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The Effectiveness of Honey in Wound Healing among Patients with Wounds in a Selected Hospital of Kolkata

Kuntal Mandal, Dr. Prabir Sur

Abstract: ***A quasi experimental equivalent time series study designed to identify the effectiveness of honey in wound healing among patient with wound. The objectives of the study were to find out the effectiveness of honey in terms of rate of healing, pain & wound infection as observed for five days. Non probability purposive sampling technique was used to select 20 patients with wounds and randomly assigned (1:1 ratio) for experimental (10 patients) and comparison group (10 patients). A semi structured interview schedule, standardized Bates Jensen wound assessment tool and visual analogue pain assessment scale and proforma for recording wound culture report were used to collect data after establishing validity and reliability of the tool. The findings of the study revealed that there was significant difference in the wound status (F value = 6.803 and critical difference = 14.23, p<0.05) from day five and in the pain status (F-value = 7.638 and critical difference = 1.84, p< 0.05) from day four in case of experimental group. Chi-square test of association was not significant in patient particulars including use of analgesics and antibiotics which indicated that the both groups are comparable and homogenous. The percentage distribution of bacterial colony count showed that 50% wound treated with honey became sterile within five days whereas in case of Povidone iodine treated wound only 10% became sterile. So application of honey provides a better wound healing and controls wound infection than Povidone iodine.***

Keywords: Wound healing, Honey

1. Introduction

Honey was used to treat infected wounds as long as 2000 years before bacteria were discovered to be the cause of infection. In c.50 AD, Dioscorides describes honey as being "good for all rotten and hollow ulcers". More recently honey has been reported to have an inhibitory effect to around 60 species of bacteria including aerobes and anaerobes, gram positive and gram negatives. An antifungal action has also been observed for some yeasts and species of Aspergillus and Penicillin as well as all the common dermatophytes. The current prevalence of antibiotic-resistant microbial species has led to a re-evaluation of the therapeutic use of ancient remedies, including honey. There are now many published reports describing the effectiveness of honey in rapidly clearing infection from wounds, with no adverse effects to show the healing process; there is also some evidence to suggest that honey may actively promote healing. However further research is needed to optimize the effective use of this agent in clinical practice.

2. Objectives

1) To assess the status of the wound in the study groups.
2) To assess the wounds of each group for five consecutive days following honey & Povidone iodine.
3) To find out the effectiveness of honey in terms of rate of wound healing as observed on each day for five days.
4) To find out the effectiveness of honey in terms of pain perception as observed on each day for five days.
5) To compare the condition of the wound status in terms of wound infection as observed on each alternate day for five days.

Hypotheses:

H_1: There is significant difference between personal characteristics of patients receiving Honey treatment than the patients receiving Povidone iodine treatment as evident from semi structured interview schedule for personal data at 0.05 level of significance.

H_2: Mean difference of wound status score between day one and day five is significantly higher in the group receiving honey than the group receiving Honey than the group receiving conventional treatment as evident from Bates Jensen wound assessment tool at 0.05 level of significance.

H_3: Mean difference of pain score between day one and day five is significantly higher in the group receiving Honey than the group receiving conventional treatment as evident from visual analogue pain assessment tool at 0.05 level of significance.

3. Methodology

A quasi experimental with equivalent time series design of quantitative research approach is selected to carry out the study. The study population comprised of all patients with wound, attending Medical / Surgical / Radiotherapy OPD, or admitted in the ward of Medical college Hospital, Kolkata. The sample size for the study was 20 (10 in experimental and 10 in control group). Purposive sampling technique was used for selecting the sample of the study and then randomly assigned as experimental and control subject in 1:1 ratio. The tools used for the study were: interview schedule on patient particulars, Bates Jensen wound assessment tool, record analysis proforma for wound culture report and visual analogue scale for wound pain assessment.

