



## Honey: Nature's Wonder of Healing

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### Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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## ABSTRACT

**Aim:** Aim of this present study is to quantify, evaluate and assess the therapeutic benefits of honey on the treatment of recurrent aphthous ulcer.

**Materials and Methods:** Sixty patients with minor oral ulcers were attended by Dept. of Oral Medicine and Radiology for treatment for oral ulcers. A double blinded clinical trial was carried out by topical application of honey or placebo therapy and the reduction in size and duration of complete elimination of ulcerations were noted.

**Results:** The ulcers had reduced in size considerably after 3 days of treatment by honey dressings, some with complete remission after another 3 days.

**Keywords:** Honey; Recurrent aphthous stomatitis (RAS); ulceration; erythema.

## 1. INTRODUCTION

Natural products have been used for several years and for several purposes, honey being one of them. "Honey" which is a nectar collected from many plants and processed by honey bees, is used by human beings as a source of energy and nutrition. It seems to dispense considerable benefits in wound care (chronic and infected), burns dressings, ulcers and for various systemic diseases. Utility of topical application of honey includes antifungal, anti inflammatory and antibacterial properties [1,2]. It causes faster elimination of bacterial infection, accelerates wound healing and stimulates tissue regeneration, hence restricting the use of antibiotics. Honey's acidity, osmolarity and antioxidant peculiarity have significant role in eradicating microbial infection while due to its high viscosity, a moist wound condition is maintained accomplishing its healing properties [1].

Oral mucosal wounds/mouth ulcers are sores or open lesions in the mouth which are caused by various disorders. Among them, recurrent aphthous ulceration or recurrent aphthous stomatitis is the most prevailing oral mucosal disease. It is signalized by periodic appearance of a painful small round or oval crater form ulceration on the mucosa of cheeks, lips, vestibule, soft palate, tongue, floor of mouth and pharynx. These ulcers have bright red circulatory inflammatory zone around the ulceration with a pseudo membrane that ranges from gray to yellow in color. These ulcers are painful and hinder mastication. Both sexes are almost equally affected with a slight higher prevalence in females. Regardless of much clinical & research attention, the clarity of etiology of RAS remains poorly understood and resulted in treatment that are largely multifactorial [1,2].

Nowadays, there is a rapidly increasing interest and research into natural health remedies and supplements with proliferations of publications now being offered on the diversity of its therapeutic properties. Henceforth, the aim of present study was to assess and evaluate the prophylactic use of honey as a natural wound healer.

## 2. METHODOLOGY

A total of 60 patients within a period of 6months with minor oral ulcers (2-6 mm) were enrolled in

this study. The diagnosis was based on history, clinical features & exclusion of other similarly appearing diseases. Demographic parameters included age, gender, size of ulcer and erythema. Informed consent was obtained from all patients after thorough explanation of the efficacy of drug in the treatment of ulcers and they were instructed to spread a thin layer of medicament which was provided to them by our dept, using sterile cotton, three times daily, as a sole remedy without using any other medications. The diagnostician and the patients were blinded for the drug trial to avoid any biased results. No food, drinks, smoking, gum chewing was permitted for 30 mins after application.

Two groups of patients were examined: (Tables 1, 2, Graph 1).

**Group 1:** 30 patients (13 male, 17 females) were treated by honey application on their ulcers three times a day for three consecutive days.

**Group 2:** 30 patients (12 males, 18 females) were treated by a placebo formula three times a day for three consecutive days.

Both groups of patients were called for follow up re-examination after treatment of three days to check the response of honey and placebo therapy. The size of ulceration, character of lesions, erythema were evaluated using sterile divider and scale by a single examiner.

