



“A COMPARATIVE STUDY BETWEEN HONEY DRESSING AND CONVENTIONAL DRESSING FOR DIABETIC FOOT ULCERS”

General Surgery

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ABSTRACT

Objective:- to compare the effect of honey dressing on wound healing vs conventional dressing for diabetic foot ulcers and to find a cost effective method of management of diabetic foot **Materials & Methods:** The study was conducted over a period of 1 year at A J Institute of Medical Sciences. 40 patients were included in the study and divided into two groups of 20 each. Group A received honey dressing and group B received conventional dressing. In each group, the surface area of the wound was measured on day 0, 7, 14, 28 and the data was statistically analyzed using Chi square / Fisher's exact test p. **Results:** At the end of the study, it was found that the patients who were in group A (honey dressing) wound healed faster. A total of 40 patients were included in the study, out of which 1 was lost to follow up. A total of 39 (n=39) eligible patients were studied, honey dressing included 19 patients and conventional dressing included 20 patients. After 28 days, healing was seen in 14(73.7%) patients in honey dressing group and 8 (40%) patients in conventional dressing group (p value < 0.05). Complete healing was seen in 6 patients in honey and 2 patients in conventional dressing group. **Conclusion:** the result showed honey dressing to be more effective and more affordable when compared to conventional dressing

KEYWORDS

Diabetic foot ulcer, honey dressing, conventional dressing, wound healing,

INTRODUCTION

Diabetes Mellitus has been gradually rising in India with an estimated 77 million affected populations which is expected to rise to 134 million by 2045¹. DM is the 9th leading cause of death with an estimated 1.6 million deaths attributed to it². In addition, macrovascular complications like cardiovascular disease and microvascular complications like retinopathy, neuropathy and nephropathy increase the morbidity and mortality due to DM. Foot problems due to DM are one of the recognised and serious problems in DM. The overall prevalence of diabetic foot syndrome among diabetics varies between 8.5% - 52%³⁻⁴ with pandemic up rise of cases¹².

Studies have shown significant association of DFS with duration of DM, advancing age, high blood pressure, low socio-economic status, low literacy, unemployment, smokeless tobacco use and sedentary lifestyle³⁻⁵.

Honey has many purposes in medicine. It was considered to be the oldest wound dressing as it dates back to ancient medical writings of Greece, Egypt and parts of India even before the discovery of bacteria⁶. Its healing ability on skin wounds has been documented on pressure ulcers, trauma wounds, skin grafts, necrotizing fasciitis, pilonidal sinuses, burns, lacerations, atopic dermatitis, surgical wounds, herpetic lesions, rheumatoid ulcers and animal bites.

Due to the emergence of antibiotics the usage of honey has reduced significantly in recent years but due to the emerging trend of antibiotic resistance of bacteria the antimicrobial action of honey is being investigated once again.

Honey is a supersaturated compound made up of approximately 17% water and 80% sugars (about 38.2% fructose, 31.3% glucose and about 7.35% of maltose and 1.3% of sucrose, rest 30% made up of isomaltose). The low pH of honey comes from the formic, butanoic and organic acetic acid pyroglutamic, lactic malic, succinic, and gluconic acid. Several studies have shown it to inhibit over 60 species of bacteria including gram positive, anaerobes and gram-negative bacteria, and even some yeast species of *Penicillium* and *Aspergillus*⁷.

The super-saturated solution of honey which contains only 17% water inhibits bacterial growth mainly due to this high osmolarity. Water is essential for the survival of bacteria but with slow availability the microorganisms cannot survive and reproduce

Dunford and Hanano studied the effect of honey dressing in patients with chronic wounds, and amongst the 40 patients enrolled in their study use of honey led to reduction of pain in 20 (50%) patients, 20 out of 21 patients had reduction in odour⁸. Due to natural glucose oxidase enzyme introduced in to the honey by the bee which when comes in

contact with moisture of the body releases sufficient amount of hydrogen peroxide in wound against bacterial growth which helps in wound healing^{8,9}.

The purpose of this single center randomized control study was to compare the efficacy of Honey Dressing vs Conventional Dressing in management of Diabetic foot ulcers

METHODS:-

- Study Design: Hospital based Comparative prospective Observational study.
- Ethical committee: A.J. Institute of Medical Sciences and Research Centre, Mangalore.
- Period of study: November 2020 to November 2021 (12 months)
- Place of study: A. J. Institute of Medical Science and research Centre, Mangalore
- Sampling Technique: Purposive sampling technique was adopted to allocate individuals to the group who meet the inclusion criteria for the study

Diabetic patients of age 18 or above were included in the study after attaining their informed consent. Patients of type 1 or type 2 Diabetes mellitus of both sexes who has ulcers on the lower extremities and compliant with medication were included in the study,

Patient previously operated for diabetic foot, ulcers of WAGNER grade 5, Patients suffering from a condition that interfered with wound healing e.g., carcinoma, connective tissue disease, vasculitis, immuno suppressive agents, malnutrition, osteomyelitis, radiation therapy, an immune system disorder, treatment with corticosteroids, chemotherapy were excluded. Patient who refused consent or not willing for dressing were excluded from this study

METHODOLOGY

Patients were divided into 2 groups of 25 each, Group A included patients who underwent honey dressing while Group B included patients who underwent conventional dressing.