4. Results

The personal characteristics (such as age, gender, religion, marital status, education, occupation, other family member's occupation, per capita income, bodyweight, height, mobility, whether diabetic, type of wound, duration of illness, duration of wound, duration of treatment, type of treatment, use of analgesics and antibiotic drugs) of patients receiving Honey

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treatment has no statistical significant difference, with the patients receiving Povidone iodine treatment. So, the null hypothesis (H_{01}) is accepted and the research hypothesis (H_1) is rejected at 0.05 level of significance. It is also noted that no respondents had any allergic reactions to either Honey or Povidone iodine.

Thus it is interpreted that both groups are homogeneous and matched in terms of personal characteristics.
The characteristics of wound are about 75 percent wounds were non malignant. Among non malignant the wound are 60% bed sore (sacrum), 13.33 % burn(leg), amputated knee 6.67%, DVT-6.67%, Diabetic foot-6.67%, mechanical injury at shoulder 6.67% and among malignant cases cancer in breast is 20%, Anorectal- 20%, back-20%, Cheek-20% & skin- 20% were present equally.

4.1 Findings related to wound status and the relationship between Experimental and Comparison group

Table 1: F- value of total wound status scores computed between experimental group and comparison group on day one to day five observation, n = 20

Day	Group	Mean	M_D	SD_D	SE_D	F value (Critical difference)
D1	Experimental Comparison	50.10 47.6	-2.5	1.03	3.076	
D2	Experimental Comparison	47.6 47.7	0.1	0.81	3.170	6.803* (14.23)
D3	Experimental Comparison	42.5 49.3	6.8	0.56	2.911	
D4	Experimental Comparison	36.8 50.9	14.1	0.41	2.487	
D5	Experimental Comparison	34.1 51.3	17.2	0.74	2.373	

$F_{0.05}(1, 18) = 4.41$ * $p < 0.05$

Data presented in Table 1 shows mean, M_D, SD_D, SE_D and results of analysis of variance (two-way ANOVA) and corresponding t-test using critical difference. It is evident that the difference in healing status between two groups changed over the days. On day one the mean score of wound status was poorer in experimental group than comparison group(M_D→-2.5) whereas on day five experimental group was much better in condition (M_D → 17.2).However perusing the table 1 above it is seen that the difference in wound condition became really significant ($p<0.05$) on day five. It denotes that the mean difference of wound status scores between experimental and comparison group is true difference, not by chance. Therefore null hypothesis (H_{02}) is rejected and it is interpreted that Honey treatment is significantly assisted in wound healing in patients receiving Honey treatment for consecutive five days.

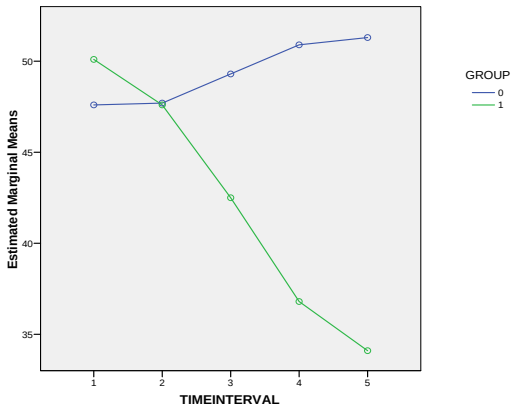


Figure 1: Line graph of estimated marginal means of wound status between groups

The above Fig.1 depicts a dramatic change of marginal mean values from day three onwards between two groups. Here the experimental group (1) shows a rapid reduction in mean score of wound status which denotes a better wound status than the comparison group (0). So above all findings clearly supports that using honey is a better alternative to that of Povidone iodine for wound healing.