## 3. RESULTS

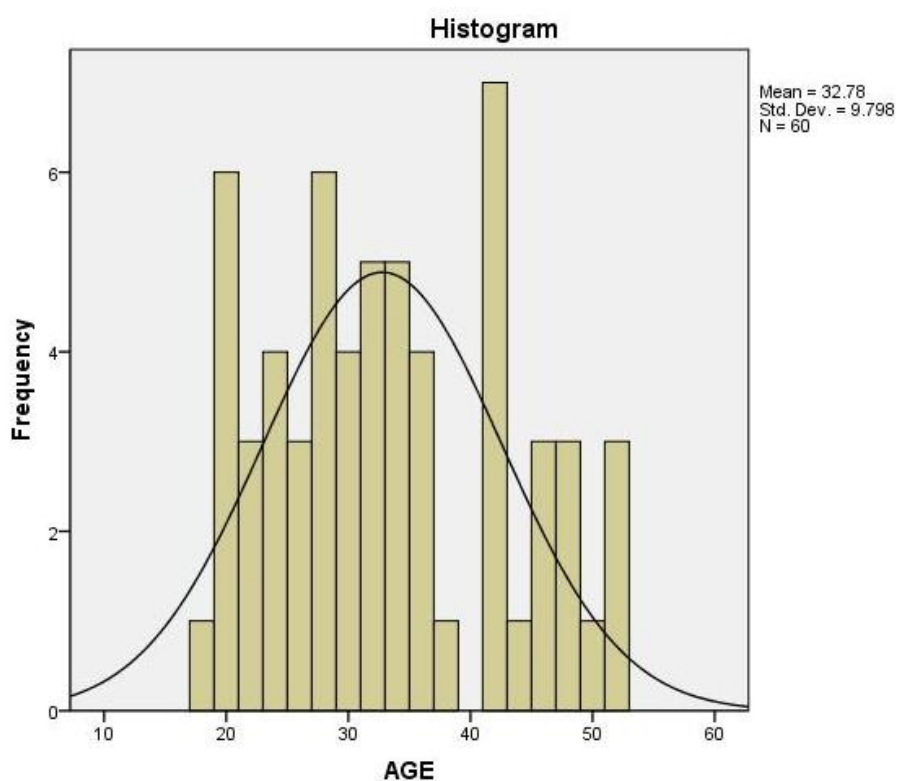
No systemic adverse reactions were noted in any case. Reduction in pain (through VAS scale) and erythema were scored as "Reduced", "Completely Healed" and "No Change". In this study, patients under group 1 showed marked reduction in size of ulcer, reduced pain as well as erythema within 3days of time interval whereas group 2 patients had reduced symptoms within 7-10 days of time interval with some of them representing no change at all. The difference in the effect of honey and placebo therapy on the healing time was significant (Table 3, Graph 2, Figs. 1, 2). T test was done for comparison of pain scores between two groups and  $p$ -value for honey treated group compared to placebo group was significant in ulcer size, pain and erythema.

**Table 1. Genderwise division of subjects in two groups**

Group			Frequency	Percent	Valid percent	Cumulative percent
Honey	Valid	Male	13	43.3	43.3	43.3
		Female	17	56.7	56.7	100.0
		Total	30	100.0	100.0	
Placebo	Valid	Male	12	40.0	40.0	40.0
		Female	18	60.0	60.0	100.0
		Total	30	100.0	100.0	

**Table 2. Mean age of subjects**

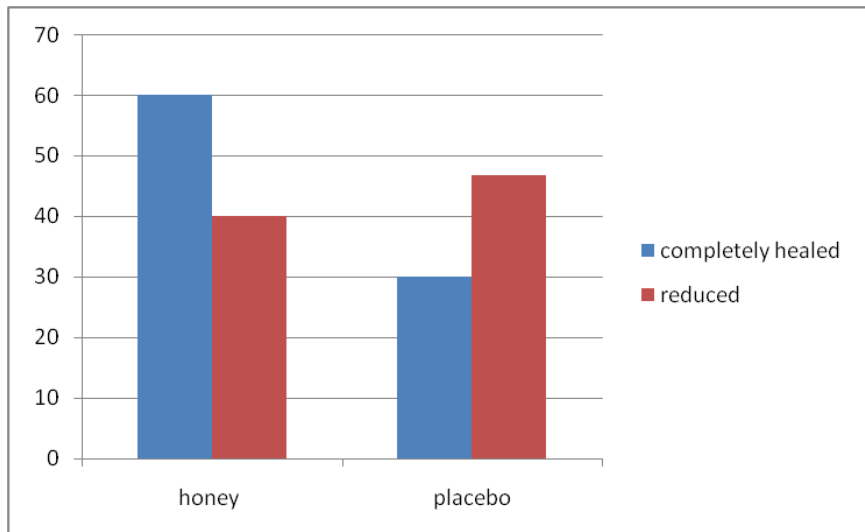
N	Valid	60
	Missing	0
Mean		32.78
Std. deviation		9.798