The mean area of the ulcer was calculated by imprinting the area on the ulcer on a sterile transparent plastic sheet and it was marked on a graph paper to calculate the area and the longest and widest dimensions were measured. Pus swab was taken on the first day and sent for culture and sensitivity. Broad spectrum antibiotic i.e Amoxicillin and clavulanic acid was started initially and switched out to other antibiotics as per the sensitivity report. Patient also underwent ophthalmic examination to check for diabetic retinopathy.

Patient in both the group underwent surgical toileting of the wound. Daily dressing of the wound was done with Betadine and normal saline

and in group A patient sterile honey was applied and covered with sterile gauze. The ulcer area was measured on Day 0, 7, 14, 28 or till complete healing of wound whichever is earlier. The measurements from both the group were then compared too see efficacy of both types

Statistical Analysis

Data was collected in Microsoft excel worksheet 2019. The collected data was analyzed by SPSS (version 23) to find descriptive statistics, mean $\pm$ standard deviation, frequency, percentage. Chi square test to test the difference in rate (percentage) between the two modalities

RESULTS

A total of 40 patients were included in the study out of which one patient was lost to followup. Therefore a total of 39 (n = 39) patients were studied and 19 were allocated into the honey dressing group and 20 were allotted to Conventional dressing group. Of the total allotted patients 14 (35.89%) were males and 25 (64.1%) were females.

Culture & sensitivity of the pus swab taken from these patients at the time of admission showed a variety of bacterial growth, with *Pseudomonas*, *Enterococci* & *Staph aureus* being the most commonly isolated species. The other species were *Proteus*, *Klebsiella*, *E coli*, *Citrobacter*, *Acenitobacter* & *MRSA* as other species in the descending order of their growth. 12 (24%) patients of the 50 had a polybacterial growth pattern. Majority of the patients belonged to WAGNER grade 2 i.e 21 patients (53.84%) followed by WAGNER grade 3 i.e 14 patients (35.89%). Majority of the patients were on insulin i.e 32 patients (82.05%) while 7 (17.94%) were on oral hypoglycemic agents. In the total sample the mean age of patients in group A is 55.72 with standard deviation of 11.845 and in group B, the mean age was 52.68 with standard deviation of 8.793.

Fig 1 Wagener's Classification Frequency Distribution

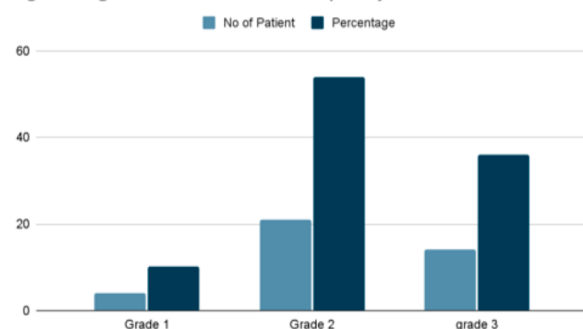


Fig 1, Wagener's Classification : Frequency distribution

After 28 days, healing was seen in 14 (73.7%) patients in the honey dressing group and 8 (40%) patients in the conventional dressing group. With a p value of 0.033 Complete healing was seen in 5 patients in honey and 2 patients in conventional dressing group

Table 1: Socio-Demography of patient

Variable	Frequency	Percentage
Gender		
Male	14	35.89
Female	25	64.1
X Ray Findings		
Osteomyelitis	34	87.17
No osteomyelitis	5	12.82
Wagener's Grading		
Grade 1	4	10.25
Grade 2	21	53.84
Grade 3	14	35.89
Mode of control of Blood sugars		
Insulin	32	82.05
Oral Hypoglycemic Agents	7	17.94

Table 2 Healing Response of Honey Vs conventional Dressing

Dressing Type	healing/healed	Non Healing /amputated	Total	X2	P value
Honey	14(73.7)	5(26.3)	19	4.496	0.033
Conventional	8(40)	12(60)	20		
Total	22	17	39		

P value <0.05 Statistically Significant

DISCUSSION

At the end of the study it is found that patient who were in the Honey dressing group (Group A) healed faster. It was also found that in 14 (73.7%) patients from the honey dressing group the wound was healed or showed features of healing at the end of study compared to only 8 (40%) in conventional dressing while complete healing was noted in 6 patients in honey dressing group and 2 in conventional dressing.

Topical NS application and use have been shown to reduce the need for antimicrobial medication in diabetic ulcer patients. However, the usage of iodine preparations has been criticized because povidone iodine, unless very weak, is cytotoxic to the majority of cell types and plays a role in the healing process. As a result, discovering novel topical alternatives that are economical and furthermore efficient in controlling infection in the management of diabetic foot ulcers has become a key concern in modern times.

