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Research Article

**MEDICAL STUDENTS' PERCEPTION ON HONEY HEALING  
EFFECTS ON BURN IN TABUK REGION, SAUDI ARABIA,  
CROSS SECTIONAL STUDY****Mansuor Ahmed Alanazi<sup>1</sup>, Rawan Mansor G Alanezi<sup>2</sup>, Faris Faez R Alanazi<sup>3</sup>,  
Faisal Musaad I Alhoshan<sup>4</sup>, Fatimah Abdullah alghabban<sup>5</sup>**<sup>1</sup>Assistant Professor of Family Medicine at Tabuk University<sup>2</sup>General Practitioner at King khalid hospital.<sup>3</sup>Medical Intern at Tabuk University.<sup>4</sup>General Practitioner at Prince Sultan Hospital.<sup>5</sup>Medicine Resident at Security Forces Hospital.**Article Received:** October 2021**Accepted:** October 2021**Published:** November 2021**Abstract:**

*The antiseptic and antimicrobial properties of honey were chemically demonstrated, and many studies have investigated the effect of honey on wound and burn recovery. This study aims to evaluate the perception of the biological role of honey in wound healing and its medicinal properties among the medical students. **Materials and methods** This is a cross-sectional study that was conducted among medical students and interns of Tabuk University, KSA. Pre-designed questionnaire was sent to social media groups of all study years among Tabuk University medical student, including interns. Only complete forms were included regardless of gender, age and study level. Data were imported into an Excel spreadsheet and analysed using the Statistical Package for the Social Sciences (SPSS) version 23. The Chi-square test was used to test distribution of categorical variables. **Results** The study included 268 medical students with age range (17-28) years and mean±SD of (22.6±1.6). The results found that (36%) of the participants are knowledgeable about the ability of honey to improve and accelerate wound healing, only (25.4%) know that honey is more effective than SSD in infection-free burns, over half of them (55.6%) know about its anti-inflammatory effect and (36.9%) are educated about the antibacterial role of honey. The estimates also showed a significant correlation between knowing the biological role of honey and the students' age and study level with ( $P < 0.1$ ). **Conclusion** Honey is effective in healing wounds with antibacterial and anti-inflammatory actions and enhance the wound dressing in comparison to SSD. This study demonstrated that the medical students should be educated about the medical progress in the medicinal properties of honey.*

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**INTRODUCTION:**

Honey is a viscous and carbohydrate-rich syrup, assembled and prepared by honeybee, *Apis mellifera* and extracted from floral and other plants nectars and secretions [1]. It is one of the most persisting substances that is usually used in wound dressing, mainly due to its antibacterial, anti-inflammatory, and antioxidant characteristics [2].

The medical use of honey is historical since the ancient Egyptians, the ancient Greeks and Hippocrates, and the ancient Chinese in folk medicine and it is so far known as the oldest wound-healing material used by man [3,1]. A study in 2011 accounted that honey is used for burn wounds since early 1933 which is documented in modern-day scientific journals [4]. Also reports in 1988 supported that topically applied honey is able to sterilize infected injuries within a week of the application, expeditiously heal wounds and enhance epithelialization [5].

Burn injuries are of high risk of infection as the skin loses its protective function as a barrier against micro-organisms. Thus, patients with burns confront high rates of morbidity than mortality due to the large exposed burn surface which in turn is more liable to get infected, takes long periods of healing and causes physical distortion and contractures [6]. Moreover, Burns are a global and critical health problem. Worldwide, more than 300,000 people die from fires alone annually, and over 30,000 people suffer from new burns every day. More people lose their lives because of burns by hot liquids, electricity, and chemicals. Severe burns also make millions of people disabled and disfigured. Burns survivors suffer from stigma and discrimination due to the disfigurement as well as the complication resulted from the physical impact. Over 95% of these burns take place in low- and middle-income countries with mortality rates of (4.5 deaths/100 000 per year), which is higher than the mortality rates in high income countries (1.0 death/100 000 per year). This implies that people with low social economic conditions are at higher risk to be affected by burns [7].

Applying natural substances to promote wound healing is frequently used throughout the world. In a randomized clinical and histological study reported from India in 1998, 100% reparation and epithelialization was conducted with applying honey to burns within the first 21 day in comparison with 84 with silver sulfadiazine (SSD) [8]. SSD has antimicrobial effect which justifies its use in burn wounds till now. The silver ion attaches to the DNA of the micro-organism and releases sulphonamide [9].

Many side effects can result from the topical applying of SSD particularly in the treatment of large injuries such as; hepatic or renal toxicity and leukopenia [10].

