the SSD used was 9.75 times that of the honey.

Conclusions: Honey appears to be a superior dressing agent for partial thickness burns than silver sulphadiazine in terms of efficacy and cost. We therefore recommend honey for the dressing of partial thickness burns, particularly in tropical countries where it is readily available and the majority of the people are poor. Enhancement of apiculture should make honey therapy of burns victims much cheaper still.

Key words: Burns, Healing, Honey, Silver sulphadiazine

Introduction

BURN injuries are common, often occur unexpectedly and have the potential to cause death, lifelong

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disfigurement and dysfunction.¹ Following resuscitation, a critical part of burn management is wound care.^{1,2} Optimisation of healing is usually achieved with dressing agents such as silver sulphadiazine (SSD) and several others which are more exotic¹ and often unavailable in developing countries. Silver sulphadiazine remains the most widely used burns topical antibacterial preparation, despite its various known side effects, toxicity and cost.¹⁻³ Honey, a natural bee product, has been used as a 'medicine' throughout the ages⁴ but in more recent times, there has been a renaissance in its use in the treatment of burns.^{4,5} Studies have been carried out in Nigeria on honey and wound healing.^{6,7}

As most patients particularly from tropical Africa are from the low socio-economic groups and are therefore

often unable to afford imported antiseptics and wound dressing agents, the need for affordable and readily available local alternatives cannot be over-emphasized. The present study is therefore aimed at evaluating the healing of partial thickness burns, comparing the outcome of the burn sites dressed with either SSD or crude undiluted honey, and the cost of dressing with either. It is hoped that the information obtained from this study will assist in improving the care of burns victims, particularly in poor communities.

Subjects and Methods

The study was conducted at the Isolation Children's Ward of the Wesley Guild Hospital, Ilesa, which is a unit of the Obafemi Awolowo University Teaching Hospital and the main referral health facility providing paediatric care for Ilesa and its environs. From March 1, 2002 to February 28, 2004, children aged below 15 years admitted consecutively with burns to the ward were prospectively studied. Inclusion criteria were fresh burns of less than six hours duration, partial thickness (deep dermal) burns covering between 15 and 25 percent of the body surface and informed consent obtained from their parents. Besides, none of the subjects should have diabetes or HIV/AIDS.

All subjects had an initial course of *Ampiclox* (ampicillin plus cloxacillin) and gentamicin prophylactically; these were changed where necessary, subject to bacterial isolations from the blood and swabs from the burns sites. For each child, the burns sites were soaked twice daily in normal saline. Consecutive subjects were randomly allotted into two wound dressing groups of twice daily open topical applications of either one percent SSD cream or undiluted crude honey. To ensure non-adulteration, the honey was harvested from an apiary by one of the investigators (OAO), while the SSD

[*Dermazine*] was obtained from the hospital pharmacy. At the time of the study, the prevailing cost of crude undiluted honey in the Ilesa area was about one naira per ml while *Dermazine* cost one thousand and three hundred naira per 250 grams. At that time, one US dollar (\$) exchanged for approximately 140 naira. The burns sites were clinically assessed on the 3rd, 7th and 21st days following treatment, noting the presence or absence of sloughs, exudates, eschars, granulation tissue, while the presence and completion of epithelialisation were documented. To avoid inter-observer bias, epithelialisation in all the burn sites was adjudged clinically by one of the investigators (OOO).

The duration of hospital stay, the quantity and the cost of honey and SSD used were also documented. Hospital discharge criteria were the presence of epithelialisation and simultaneous absence of sloughs, exudates, eschars and granulation tissue.

Statistical analysis

Data was analysed with the Student's 't' test or the z test as applicable using the Computer program for epidemiologists (PEPI) Version 3.01.⁸ Values of $p < 0.05$ in two-tailed tests were accepted as being statistically significant.

Results

A total of 27 children [11 males and 16 females] were recruited into the study. Twelve (44.4 percent) children [seven males and five females] were allotted to the SSD group and 15 (55.6 percent) [nine males and six females] to the honey group. Table I shows the mean ages of the children, percentages body surface area of burns and the intervals between sustenance of the burn injury and presentation at the hospital. Their ages ranged from four months to 13 years [mean (\pm SD) = 5.5 (\pm 3.4) years]. The mean (\pm SD) percentage surface area of burns was 22.4 (\pm 4.7) percent. The mean (\pm SD) interval between

Table I

Comparison of the Children in the Honey and SSD Treatment Groups

	All Cases	Children in the Honey Group (n = 15)	Children in the SSD Group (n = 12)	t	p Value
Mean (\pm SD) age [years]	5.5 (\pm 3.4)	5.7 (\pm 2.3)	5.3 (\pm 6.8)	0.21	0.832
Mean (\pm SD) surface area of burns (%)	22.4 (\pm 4.7)	23.1 (\pm 0.8)	21.8 (\pm 3.2)	1.52	0.141
Mean (\pm SD) duration of injury before presentation at the hospital (hours)	3.6 (\pm 2.3)	2.8 (\pm 1.5)	3.0 (\pm 0.6)	0.43	0.668

sustaining the burns injury and hospital presentation was $3.6 (\pm 2.3)$ hours. Further analysis shows that these parameters were not significantly different in the two groups (Table I).

All the children had had the burns sites initially soothed at home with raw eggs and corn flour pap. Table II however, shows the details of the clinical conditions of the burns sites on the 3rd, 7th and 21st days of treatment. By the 3rd day, higher percentages of children with honey dressing than those with SSD dressing had exudates and sloughs but this difference was not significant. By the 7th day, more children with honey dressing had burns sites that were dry without exudates, or that lacked slough. Here again, these differences were not significant. However, all the children in the honey group had burns sites with granulation tissues and in 80 percent, there was epithelialisation as against 58.3 percent and 33.3 percent respectively, of those in the SSD group ($p=0.023$ and 0.039 , respectively). By the 21st day, epithelialisation was complete in 86.7 percent of those with honey dressing as compared with only 41.7 percent of those with SSD dressing ($p=0.04$).

