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ORIGINAL ARTICLE



ORIGINAL ARTICLE COMPARISON OF MEAN HEALING TIME WITH HONEY VERSUS 1% ACETIC ACID IN THE TREATMENT OF INFECTED WOUNDS

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ABSTRACT:

BACKGROUND: Infected wounds pose a significant challenge in medical practice, requiring effective treatment strategies to facilitate timely healing. The use of topical solutions is a common approach for wound management. The antimicrobial properties of honey compare with 1% acetic acid make it an attractive option for treating infected wounds. Honey creates an acidic environment that decrease the bacterial growth of bacteria, also MRSA Methicillin-resistant Staphylococcus aureus and commonly Pseudomonas aeruginosa, can happen due to wound infections. **OBJECTIVE:** To compare mean healing time with honey versus 1% acetic acid in the infected wound treatment. **PLACE AND DURATION OF STUDY:** This is a Randomized Control Trial Study was done on patients in the Department of general surgery, Liaquat University of Medical & Health Sciences Hospital Jamshoro, for the period of one and half year July 2022 to March 2023. **PATIENTS AND METHOD:** All patients who fulfilled the inclusion criteria and visited LUMHS, Jamshoro were included in the study. Informed consent was taken after explaining the procedure, risks and benefits of the study. The sample was divided into two groups (intervention and control). For the intervention group, honey available commercially was used for cleaning and debriding the wound and placed on the wound via soaked gauze. The dressing was done twice daily. The same was done for the control group using obtained 1% acetic acid. All the collected data were entered into the proforma attached at the end and used electronically for research purposes. Total 440 cases with clinical diagnosis of infected wound were admitted through outpatient department. All the data was recorded on predesigned Performa. **RESULTS:** The mean \pm standard deviation of age in group A (Honey locally available) was 41.10 ± 12.95 and group B (1% acetic acid) was 43.65 ± 13.62 years. In the group-wise distribution of gender, 146 (66.4%) males and 74 (33.6%) females have included in group A while 166 (75.5%) males and 54 (24.5%) females were included in group B respectively. The mean \pm SD for the duration of healing time was noted as 5.31 ± 3.50 and 13.68 ± 7.64 days in group A and group B respectively while having a highly significant P-value i.e. (0.0001) **CONCLUSION:** It is to be found that the healing time of infected wounds with honey is significantly less as compared to 1% acetic acid. More well-controlled prospective randomized trials with bigger sample size, with more parameters in large centers in Pakistan are

KEY WORDS: Honey (Locally available), Acetic Acid, Healing, Infected Wounds, Time

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INTRODUCTION

Injuries and wounds account for much of the health-care burden faced across the world and infection, chronicity and inability to heal incur a steep hike in its already taxing nature, as a result of which surgeons have to face more workload. A variety of topical agents are employed routinely for wound management including dressings (as simple as saline to as complex as modern self-healing grafts). Though seemingly simple, wounds may be devastating for patients on various fronts; namely.^{1,3} 1. Physical (loss of blood and experience of pain). 2. Nutritional (loss of electrolytes and proteins). 3. Vocational (inability to work due to debilitation). 4. Financial (cost of treatment and care), 5. Psychological (depression and damaged confidence). 6. Socially (loss of autonomy and personal/professional dependence). Honey is produce naturally it contain some compounds which contain phenol derivative, rich in enzymes, antioxidant, anticarcinogenic, antimicrobial element and anti-inflammatory, Indeed, the dressing with honey and care of wound other microbial derivative applications are more commonly used for many years. Some of the benefits of the use of honey for healing of many types of wounds effect can happen due to rapid repair of skin, increased epithelialization, neovascularization more, immune response, healing reduce the infection rate due to pathologic microorganisms. The process of wound-healing has the recovery of the already damaged tissue and regeneration of lost epithelium.⁴ During inflammatory process the hemostasis, chemotaxis, and the increased vascular permeability decrease the more harm, to

