

# A prospective randomized trial to compare the effectiveness of honey vs. silver sulfadiazine dressing in burn wound management

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## Abstract

**Introduction:** In tribal part of central India burn injuries is a major cause of morbidity and mortality. This trial carried out at Chhattisgarh institute of medical sciences, Bilaspur intended to evaluate the efficacy and outcome of local application of honey vs. conventional silver sulfadiazine dressing treatment of burn wound. **Methods:** The study encompasses 200 patient of burn injury of varied aetiology admitted in burn ward whose total body surface area of burn was 15% to less than 50%. The patient receiving local application of honey were in group I (n=100) and those with conventional silver sulfadiazine ointment dressing treatment formed group II (n=100). Honey local application dressing was done on alternate day for 6 weeks of follow up period. The major outcome was, complete healing after 6 weeks period, while wound healing status was assessed at 2 weeks interval. **Result:** 52 out of 100 subject in honey treated group achieved complete healing as compare to 16 out of 100 subjects in silver sulfadiazine treated group. There was significant decrease in wound surface area, pain score & increase in comfort score in honey treated group in comparison to silver sulfadiazine ointment treated group at 0.00 level of significance. **Conclusion:** Markedly inexpensive honey as local application is highly effective in achieving complete healing in burn wound and is a very use full alternative for burn wound management.

**Keywords** - Honey local application, Silver Sulfadiazine Ointment & Burn Wound.

## Introduction

The present trial was under taken in teaching hospital of tribal dominated region of Chhattisgarh where state of art health care services are meagre and incidence of burn casualties are very common. Infection in burn patient is a leading cause of morbidity & mortality posing immense management problem for the health care personal [1, 2].

Various topical agents with varying degree of success have been used to prevent complication in burn wound

[3, 4]. Honey is used as a wound dressing in traditional Indian medicine [5]. In recent times this has been rediscovered as a topical antibacterial agent for treatment of wound & burn [6]. It quickly reduces the inflammation, swelling, pain & unpleasant odours. It also facilitates separation of necrotic tissue without the need for debridement [7]. The honey dressing can be removed painlessly without causing damage to regrowing tissue [8, 9]. Honey may provide nutrients needed for regenerating tissues because it contains large quantities of readily assailable sugars, many amino acids, vitamins and trace elements. Its high vitamin C content may prove beneficial by promoting collagen synthesis [10]. In this era of super speciality and multi disciplinary approach in well equipped burn units,

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available at very high cost, the health care provider seldom talk about low cost burn wound treatment. Since there is no randomised controlled trial comparing the effect of honey with silver sulfadiazine ointment, we conducted this trial to compare the effect of honey with silver sulfadiazine ointment. Honey is not a difficult commodity in tribal area of Chhattisgarh. This study was planned to assess effectiveness of Honey over Silver Sulfadiazine.

### Patient and Method

**Settings:** This trial was conducted in Burn Centre of Department of General Surgery, Chhattisgarh Institute of Medical Sciences from 1<sup>st</sup> September 2014 to 31<sup>st</sup> August 2015. The ethical committee CIMS approved the study.

### Inclusion Criteria

A total of 434 patients admitted in burn ward from 1<sup>st</sup> September 2014 to 31<sup>st</sup> August 2015. The patients were having total Burn surface area (TBSA) between 15% - 50% (n = 200) were included in the study. The patient included adults and children of both sexes who had diverse burn aetiology viz. flame, scald, electricity etc.

**Exclusion criteria:** The remaining 234 patient not adhering to the study plan were excluded from the study

- (1) Those who either expired or got discharged within one week of admission.
- (2) Patient who had more than 50% TBSA and were referred to nearby higher centre on request.
- (3) Some cases of electric burn having full thickness damage (muscle or bone deep) because some form of reconstructive procedure was anticipated in early stage of hospitalisation.

**Methods of burn wound management:** All 200 patients received treatment as per protocol like resuscitation, intravenous fluids, antibiotics, analgesics, nutrition supplement, physiotherapy etc. Delayed conservative approach of Burn wound management was used in all cases, instead of early active debridement and skin grafting. Patients were divided into group - I

and II of 100 each. This division in groups was based on the basis of fixed days of admission in a particular unit system of Surgery department irrespective of age, sex, aetiology of burn, TBSA etc.

Either group in a particular unit had decided to adopt a separate protocol of burn wound management. In group - I (n = 100), burn wound was managed by commercially available Honey as local application, alternate day with sterile gauze by paramedical staff. In group- II (n = 100), burn wound was managed by conventional dressing treatment with silver sulfadiazine ointment. Dressing was changed every alternate day. Patient in both group were initially cleaned with normal saline followed by removal of loose skin and puncture of blisters.