Recently, the antiseptic and antimicrobial properties of honey were chemically demonstrated. Honey provides a moist repairing condition that intercepts bacterial growth even when burns are excessively infected. Due to the antimicrobial nature of honey, we can sterile wounds with avoiding the adverse effects of antibiotics and it is also functional against antibiotic-resistant bacterial strains [11]. Its antiseptic characteristics and its viscosity both act as a barrier against cross-infection of burns. It also supplies the leucocytes with glucose which is indispensable for the “respiratory burst” that provides hydrogen peroxide, the ascendant element in the antibacterial activity of macrophages. The antibacterial action of macrophages is also enhanced by the acidic nature of honey as an acidic pH within the vacuole can be lethal to ingested bacteria [12]. Additionally, the high osmolarity of honey assists the outflow of lymph to supply the regenerating tissue with nourishment which in turn supports the healing process [13].

**Objectives:**

This study aims to assess the perception of medical students and interns of Tabuk University on the effect of honey on burns.

**I. Methodology and subjects****II.I. Study design**

Descriptive cross-sectional study.

**II.II. Study area**

Tabuk City

**II.III. Setting and data collection**

We performed this quantitative survey analysis on medical students of Tabuk University. A pre-formed self-administered questionnaire was sent online to participants by the principal investigators.

**II.IV. Sample**

Questionnaire was sent to social media groups of all study years among Tabuk University medical student, including interns. Only complete forms were included regardless of gender, age and study level. A total of 268 forms were filled completely have been included.

**II.V. Inclusion Criteria**

- 1- Medical students of Tabuk University
- 2- All study levels and interns are to be included
- 3- Both genders.

**II.VI. Exclusion Criteria**

- 1- Non cooperative students.
- 2- Incomplete forms.

**II.VII. Study tool:**

Pre-designed self-administered questionnaire that requires information about: (gender, age, study level, clinical experience, as well as questions assessing the perception of the participant to the main effects of honey on burn healing). It was designed to assess perception of medical students and interns towards honey healing effects on burns.

**II.VIII. Statistical analysis:**

This quantitative survey analysis was conducted among included responses. The filled up form was imported into an Excel spreadsheet and analysed using the Statistical Package for the Social Sciences (SPSS) version 23. The chi square test was used to test distribution of categorical variables. Statistical significance was accepted at P value < 0.05.

**II.IX. Safety and ethical considerations:**

The adverse impact of this questionnaire survey was recorded and followed up, if any. Participation was completely voluntary. The questionnaire has information about the study, explaining the aim of participation, and scope of study and a consent section. Approval was obtained from the Research Committee (Faculty of Medicine, Tabuk University, KSA).

**RESULTS:**

**Table (1)** shows the age of the included 268 medical students which ranges from (19-28) years, with a mean±SD of (22.6±1.6). The studied participants aging from (21-23) years constituted the majority of our sample with frequency of (59.7%). More than half of the students (54.5%) were males. The study included the first six years of the medical school, most of the students were from the 4<sup>th</sup> year (38.1%), while the least subjects (3.4%) were from the 1<sup>st</sup> year students. Approximately (59.3%) of the total population believed that honey has biological role in the healing process of wounds.

**Table (1): Socio-demographic data of the participants, KSA, 2020 (N=268).**

Parameter	Frequency	Percent
<b>Age</b>		
• 19 – 20 years	32	11.9%
• 21 – 23 years	160	59.7%
• 24 – 28 years	76	28.4%
Mean±S.D.	22.6±1.6	
<b>Gender</b>		
• Male	146	54.5%
• Female	122	45.5%
<b>Educational level</b>		
• Year 1	9	3.4%
• Year 2	46	17.2%
• Year 3	30	11.2%
• Year 4	102	38.1%
• Year 5	37	13.8%
• Internship year	44	16.4%
<b>Honey has healing properties on burns</b>		
• Yes	159	59.3%
• No	109	40.7%

**Table (2)** assesses the knowledge about the role of honey in healing burns among the whole population. When they were asked about the effect of honey on burn wounds; (36.6%) of the students believed that it improves and accelerates the healing process, (21.3%) of them thought it has a healing function but in slow rate, (10.4%) presumed that it worsens healing and (31.7%) were convinced that honey has no healing effect on burns. About (55.6%) respondents were aware that honey decreases the inflammation during wound healing. Estimates shows that only (25.4%) of the medical students know that honey is faster than SSD in healing an infection free burn. The participants were asked about the effect of honey on infected burns; (25%) and (38.1%) of them thought that honey increases the infection or has no effect at all, respectively, whereas (36.9%) were acknowledged that it prevents the infection. Over half of the participants (51.9%) knew that applying honey on burns will reduce the pain during wound dressing.