wound, reduce cellular waste, bacteria, and shifting of cell raised.⁵ The healing time of wounds different if dressing done with honey or honey-derivate it can be different from months to weeks can be depend nature of the wound, the area and duration of the wound.^{6,7} because of osmotic nature of, honey which creates a layer of liquid between the dressing and the wound bed.⁸ It is thus favorable for all, the patients, society and the healthcare system to seek methods to expedite wound management and recovery, However, infections (fungal and bacterial) make it difficult to achieve the desired goal of quick management and recovery of wounds. In an attempt to fight the afore mentioned types of infections, conventional treatment entails the use of systemic antibiotics, but this too falls short of being completely effective in diabetic patients and those with weakened immune defenses - leading to chronic non healing wounds. Other methods of treating wounds too each have their own shortcomings with high cost, low availability, resistance and undue adverse events being major challenges.^{9,10} while applied honey get a remarkable improvement of wounds, has shown even more efficacy than conventional treatment using commercially available wound dressings or antibiotics (systemic and local application).^{11,12} Honey can quickly replace sloughs and produce granulation tissue and promotes a rapid epithelialization and decrease edema around the wound margins, significantly decreasing the healing time.^{11,13} Systemic antibiotics, local agents are employed to decrease the infection. However, the efficacy and safety of the topical antiseptics management of wound is at best

questionable. Concerns regarding the safety of topical agents (such as iodine, hydrogen peroxide, chlorhexidine, silver sulfadiazine, alcohol, Mafenide acetate and sodium chloride/sodium nitrate) have been voiced by numerous in vitro and animal studies wherein toxic effects were noted. Some published text also claims to have observed toxicity to fibroblasts and potential to retard fibroblast contribution to the healing process associated with the use of iodine and hydrogen peroxide.^{14,15} Infections in wound is more healthcare issues. The process of wound infection is more complicated and plays many biological effect at the molecular levels. Wound infections can cause more morbidity develop mortality.¹⁶ Acetic acid ($C_2H_4O_2$) has low toxic effect and is compared with as an antimicrobial agent. It has a many mechanism of action and cannot be totally explained by its acidic nature. that application of 1% acetic acid brings down the healing time from 12.25 days (control subjects) to as low as 5.5 days (test subjects), and a noted benefit even among otherwise drug-resistant infections.¹¹ 1% acetic acid may thus be a promising therapy and may yield benefits to the local populace wherein drug resistance is rampant, and the cost of treatment is high. This research thus hopes to provide much-needed evidence pertaining to the role of 1% acetic acid in the management of infected wounds.

OBJECTIVE: To compare mean healing time with honey versus 1% acetic acid in the infected wound treatment

Place and duration of study: This is a Randomized Control Trial Study was done on patients in the Department of general surgery, Liaquat University of Medical & Health Sciences Hospital Jamshoro, for the period of one and half year July 2022 to March 2023. **Patients and Method:** All patients who fulfilled the inclusion criteria and visited LUMHS, Jamshoro were included in the study. Informed consent was taken after explaining the procedure, risks and benefits of the study. The sample

was divided into two groups (intervention and control). For the intervention group, honey local available commercially was used for cleaning and debriding the wound and placed on the wound via soaked gauze. The dressing was done twice daily. The same was done for the control group using obtained 1% acetic acid. All the collected data were entered into the proforma attached at the end and used electronically for research purposes. Total 440 cases with clinical diagnosis of infected wound were admitted through outpatient department. All the data was recorded on predesigned Performa.