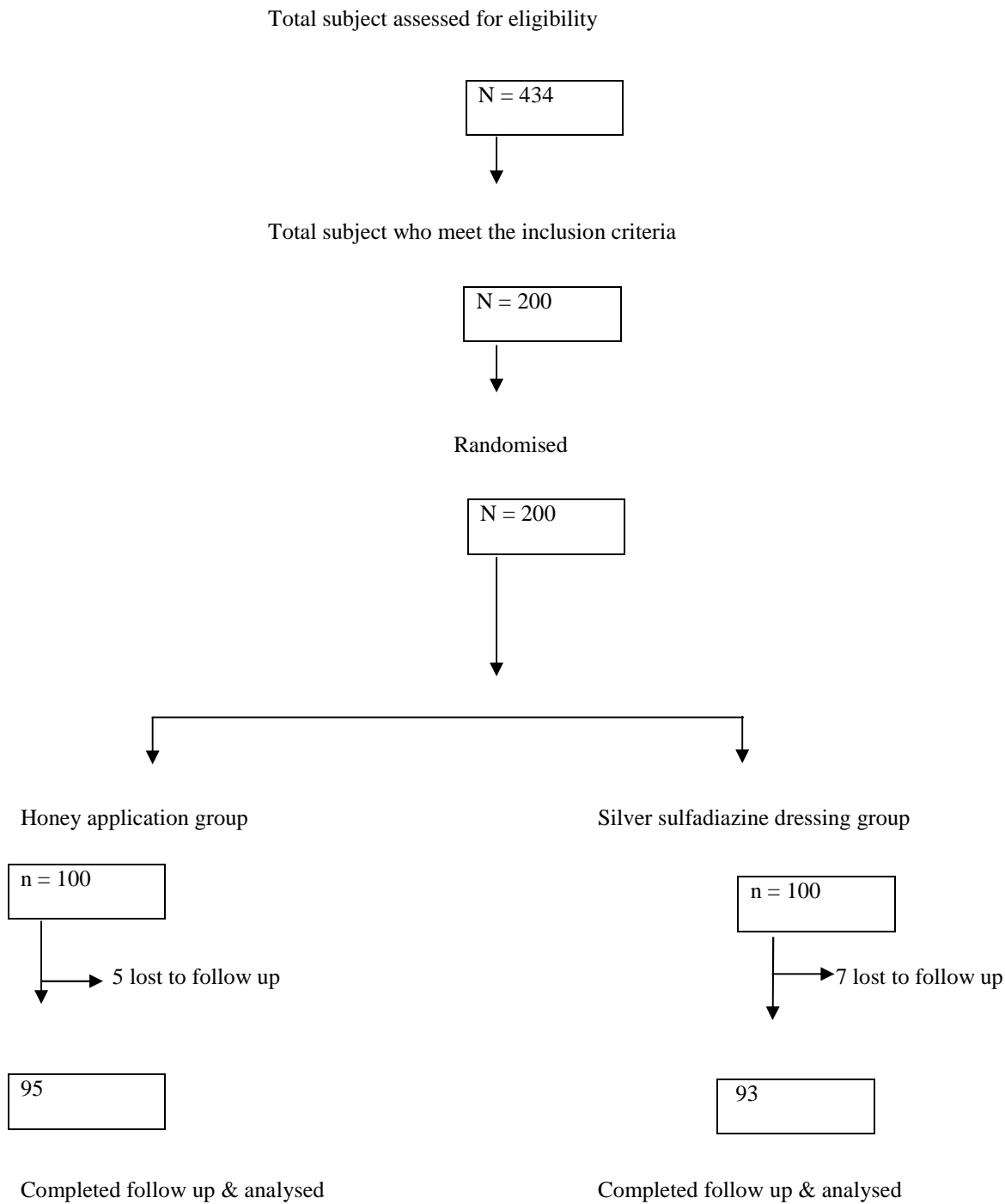
In study group, after local application of honey, patients were cleaned with clean cloth. After 5 to 7 days a dry and adherent crust (eschar) developed over the wound which started to separate out, gradually leaving a granulating surface in 1 to 3 weeks. Honey as local application was continued over the remaining wound.

All patients were subjected to routine haematological evaluation once a week and swab culture sensitivity fortnightly. After haemogram estimation, blood transfusion was given to patients, as and when necessary. The observation of wound healing status was made at 2 week intervals i.e. 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> weeks in all patients. In both groups, the incidence of febrile episode and hyperpyrexia was recorded. The pain and over all comfort was recorded on a visual analogue scale (VAS) and any adverse reaction was recorded in all patients as per protocol.