**Graph 1. Mean age of subjects**

**Table 3. Patient response in two groups**

Group			Frequency	Percent	Valid percent	Cumulative percent
Honey	Valid	Completely healed	18	60.0	60.0	60.0
		Reduced	12	40.0	40.0	100.0
		Total	30	100.0	100.0	
Placebo	Valid	Completely healed	7	23.3	23.3	23.3
		No change	9	30.0	30.0	53.3
		Reduced	14	46.7	46.7	100.0
		Total	30	100.0	100.0	



**Graph 2. Patient response in two groups**



**Fig. 1. Unhealed ulcer**



**Fig. 2. Reduced erythema**

#### 4. DISCUSSION

Honey is a super saturated nectar collected by bees from a wide variety of plants [1]. Honey is an ancient remedy for the treatment of infected wounds, which has recently been 'rediscovered' by the medical professionals, particularly where conventional modern therapeutic agents fail. The

first written reference to honey, Sumerian tablet writing, dating back to 2100-2000 BC mentions honey use as a drug and an ointment. The immuno-modulatory property of honey is relevant to wound repair too. In addition, honey is hygroscopic, which means that it can draw moisture out of the environment and dehydrate bacteria, and its high sugar content and low level pH also prevent the microbes from growing [2].

The natural anti-oxidants and flavonoids exhibit a wide range of biological effects including antibacterial, anti-inflammatory, anti-allergic, anti-thrombotic and vasodilatory action [3]. The properties of moisture retention, antimicrobial and angio-genetic activity, and granulation tissue formation and epithelialisation have also been confirmed by in-vitro and animal studies [4-6]. Honey also contains other bioactive constituents such as organic acids, ascorbic acid, trace elements, vitamins, amino acids, proteins and a total of approximately 200 components [7].

Honey is easy to apply, painless and comfortable, harmless to tissues, creates a moist healing environment, is antibacterial and stimulates healing and epithelialisation. Its antibacterial activity is due to the high osmolarity created by its sugar content, some is due to hydrogen peroxide released by exudate, and some is due to photochemical that come from the nectar of plants [8]. Hydrogen peroxide is the major contributor to the antimicrobial activity of honey, and the different concentrations of this compound in different honeys result in their varying antimicrobial effects [9]. In addition, its physical properties provide ideal moist conditions

for healing and a stimulating effect on the growth of wound repair tissues. Unlike other antiseptics, honey has no harmful effects on tissues because slow enzymatic production of hydrogen peroxide is one thousandth hydrogen peroxide 3% [10].

Though honey has a valued place in traditional medicine for centuries and its therapeutic potential of uncontaminated, pure honey is grossly underutilized. It is widely available and although the mechanism of action of several of its properties remains obscure, the time has now come for conventional medicine to lift the blinds off this traditional remedy and give it its due recognition, as we did in our study [11].

Recurrent aphthous stomatitis (RAS) is the most common form of recurrent oral ulceration, reportedly affecting up to 20% of the population. A more typical pattern of recurrent oral ulceration will be characterized by periods of ulceration with remissions between bouts of ulceration. The diagnosis and management of the patient with recurrent aphthous stomatitis requires a systematic approach based on the adequate history, clinical examination, investigations as appropriate, institution of management and, finally, review to allow for any necessary modifications of that management. So a thorough history, clinical evaluation and investigations were carried out in this study prior to implementing treatment [12].

It is a chronic inflammatory, ulcerative condition of the oral mucosa and the higher incidence of RAS in people with a higher socio-economic status is observed. Due to unclear etiopathogenesis of the disease, the treatment is mainly symptomatic, not very effective and does not prevent their recurrences [13]. Since the etiology and pathogenesis of RAS remain unclear, there is currently no consensus regarding a definitive curative therapy. The commonly accepted treatment strategy is to lessen the pain and duration of lesions [14]. Topical corticosteroids, antibiotics, and analgesics are highly recommended for patients with RAS [15]. However, longer treatment and frequent exposure to these medications may cause fungal infection and drug resistance, which may further lead to more severe adverse effects or even life-threatening complications [16].