RESULTS

This is randomized controlled trial, the total of 440 patients registered admitted through outpatient patients divided into two groups in A and B by balloting method each group containing 220 patients included to compare mean healing time with Honey (locally available) versus (1% acetic acid) in the treatment of infected wounds and the results were analyzed as: The distribution of continuous variables was tested by applying the Shapiro-Wilk test for age group ($P=0.067$) & ($P=0.089$) and duration of healing ($p=0.166$) & ($p=0.106$) in group A Honey (locally available) group B (Acetic acid 1%) respectively, as shown in TABLE 1. The mean \pm SD of age in group A was 41.10 ± 12.95 with C.I (39.38---- 42.82) and group B was 43.65 ± 13.62 with C.I (41.84----45.46) years, as shown in TABLE 2. The mean \pm SD for the duration of healing in group A was 5.31 ± 3.51 with C.I (4.85---- 5.78) and group B was 13.69 ± 7.64 with C.I (12.67-- --14.70) days, as shown in TABLE 3. In the group-wise distribution of gender, 146 (66.4%) males and 74 (33.6%) females have included in Group A while 166 (75.5%) males and 54 (24.5%) females were included in Group B respectively, as shown in TABLE 4. Residence status showed that 141 (64.1%) were urban while 79 (35.9%) were residents of rural areas in group A and 120 (54.5%) 59 were urban

while 100 (45.5%) were residents of rural areas in group B respectively, as shown in TABLE 5. Granulation tissues were noted in 92 (41.8%) & 101 (45.9%) in group A & B patients respectively, as shown in TABLE 6. The mean \pm SD for duration of healing was noted as 5.31 ± 3.50 and 13.68 ± 7.64 days in group A and group B

respectively while having a highly significant P-value i.e., (0.0001) as shown in TABLE 7. Stratification of age group, gender, body mass index and residential status were done to assess the statistical difference between both groups from TABLE 8-10.

TABLE # 1 DESCRIPTIVE STATISTICS FOR DISTRIBUTION OF CONTINUOUS VARIABLE No:440

GROUP	VARIABLES	MEAN \pm SD	P-VALUE
Honey (Locally available) (Group A)	Age Group	41.10 \pm 12.95	0.067
	Duration of Healing	5.31 \pm 3.50	0.166
Acetic Acid (Group B)	Age Group	43.65 \pm 13.62	0.089
	Duration of Healing	13.69 \pm 7.64	0.106

Applied Shapiro Wilk test

TABLE # 2 DESCRIPTIVE STATISTICS OF AGE No: 440

AGE years	No	MINIMUM	MAXIMUM	MEAN	\pm SD	95% C. I
GROUP	GROUP A	18.00	60.00	41.10	12.95	39.38--42.82
	GROUP B	18.00	60.00	43.65	13.62	41.84--45.46

TABLE # 3 DESCRIPTIVE STATISTICS FOR DURATION OF HEALING No: 440

DURATION DAYS	No	MINIMUM	MAXIMUM	MEAN	\pm SD	95% C. I
GROUP	GROUP A	02.00	15.00	05.31	03.51	4.85--5.78
	GROUP B	05.00	28.00	13.69	07.64	12.67--14.70

TABLE # 4 DISTRIBUTION OF GENDER No: 440

GROUPS	GENDER	
	MALE	FEMALE
GROUP A	166	54
	75.5%	24.5%
GROUP B	146	74
	66.4%	33.6%

TABLE # 5 DISTRIBUTION OF RESIDENTIAL STATUS No: 440

	RESIDENTIAL STATUS	
	URBAN	RURAL
GROUP A	141	79
	64.1%	35.9%
GROUP B	120	100
	54.5%	45.5%

TABLE # 6 DISTRIBUTION OF GRANULATION TISSUES No: 440

	GRANULATION TISSUES	
	YES	NO
GROUP A	101	119
	45.9%	54.1
GROUP B	92	128
	41.8%	58.2%

TABLE # 7 COMPARISON FOR DURATION OF HEALING BETWEEN GROUPS NO:440

GROUP	DURATION OF HEALING		P-VALUE
	MEAN	±SD	
GROUP A	05.3	3.505	0.0001
GROUP B	13.68	07.643	

TABLE # 8 STRATIFICATION OF AGE GROUP WITH DURATION OF HEALING BETWEEN GROUPS No: 440

GROUP AGE In years		DURATION OF HEALING		P-VALUE
		MEAN	±SD	
18 – 40	Group A (n=99)	05.19	3.337	0.0001
	Group B (n=91)	14.23	07.186	
>40	Group A (n=121)	05.41	3.648	0.0001
	Group B (n=129)	13.30	07.526	