4.2 Findings related to pain perception

Table 2: F- value of total perception of pain scores computed between experimental group and comparison group on day one to day five observation, n = 20

Day	Group	Mean	M_D	SD_D	SE_D	F value (Critical difference)
D1	Experimental Control	8.5 7.7	-0.80	-0.7	0.403	
D2	Experimental Control	7.9 7.8	-0.10	- 0.78	0.401	
D3	Experimental Control	7.2 8.2	1.00	- 0.72	0.383	7.638* (1.84)
D4	Experimental Control	6.5 8.6	2.10	- 0.75	0.433	
D5	Experimental Control	6.0 8.7	2.70	- 0.56	0.367	

$F_{0.05}(1, 18) = 4.41$ * $p < 0.05$

Data presented in Table 2 shows mean, M_D, SD_D, SE_D and results of analysis of variance (two-way ANOVA) and corresponding t-test using critical difference. It is evident that the difference in pain status between two groups changed over the days. On day one the mean score of pain was poorer in experimental group than comparison group (M_D→-0.80) whereas on day five experimental group was much better in condition (M_D → 2.70).However perusing the table above it is seen that the difference in pain score became really significant ($p<0.05$) on day four and five. It denotes that the mean difference of pain status scores between experimental and comparison group is true difference, not by chance. Therefore null hypothesis (H_{03}) is rejected and it is interpreted that Honey treatment is significantly assisted in reducing pain.

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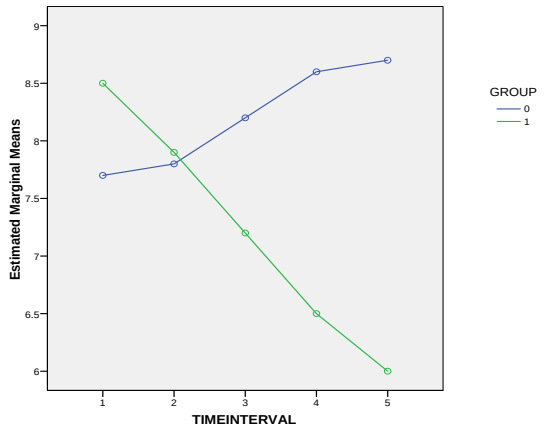


Figure 2: Line graph of estimated marginal means of pain score between groups

The data presents in Fig. 2 depicts that the estimated marginal means of pain score rapidly changes from day three onwards between two groups which are calculated from day one to day five. Here the experimental group (1) shows a rapid reduction in estimated marginal mean score of pain perception which denotes a better reduction in pain score than the comparison group (0).

So above all findings clearly supports that using honey is a better alternative to that of Povidone iodine for pain management.

4.3 Findings related to isolated bacteria from infected wound

Table 3: The percentage distribution of isolated bacteria from infected wound between experimental and comparison group, n = 19

Name of the bacteria		Experimental Group		Comparison Group		Total	
		No	%	No.	%	No	%
Klebsella aerogens		3	30	5	50	8	40
Staphylococcus aureus		6	60	8	80	14	70
Pseudomonous aeruginosa		3	30	2	20	5	25
E. coli		1	10	2	20	3	15
Enterococcus spp.		0	0	3	30	3	15
Proteus mirabillis		0	0	1	10	1	5
No growth	Within 48 hrs.	2	20	0	0	2	10
	Within 48-96 hrs.	3	30	1	10	4	20
Colony count reduced	Gradually starts within 48 hrs.	5	50	0	0	5	25
	Among multiple infection any one or two bacterial count reducing gradually, others increased	0	0	5	50	5	25

Data presented in table 3 shows that the total percentage of *Staphylococcus aureus* is high (70%) whereas the *Proteus mirabilis* shows lowest (5%) in percentage distribution. Data reveals that within 48hrs about 20% and within 48-96 hrs. about 30% became sterile among experimental group (among them one was insulin dependent diabetes patient). Whereas among comparison group only one respondents (10%) became sterile within 48-96 hrs (on fifth day). Rests half of the experimental group shows reduction in colony count within 48 hrs. Whereas no comparison group shows such reduction in colony count, but among multiple infection any one or two strains of bacterial count slightly reduced in 50% of client receiving treatment with Povidone Iodine. The above data also reveals that the frequency of the bacterial infection to different strain is also more in comparison group except the infection with *Pseudomonous aeruginosa*, where the experimental group has 10% more infection rate among respondents.