In 50 century AD, honey was described as being "good for all rotten and hollow ulcers" by Dioscorides. Although honey has been used in wound dressing since thousand of years it has gained popularity in recent years due to its antimicrobial property. Honey being acidic with pH of around 3.2-4.5, inhibit the activity of protease, hence reducing the destruction of the matrix needed for tissue repair^[10]. Additionally, an acidic environment increase the release of oxygen from hemoglobin, thus positively affecting the wound healing process. Other studies have indicated that an alkaline environment was beneficial to the growth of microbes, so the acidity of honey may inhibit the reproduction of microbes.

During honey dressing honey becomes dilute as the high solute concentration creates an osmotic effect drawing lymph and other fluids out from the wound. Due to an enzymatic effect from the generation of hydrogen peroxide by glucose oxidase, honey's antibacterial activity does not reduce as osmolarity reduces. Honey contains glucose oxidase, which breaks down glucose into gluconic acid and hydrogen peroxide. A bactericidal substance called hydrogen peroxide lowers the amount of microorganisms on the wound bed. Although hydrogen peroxide is slowly and persistently produced, it has no deleterious effects on the surrounding tissue^[11], serving as a continual antimicrobial. The phytochemicals in nectar are the second cause of honey's antibacterial effects.

Honey's antibacterial properties are primarily brought on by its osmolality (high sugar content), acidic pH, and hydrogen peroxide level. These antimicrobial effects of honey also are due to the presence of methyl syringate and methylglyoxal, as per previous research. Hence, non-peroxide components such methylglyoxal, bee defensin-1, polyphenols, and phenolic acids may explain the variance in the effectiveness of honey's antibacterial effect^[12,13,14]

CONCLUSION

Honey dressing as compared to conventional dressing is very effective in wound healing with rapid slough and microbial clearance. The making, storage and application are simple with cost effectiveness and gratifying results. With the increasing prevalence of antibiotic resistance, the duration of hospital stay and the expenditure for wound care has been continuously increasing. This calls for a more economical and effective mode of wound management.

In this study it was noted that Honey dressing gave better results in reducing ulcer size when compared to conventional dressings, furthermore considering the reduced duration of hospital stay and easy and affordable available of honey is a cost-effective alternative to conventional dressing

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REFERENCES

- Pradeepa R, Mohan V. Epidemiology of type 2 diabetes in India. *Indian J Ophthalmol*. 2021;69(11):2932-2938. doi:10.4103/ijo.1627_21
- World Health Organization. *The top 10 causes of death*. [Last accessed on 2021 Jun 04]. Available from: <http://www.who.int/en/news-room/fact-sheets/detail/the-top-10-causes-of-death>
- Vibha SP, Kulkarni MM, Kirthinath Ballala, AB, et al. Community based study to assess

- the prevalence of diabetic foot syndrome and associated risk factors among people with diabetes mellitus. *BMC Endocr Disord* 18, 43 (2018). <https://doi.org/10.1186/s12902-018-0270-2>
4. Ferguson TS, Tulloch-Reid MK, Younger NO, et al. Diabetic foot complications among patients attending a specialist diabetes clinic in Jamaica: prevalence and associated factors. *West Indian Med J*. 2013;62(3):216-223.
 5. Piaggese A, Apelqvist J (eds): The Diabetic Foot Syndrome. Front Diabetes. Basel, Karger, 2018, vol 26, pp 1-18
 6. Svedsen. P.A., Lauritzen. T: "Sjoegaard, V. Neru P.J". *Diabtologia*: 1987;23:403.
 7. Suhaimi A, Hairi F, Ahmad T.S, Yusof K.M, The Efficacy Of Honey Dressing In Wound Management: A Clinical Observation; *Malaysian Journal of Public Health Medicine* 2003;Vol. 3(Supl): 39-40.
 8. Dunford C, Hanano R. Acceptability of Honey dressing for non healing Venous leg ulcers. *J Wound Care* 2004; 13 (5):193-7.
 9. Chirife J, Scarmato GA, Herszage L. Scientific basis for use of granulated sugar in treatment of infected Wounds. *Lancet* 1982; 1:560-561
 10. Bittmann S, Luchter E, Thiel M, Kameda G, Hanano R, Langler A. Does honey have a role in paediatric wound management? *Br J Nurs* 2010; 19: S19-S20, S22, S24
 11. Effectiveness of honey on wound repair [on line]. [cited on october5]; Available from: URL:http://www.ispub.com/journal/the_internet_journal_of_surgery/volume_23_number_2/article/effect-sof-honey-in-wound-repair-in-patients-who-underwent-laparotomy.html
 12. Kateel R, Adhikari P, Augustine AJ, Ullal S. Topical honey for the treatment of diabetic foot ulcer: A systematic review. *Complement Ther Clin Pract* 2016; 24: 130-3.
 13. Irish J, Blair S, Carter DA. The antibacterial activity of honey derived from Australian flora. *PLoS One*, 2011; 6, e18229
 14. Jaganathan SK, Mandal M. Antiproliferative effects of honey and of its polyphenols: a review. *J Biomed Biotechnol*, 2009; 830616