Applied Independent t- test

TABLE # 9 STRATIFICATION OF GENDER WITH DURATION OF HEALING BETWEEN GROUPS No: 440

GROUP AGE In years		DURATION OF HEALING		P-VALUE
		MEAN	±SD	
MALE	Group A (No:146)	05.37	03.604	0.0001
	Group B (No: 166)	13.73	07.631	
FEMALE	Group A (No: 121)	05.18	03.321	0.0001
	Group B (No: 129)	13.53	07.750	

TABLE # 10 STRATIFICATION OF RESIDENTIAL STATUS WITH DURATION OF HEALING BETWEEN GROUPS No: 440

RESIDENTIAL STATUS		DURATION OF HEALING		P-VALUE
		MEAN	±SD	
URBAN	Group A (No:141)	05.30	03.604	0.0001
	Group B (No: 120)	13.56	07.390	
RURAL	Group A (No: 79)	05.32	03.583	0.0001
	Group B (No: 100)	13.83	07.972	

DISCUSSION

Angiogenesis will have formed during wound healing phase of proliferative. Through new angiogenesis need oxygen supply to the wound, it is very good time for the healing phase. This phase is regulated by strong signals from extracellular environment.¹⁷ In other study shows the honey and its effect of immune system mediators. Honey can stimulate B & T lymphocytes due to this neutrophil phagocytosis will activate in cell culture.^{9, 18} secondly, honey help in production of antibody during two phases of immune responses primary and secondary.¹⁹ In addition to that honey effects on formed

tissue its good step new wound healing tissue formation.²⁰ The acidifying media of wound in the favors the macrophages, reduce bacterial growth, and decrease the production of ammonia to damage tissues.^{21, 22} The scientific research shows that honey may provide more advantage as compare with antibiotics now used in the wound healing. this natural product more effective and completely free from adverse effects. With Chronic wounds developed in general population are about to 1–2% of the world's. They effect a major impact on terms of healing wound add to the cost in terms of life quality the patient and financial cost for hospitals.²³ decrease

blood supply cause in low oxygen supply to tissues, which can lead to cell death and necrosis in wound. Due to that conditions for pathogenic organisms leading to the development of bacteria in the host tissue.^{24,25} Open wounds are colonized with *P. aeruginosa* very difficult manage and even more if they are hospital acquired. The treatment is difficult even with the best available newer antibiotics. Treatment should be managed according blood and pus culture sensitivity. *Pseudomonas aeruginosa* is a hospital acquired classic organism with more resistance to many antibiotics and disinfectants. In our study, the mean age in group A (1% acetic acid) was 41.10 ± 12.95 and group B (normal saline) was 43.65 ± 13.62 years. Another study found age as 41.2 ± 13.5 and 42.4 ± 17 years in 1% acetic acid and normal saline groups, respectively.¹ In our study, the mean duration of healing was noted as 5.31 ± 3.50 and 13.68 ± 7.64 in group A (1% acetic acid) and group B (normal saline) while having a highly significant P-value i.e. (0.0001). The study by Madhusudhan VL, et al reported mean healing time in 1% acetic acid group versus normal saline group (3 ± 11 v/s 8 ± 17), respectively with P value

CONCLUSION

It is to be concluded that the healing time of infected wounds in 1% acetic acid is significantly less as compared to normal saline. More well-controlled prospective randomized trials needed with bigger size with more number of patients in multiple study centers in Pakistan are required to compare the findings of the present study.

ETHICS APPROVAL: The ERC gave ethical review approval.

CONSENT TO PARTICIPATE: written and verbal consent was taken from subjects and next of kin.

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AUTHORS' CONTRIBUTIONS:

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated in the work to take public responsibility of this manuscript. All authors read and approved the final manuscript.

CONFLICT OF INTEREST: No competing interest declared

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