**Table (2): Knowledge of participants regarding effect of honey on burn (N=268).**

Parameter	Frequency	Percent
<b>Effect of honey on burns</b>		
• Improves and speeds-up healing	98	36.6%
• Healing with slow progression	57	21.3%
• Worsens healing	28	10.4%
• No Effect	85	31.7%
<b>During wound healing, honey will decrease the inflammation</b>		
• Yes	149	55.6%
• No	119	44.4%
<b>Healing with honey is faster than Silver sulfadiazine (SSD) in an infection-free burn</b>		
• Yes	68	25.4%
• No	200	74.6%
<b>Effect on infection</b>		
• Increase infection	67	25.0%
• Prevent infection	99	36.9%
• No effect on infection	102	38.1%
<b>Application of honey on burns will reduce the pain during dressing change</b>		
• Yes	139	51.9%
• No	129	48.1%

**Table (3)** demonstrates the correlation between the comprehension among the medical students of healing properties of honey and their age, sex and study level. The pooled results revealed a statistically significant association considering the student's perception of healing properties of honey on burns in the following; their age with ( $P = 0.003$ ) as the older students aging from (24-28) years were the most educated class (73.7%), and their study level ( $P = 0.001$ ) where the students in their internship year and 5<sup>th</sup> year rates were the most acknowledged students (77.3%) and (75.7%) respectively, compared to the students in their 1<sup>st</sup> year (33.3%) who were less educated.

**Table (3): Correlation between perception of healing properties of honey on burns with age, sex, and study level, KSA, 2020 (N=268)**

Parameter		Honey has healing properties on burns	P-value
		Yes	
Age groups	• 19 – 20 years	65.6%	0.003
	• 21 – 23 years	51.3%	
	• 24 – 28 years	73.7%	
Sex	• Male	61.0%	0.552
	• Female	57.4%	
Study level	• Year 1	33.3%	0.001
	• Year 2	67.4%	
	• Year 3	43.3%	
	• Year 4	49.0%	
	• Year 5	75.7%	
	• Internship year	77.3%	

P-value is calculated by Chi-Square Test

P-value <0.05 is statistically significant

**Table (4)** shows the correlation between the students' age and whether they were aware about honey's ability to decrease the inflammation of burns within the healing process which was significantly correlated ( $P = 0.023$ ), as students aging (19-20) and (24-28) years revealed high level of knowledge (65.6%) and (65.8), respectively. This relationship was also significant considering the participants' study level ( $P = 0.001$ ), students in their internship year and 2<sup>nd</sup> year recorded higher acknowledgment level (72.7%) and (71.7), respectively than the other levels of study.

**Table (4): Correlation between perception of honey ability to decrease inflammation of burns during healing with age, sex, and study level, KSA, 2020 (N=268)**

Parameter		Honey decreases burns inflammation during healing	P-value
		Yes	
Age groups	• 19 – 20 years	65.6%	0.023
	• 21 – 23 years	48.8%	
	• 24 – 28 years	65.8%	
Sex	• Male	56.2%	0.838
	• Female	54.9%	
Study level	• Year 1	33.3%	0.001
	• Year 2	71.7%	
	• Year 3	30.0%	
	• Year 4	49.0%	
	• Year 5	59.5%	
	• Internship year	72.7%	

P-value is calculated by Chi-Square Test

P-value <0.05 is statistically significant

**Table (5)** defines the relationship between the students regarding their age, sex and study level and perception of whether topically applied honey is faster in healing non-infected burns than SSD. Considering the student's age, the mentioned correlation was significant ( $P = 0.000$ ), as the students aging from (19-20) positive response was (50%) and the group ranges from (24-28) was (36.8%). The previously explained association was also significant considering their study level ( $P = 0.023$ ) with ranking response in the internship year and the 5<sup>th</sup> year (40.9%) and (35.1) respectively.

**Table (5): Correlation between perception of whether healing of non-infected burns is faster with honey than SSD with age, sex, and study level, KSA, 2020 (N=268)**

Parameter		Healing of non-infected burns is faster with honey than SSD	P-value
		Yes	
Age groups	• 19 – 20 years	50.0%	0.000
	• 21 – 23 years	15.0%	
	• 24 – 28 years	36.8%	
Sex	• Male	25.3%	0.990
	• Female	25.4%	
Study level	• Year 1	11.1%	0.023
	• Year 2	23.9%	
	• Year 3	10.0%	
	• Year 4	21.6%	
	• Year 5	35.1%	
	• Internship year	40.9%	

P-value is calculated by Chi-Square Test

P-value <0.05 is statistically significant

**Table (6)** assesses the correlation between the respondents' perception of the ability of honey to reduce the pain in wound dressing and their age, sex and study level. This correlation was only significant apropos to the study level ( $P = 0.022$ ), as the students in their internship year, 3<sup>rd</sup> year and 2<sup>nd</sup> year responded positively to the question with rates of (63.6%), (63.3%) and (63.0%) respectively.