**Outcome variables:** The main outcome of interest was complete healing at the end of the 6<sup>th</sup> week. Secondary outcome were reduction in surface area of burn would measured by Wallace Rule of Nine and pain during dressing change measured on visual Analogue Scale (VAS 0 – 10) and over all comfort of subjects during hospitalisation measured on the VAS of 0 – 10.

**Statistical Analysis:** Paired t – tests were used to find out the difference between the two groups. Data analysis was performed on SPSS software (Version 11.5). A P value of < 0.05 was accepted as significant.

**Fig - I Consort flow diagram**



**Result**

In honey treated group of 95 subjects completed the follow up. Five subject suffered multi organ failure and death and were excluded from outcome analysis. In silver sulfadiazine group seven subject suffered multi organ failure and death and were excluded from outcome analysis.

Table – I describes the demographic and biochemical baseline characteristics. There was female preponderance in both the group. Both the groups were comparable in terms of demographic characteristics, aetiology and location of burn wound. Similarly both groups were comparable in terms of concomitant disease, previous medical and surgical

treatments. Most subjects had burn wound of flame burn/ flash burn. Two groups were comparable in terms of burn surface area, pain score during dressing and overall comfort score during hospitalisation.

**Proportion of complete healing at 6 weeks:** In the honey group, 52 subjects achieved complete healing of burn wound at six weeks. Only 16 subjects attained complete healing with silver sulfadiazine in 6 weeks.

**Surface area reduction:** Median surface area of burn wound was 27.67% at baseline (0 week) in the silver sulfadiazine group which reduced to 8.86% (Residual burn surface area) at 6<sup>th</sup> week. In the honey group, baseline median surface area was 28.05% which reduced to 2.91% (Residual burn wound) at 6<sup>th</sup> week. The difference was significant at < 0.05% levels (Table 2 and 3).

**Pain score on Visual Analogue Scale (VAS):** Median pain score as baseline was 7 on 11 point scale of 0 – 10. This reduced to 1 at the 6<sup>th</sup> week in the honey treated group. Patients in the silver sulfadiazine group experienced a reduction in pain score from 7 at baseline to 5 at the 6<sup>th</sup> week (Table 2 and 3).

**Overall comfort score on Visual Analogue Scale (VAS):** Median overall comfort score at baseline was 4 which markedly increased to 9 at the 6<sup>th</sup> week in the honey treated group (Table – 2). Patients in Silver sulfadiazine group experienced increase in overall comfort score from 4 at baseline to 6 at the sixth week.

The group in which honey application was used did not require frequent use of analgesics, contrary to silver sulfadiazine group in which analgesics were used very frequently. Incidence of febrile episodes and hyperpyrexia were equal in both groups in initial period, but with the use of honey, it was observed that there was reduced incidence of febrile episodes and hyperpyrexia in group – I (20%) as compared to group – II (70%).

This was mainly because of deep invasive wound infection that solely occurred in group II, as hot, humid, hypoxic atmosphere favoured rapid bacterial proliferation. Although surface bacterial contamination was observed on culture in all patients of group-I, but deep invasive infections was remarkably absent.

Swab culture in wound infection exhibited pseudomonas, proteus and staphylococcus as commonest offending organism. Group I exhibited staphylococcus as commonest pathogen while in group II, it was pseudomonas that was predominant. There was equal incidence of anaemia in both groups.

As depicted in table-4, leucocytosis in group II was mild in 60%, whereas incidence of significant leucocytosis in 65% of patients. Leucocytosis after second week was significantly more in group II (65%) as compared to group I. Liver and renal profile for biochemical parameters exhibited insignificant difference in both the groups. One remarkable observation was that most of the patients were ambulatory from 4<sup>th</sup> to 6<sup>th</sup> post burn day in group I, whereas in group II most of the patients were bed-ridden for a significantly prolonged period.

**Table-1: Baseline characteristics of Honey and silver sulfadiazine dressing group**

Variables	Honey application n = 95	Silver sulfadiazine group n = 93
Age in Years	Mean - 19.72, S.D. – 16.24	Mean - 23.95 S.D. – 13.5
Gender	Male – 12(12.63%) Female – 83(87.36%)	Male – 9(9.67%) Female – 84 (90.32%)
No. of febrile episode	20	70
Haemoglobin gm%	Mean 10.6 S.D. - 1.6	Mean 9.5 S.D. - 1.4
Serum Protein gm%	Mean 7.2 S.D. – 0.68	Mean 6.9 S.D. – 0.64