The plethora of treatment used for the treatment of oral ulcerations is testament to the lack of any single effective treatment [12]. So here honey is

tried as a topical medication for its natural and beneficial properties [17].

Natural herbal medications are on the rise for its negligible side effects as Ghalayani et al. [18] reported a significant difference in the mean healing time between  $8.6 \pm 0.99$  days of placebo treatment and  $5.3 \pm 0.81$  days of treatment with *Punica granatum* extract ( $P > 0.001$ ). In yet another study, it was found that Tian-zhu aerosol oral rinse remarkably reduced the duration of the ulcer compared with chlorhexidine rinse ( $P > 0.05$ ) [19].

In a double blinded randomized clinical trial of a total of 75 eligible adult participants conducted in 2011, it was suggested that Oral mucositis can be successfully treated by a combination of honey and coffee as an alternative medicine, though the impact may be due to the synergistic effect of these two substances. This study is in collaboration with our study suggesting honey as a novel topical drug and an antioxidant [20].

In a meta-analysis done, it was showed that all the studies reported a statistically significant reduction of the ulcer size, shortening ulcer duration and remission of pain using visual analog scale without severe complications in patients receiving herbal medicine therapy compared with the controls. In the study, the author focused on the efficacy and safety of the topical application of natural herbal medicines for the treatment of RAS. A total of 1,515 subjects in 13 clinical trials were analyzed in the present meta-analysis. Thus, there is some evidence to suggest that topical herbal medicine therapy is an effective and safe alternative option to current Western medicine-based treatments for RAS [21].

In patients with constant and aggressive outbreaks (major aphthae), pain is intense and topical treatment is unable to afford symptoms relief. Systemic therapy is indicated in such situations, in the form of corticosteroids (prednisone) or thalidomide, among other drugs, but its severe adverse reactions are well documented. In view of the above facts, natural topical products like honey which is readily available, can be promoted with almost no side effects [22]. The glycosylated proteins present in honey can induce TNF- $\alpha$  secretion by macrophages, and this cytokine is known to induce the mechanism of wound repairing. Furthermore, the ability of honey to reduce 'reactive intermediates' release may well limit the

tissue damage by activated macrophages during wound healing of ulcers. Thus, the immunomodulatory property of honey is relevant to wound repair and healing of ulcer [23]. In a case control study conducted on 56 patients in Iran, Salivary malondialdehyde MDA level was significantly higher ( $p < 0.001$ ) and total antioxidant capacity (TAC) level was significantly lower ( $p < 0.042$ ) in RAS as compared with the control group indicating the alteration of oxidant/antioxidant status in recurrent aphthous stomatitis. It seems that the increase of oxidative stress may lead to imbalance of oxidant / antioxidant status which is crucial in inflammatory mechanism of RAS. Since honey is known to have antioxidant property, it appears useful in cases of recurrent aphthous stomatitis, so was used in the present study [24]. Honey is also used in radiation induced mucositis which is more severe and grave compared to recurrent aphthous stomatitis, and has proved to be successful in reducing the size of ulcerative areas by its use for a two-week period. The research subjects who were studied by use of the honey as a mouthwash felt calm during the research and expressed that using honey had led to the relief of pain and had soothing effect on the ulcerative sites in the oral cavity [25]. Thus honey is a safe, satisfying and effective healing agent and also in its natural form, it is extremely cost-effective.

## 5. CONCLUSION

Herbal medications such as honey are not only natural, safe, soothing but cost effective too and the most ancient of wound treatments, it is taking its place in modern age wound care. Successful use of honey as a topical medication for decreasing healing time and pain remission in recurrent aphthous stomatitis was proven in our study. However, only a weak conclusion can be drawn due to several limitations and further studies are warranted to prove its efficacy for therapeutic benefit on a boarder scale.

## CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

## ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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