The mean duration of hospital stay of patients with honey-treated burns was 14.24 ± 4.58 days (median = 12 days) as against 18.62 ± 2.08 days (median = 19 days) for patients with SSD-treated burns ($t = 3.06$, $p = 0.005$). No side effects of the treatment were observed among children in both treatment groups. However, two (16.7

percent) of the 12 children in the SSD group developed *Staphylococcus aureus* septicaemia [both sensitive to ciprofloxacin and amoxicillin-clavulanic acid] while another one (8.3 percent) had *Pseudomonas aeruginosa* skin infection [sensitive to ciprofloxacin]. None of the 27 children required plastic surgical intervention, and there was no mortality.

The cost of the honey used for the 15 children in the honey treatment group was 3,000 naira (\$21.43) for three litres of honey; the average quantity of honey used per child was thus about 200 ml, and excluding all other hospital fees, the average cost of the honey dressing was 200 Naira (or U.S. \$1.43) per child. For the 12 children in the SSD treatment group, 4,500 grams of *Dermazine* at 23,400 naira (\$167.14) was used. Therefore, the average quantity of SSD used per child was 375 grams, and the comparative average cost of the SSD dressing was 1,950 Naira (or U.S. \$13.93) per child. Consequently, the average cost of dressing of the burns with SSD treatment was about 9.75 times that of crude undiluted honey dressing.

Discussion

Honey was renowned in ancient medicine as a good wound-healing remedy.⁴ The results obtained in the present study clearly demonstrates not only the effectiveness of crude undiluted honey in the healing of burns but also its superiority over SSD. Compared

Table II

Comparative Analysis of Honey and SSD-treated Burns

Clinical Condition of the Burns Sites	Number (Percentages) of Children		z Score	p Value
	Honey dressing n = 15	SSD dressing n = 12		
Day 3				
Presence of sloughs	13 (86.7)	9 (75.0)	0.28	0.780
Presence of exudates	10 (66.7)	6 (50.0)	0.48	0.629
Day 7				
Absence of sloughs	15 (100.0)	10 (83.3)	0.91	0.365
Absence of exudates	13 (86.7)	8 (66.7)	0.78	0.437
Presence of eschars	12 (80.0)	6 (50.0)	1.23	0.218
Granulation tissue	15 (100.0)	7 (58.3)	2.27	0.023
Presence of epithelialisation	12 (80.0)	4 (33.3)	2.06	0.039
Day 21				
Completion of epithelialisation	13 (86.7)	5 (41.7)	2.05	0.040

Figures in parenthesis represent percentages

with SSD, the rate of healing with honey was significantly more rapid, while granulation and re-epithelialisation were earlier. Similar observations have been reported by other workers.^{4,5} The better and faster response of the honey-treated wounds observed in the present study, allowed shorter hospital stays. This finding supports the claims of Al-Waili and Saloom⁹ that application of topical honey on infected wounds caused fast eradication of bacterial infections, reduced the period of antibiotic use and hospital stay, accelerated wound healing, and also caused minimal scar formation.

Honey has been reported to be associated with no significant side effects.¹⁰ Considering that no adverse effect was also observed with honey dressing in this study, this is particularly beneficial in view of the toxicity for which SSD is well known.³ It is also noteworthy that none of the children treated with honey developed wound sepsis or septicaemia unlike some cases in the SSD group. Had the latter children been treated with honey, which has well-documented anti-bacterial activities,¹¹⁻¹⁴ perhaps such adverse events might not have occurred. Unfortunately, none of the subjects could be followed-up for up to two months post injury due to patient default; the assessment of the burns sites particularly for scar tissue could therefore not be carried out. In addition to this drawback, our conclusions are also limited by the risk of observer bias as we were not blind to the treatment category of each burn wound. This is especially so as the physical appearances of both honey and SSD are strikingly different.

The modes of action of honey are diverse and not yet fully elucidated.⁴ Honey also de-odorises⁴ and de-sloughs.¹⁴ Its anti-bacterial activity reportedly persists even if diluted ten-fold by wound exudates.¹¹ Honey also induces monocytes to release TNF-alpha.¹⁵ Plausibly, its sheer viscosity is also asphyxiating to most bacterial pathogens.

Efforts are on the way to sterilize natural honey and rid it of possible clostridial spore contamination by gamma irradiation in an attempt to make it more hygienic and widely acceptable.¹⁶ Reports have indicated that honey compares very favourably with even more sophisticated burns and wound treatment agents such as polyurethane film (*OpSite*)¹⁷ and amniotic membrane.¹⁸ It is conceivable that future studies may isolate the active agents from honey that could revolutionize wound care even further. But then, will this be necessary? Most probably, it will only result in more costly and exotic therapy. Our results indicate that burns therapy with crude undiluted honey is significantly cheaper than with the present standard therapy with SSD both in terms of shorter hospital stay and the direct financial costs. Ironically, honey dressing of burns and wounds is still unpopular in Africa² despite the abundant supply of

honey that is produced with effortless ease by wild honey bees which thrive well in the supportive tropical vegetation. Plausibly, if commercial and subsistence apiculture are encouraged in the region, honey can become much more readily available at a still cheaper price.

We conclude that topical application of crude undiluted honey is beneficial to the healing process in partial thickness burns. It is cheaper and more effective than SSD. We therefore recommend the use of honey in the management of such burns particularly in the tropics. Furthermore, the public should be advised to keep honey at home for emergency uses following domestic accidents.

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