**Table -2: Outcome honey dressing group**

Variables	Median (Range)				P value
	Honey dressing Group (N=95)				
	0 weeks	2 <sup>nd</sup> week	4 <sup>th</sup> week	6 <sup>th</sup> week	
Surface area of burn wound in percentage	28.05% (15-49%)	20.08% (10-40%)	13.75% (8-30%)	2.91% (0-15%)	0.000
Pain score during dressing Change	7 (0-10)	5 (0-10)	2.5(0-6)	1(0-4)	0.000
Overall comfort score of dressing	4 (3-7)	6(4-9)	8(4-10)	9(7-10)	0.000

**Table- 3: Outcome Silver sulfadiazine dressing room**

Variables	Median (Range)				P value
	Silver sulfadiazine (N=93)				
	0 weeks	2 <sup>nd</sup> week	4 <sup>th</sup> week	6 <sup>th</sup> week	
Surface area of burn wound in percentage	27.67 % (15-49%)	19.55% (10-40%)	17.98% (8-30%)	8.56% (0-20%)	0.000
Pain score during dressing Change	7 (0-10)	5 (0-10)	5(0-9)	5(0-9)	0.000
Overall comfort score of dressing	4 (2-7)	5(3-8)	6(4-7)	6(4-8)	0.000

**Table-4: Showing Leucocytosis Pattern in Group I and II**

Leukocyte Count	Group I	Group II
Physiological range (4000 to 6000/cu.mm)	20%	10%
Mild leucocytosis (12000 to 18000/cu.mm)	50%	60%
Significant Leucocytosis (more than 18000/cu.mm)	30%	52%

**Table-5: Showing Frequency of Isolates in Culture Positive Cases of Group I**

<b>Organism</b>	<b>Number of Culture positive Samples (%)</b> <b>(Total no. of samples n=95x3)</b>
Staphylococcus Species	82 (28.7)
Proteus species	74 (25.9)
Enterobacter	48 (16.8)
Klebsiella	32 (11.2)
Pseudomonas Species	16 (5.6)
Enterococcus species	12 (4.2)
Others	8 (2.8)

**Table-6: Showing Frequency of Isolates in Culture Positive Cases of Group II**

<b>Organism</b>	<b>Number of Culture positive Samples (%)</b> <b>(Total no. of samples n=95x3)</b>
Pseudomonas Species	160 (56.1)
Proteus species	44 (15.4)
Staphylococcus Species	32 (11.2)
Enterobacter	18 (6.3)
E coli	11 (3.8)
Enterococcus species	08 (2.8)
Others	07 (2.4)

## Discussion

Majority of the subjects – 75.10% in the honey dressing group and 61.5% in the silver sulfadiazine group were having flame/ flash burn aetiology [11, 12]. Several authors have reported that honey enhances wound healing rate, compared to other conventional or topical application in varieties of clinical condition including burn [12, 13, 14,15].

Our results with honey were similar to reports in literature showing rapid healing with the application of honey [15]. Hamdy et al (1988) reported that number of micro organisms and bacterial species decreased by 50-100% on application of honey on infected wounds [16]. Various authors reported mild or no pain at all during application of honey as compared to other treatments [17, 18, 19].

In our study, 54.7% of the subjects in the honey group achieved complete healing at 6<sup>th</sup> week. Medhi et al (2008) reported similar findings by conducting a meta-analysis to evaluate the efficacy of topical application of honey in studies as well as in clinical trials [20].

Barillo et al (2008) observed that honey topical application makes the wound dry [21] and creates a

hard coagulum to minimise exudation and fluid loss (escharotics) [22, 23]. Amongst the diverse variety of substances advocated for topical application in burn wound management, honey local application is non-irritant and cost effective [24, 25]. In this study, most of the burn wounds healed in 6 weeks in absence of severe sepsis, even without skin grafting. In this trial, the reduced infection in burn wound might also be attributed to early weaning from intravenous fluids and early acceptance of oral feeding as compared to subjects in group II.

### Conclusion

The present randomized trial is unique in the sense that burn patient often faces difficulty in dressing i.e. lack of meticulous technique in terms of infrastructure, manpower and material. The gauges and bandages are expensive items required in bulk and are usually out of stock in hospital. This trial also demonstrates that the rate of wound healing with silver sulfadiazine was much slower than that achieved in honey treated group. In search of cost effective burn wound management, use of honey proved to be a better alternative to early active management in well equipped burn units available at very high cost.

Education on first aid management on burn wound is the need of the hour in developing states like Chhattisgarh where most of the patients do not use running water as immediate remedial measures. It may be recommended that honey local application should be used as home treatment of less severe burn, even up to 20-25%.

Honey dressing is more effective as compared to silver sulfadiazine dressing in achieving complete healing, reducing burn surface area, pain and increasing comfort in subject with burn wounds.

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