Further tests of significance were not attempted, as in many cases the infection by particular bacteria was not present as is evident from the above table. Such as in the cases of Enterococcai and Proteus only three and one cases were found respectively in comparison group only. Again E. coli infection only one case in experimental group and two in comparison group were found. So statistical calculations could not be possible.

5. Discussion of the Findings Related to other Studies

The findings of this present study reveals that, Honey enhances wound healing rate which is much faster than that attained by Povidone iodine group in variety of clinical condition such as burns, chronic wounds, pressure ulcers, infected surgical wound and even malignant wound. The same findings are reported by several authors such as Yapucu (2007), Okeniyi (2005), Subrahmanyam (1994 and 1998), Molan, P.C. et al (1997), Ndayisaba el al (1993), Weheida et al (1991). All of them also support in various randomized clinical studies comparing Honey dressing with other conventional or topical application in variety of clinical condition viz. burns, chronic wounds, infected surgical wounds and pressure ulcers.

The present study shows that bacteriological wound infection rate significantly reduced by 50% and becomes sterile about 50% within five days in Honey dressing compared to baseline value. Where as in case of Povidone iodine group no infected wounds became sterile within five days. Only 30% infected wounds showed a reduction in a strain of bacterial count among multiple bacterial infections. It has been reported from various clinical studies on the usage of honey as a dressing agent for infected wounds that the wounds become sterile in three to six days as reported by Cavanagh, D. et al (1973), Bergman, A. et al (1983). Within seven days the wounds become sterile reported by Efem, SEE (1993), and Phuapradit, W. et al (1992), and within seven to ten days as described by Armon, P. J. (1980). Bulman, MW. (1995) and Green AE. (1988). Efem, SEE. (1993) had also reported that honey dressings halt advancing necrosis.

In the present study the median pain score at 1st day was 8.5 for Honey dressing group and eight in Povidone iodine group on a 10 point visual analogue pain measurement scale. The result shows reduced median pain score as six in case of Honey dressing group in comparison to nine for Povidone iodine group on fifth day. This finding revealed that honey plays a significant role in the reduction of wound pain. These findings are supported by Mphande et al (2007), Subrahmanyam (1994 and 1991). They reported in

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prospective randomized clinical trial that subjects had reported mild or no pain during dressing change with honey as compared to other treatment.

In the present study commercially available Honey had been used to make it cost effective and for easy convenience as a dressing material. The study was supported by Mossel, D. A. A., who describes that Honey sometimes contains spores of clostridia, which poses a small risk of wound botulism, yet there are no reports of any type of infection resulting from the application of honey to wounds. If spores germinated, any vegetative cells of clostridia, being obligate anaerobes, would be unlikely to survive in the presence of the hydrogen peroxide that is generated in diluted honey. But the use of honey as a wound dressing has been argued against, however, on the grounds that the risk of it possibly causing wound botulism is unacceptable.

6. Implication

Honey is a safe and effective alternative to Povidone iodine solution for wound dressing in clinical practice for treating wounds.

7. Recommendations

- Study can be conducted with a large sample size for the generalization of its result.
- A comparative study can be conducted on Honey dressing, commercially available Honey versus sterile (Gamma irradiated) Honey.
- Large randomized double or triple blinded multi-centric clinical trials may be undertaken to compare the efficacy of Honey dressing with Povidone iodine dressing in wound healing.

8. Conclusion

Based on this scientific evidence it is concluded that Honey dressing is effective as compared to Povidone iodine dressing in reducing bacteriological wound infection rate, and pain score (pain related to wound). Honey dressing also enhances the wound status better as compared to Povidone iodine dressing by reducing the score as observed in Bates Jensen Wound Assessment tool in subjects with wounds. Honey shows no impairment of the healing process through adverse effects on wound tissues and to the contrary it appears to have a stimulatory effect on tissue regeneration.

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