**Table (6): Correlation between perception of whether honey treatment is associated with less pain in dressing change with age, sex, and study level, KSA, 2020 (N=268)**

Parameter		Honey treatment is associated with less pain in dressing change	P-value
		Yes	
Age groups	• 19 – 20 years	50.0%	0.781
	• 21 – 23 years	50.6%	
	• 24 – 28 years	55.3%	
Sex	• Male	56.2%	0.123
	• Female	46.7%	
Study level	• Year 1	22.2%	0.022
	• Year 2	63.0%	
	• Year 3	63.3%	
	• Year 4	43.1%	
	• Year 5	45.9%	
	• Internship year	63.6%	

P-value is calculated by Chi-Square Test

P-value <0.05 is statistically significant

**DISCUSSION:**

Unhealed burns and wounds are a worldwide problem that has a critical effect on the community health and the economy [14]. The medicinal uses of honey has been known for over 2700 years [15]. The Ayurveda medical system in India defined honey as the nectar of life and prescribed it as a treatment for many injuries such as ulcers, burns, etc [16]. Honey was found to have the ability to accelerate healing in burns, infected wounds and ulcers and even used to preserve skin grafts [17]. The antibacterial effect of honey is caused by the action of some components mainly inhibines, which composed of hydrogen peroxide, flavonoids, phenolic acids, and many other unspecified substances [18].

Clinical records demonstrated that honey has the initiate to start or enhance the healing process of chronic wounds and also has anti-inflammatory properties [19]. Moreover, Professor Peter Molan from New Zealand, counted on his work at Honey Research Unit at the University of Waikato, he supported that honey has a powerful antimicrobial activity and even able to treat methicillin-resistant *Staphylococcus aureus* (MRSA) infections [20]. Gupta et al. [15] through a retrospective study compared the daily application of honey to first and second degrees burns to SSD and found that honey accelerate wound healing, sterilize wounds in lesser period and has better results regarding the incidence of hypertrophic scars and post-burn and contractures.

In this study we assessed the knowledge of 268 medical students about the properties of honey in healing wound burns. And found that (36%) of our sample are aware that honey improves and accelerates the healing process, over half of them (55.6%) know that it decreases the inflammation, only (25.4%) know that honey is more effective than SSD in infection-free burns, (36.9%) are educated about the antibacterial role of honey and about half of them (51.9%) believe that honey relives pain during wound dressing. These results indicate the lack of knowledge among the medical students about the antimicrobial, anti-inflammatory and healing properties of honey.

Honey has had a valuable place in folk medicine for hundreds of years [21]. Nevertheless, it is defined narrowly as a medical substance in modern medicine as a result of the lack of scientific support [22]. Then, the antimicrobial effect of honey was first determined in 1892; by Van Ketel [23]. Later, it was reported that honey has an inhibitory effect to about sixty species of bacteria which includes; aerobes, anaerobes, gram-positives and gram-negatives [24].

Since the Russians applied honey to infected wounds in World War I to accelerate wound healing and the Germans mixed cod liver oil and honey to treat burns and ulcers [25], there has been a lot of research and clinical trials to study the use of honey in wound healing as one of its most effective uses [26].

Our results evaluated this knowledge about the medical role of honey and the age, sex and study level of the students. The participant's age was found significant regarding the healing properties of honey on burn wounds, honey's ability to decrease the inflammation during wound dressing and that honey is able to accelerate wound healing faster than SSD with ( $P = 0.003$ ), ( $P = 0.023$ ) and ( $P = 0.000$ ). This correlation was also found significant in the terms of the study level. Finding the awareness about the effect of honey on healing wounds ( $P = 0.001$ ), the anti-inflammatory activity of honey ( $P = 0.001$ ), the ability of honey to heal wounds faster than SSD ( $P = 0.023$ ) and its capability in decreasing pain within healing ( $P = 0.022$ ) almost implied that older students and the students in their last year showed higher knowledge than the younger ones.

**CONCLUSION:**

Honey has a great effect on burns, accelerate wound healing, prevent the bacterial growth and act as anti-inflammatory agent. This study indicates that the scientific progress in understanding the medicinal properties of honey is not completely covered in the medical schools.

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