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Evaluation of the Therapeutic Effect of Honey in Treatment of Superficial Burn among Children – A Retrospective Study

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Abstract **Original Research Article**

Introduction: A burn is a heat-induced acute trauma. It is often brought by chemical, electrical, friction, or radiation, physical, and chemical (organic or inorganic) agent. Burn injury uniformly involves local and systemic adverse impacts on any living creature, including humans, with short- and long-term consequences. Severe burns have been observed to upset cardio-vascular physiology resulting in hypovolemic and distributive shock. Besides multiple natural substances, traditionally used as medication, especially honey, have been used to aggrandize burn-induced trauma alleviating. ***Aim of the study:*** The aim of this study was to evaluate the therapeutic effect of honey in treatment of superficial burn among children. ***Methods:*** This was a retrospective study and was conducted in the Department of Burn & Reconstructive Surgery, Bangladesh Shishu Hospital & Institute and Shefa Hospital, Shamoly, Dhaka, Bangladesh during the period from January, 2015 to December, 2016. ***Result:*** In total 57 children completed the study. In our study we found the majority (49%) of children were aged between 1-4 years old. The mean ±SD of age was 6.08 ± 3.02 years. Majority of children were boys (63%) compared to girls (37%). We found the mean ±SD of weight was 11.06 ± 4.18 kg. Majority (33%) of burn extents were 31-40% and majority (39%) of children required 11-20 days to heal the wound. ***Conclusion:*** We found that honey acts mainly as a hyperosmolar medium and prevents bacterial growth. It can form a physical barrier because of its high viscosity and the presence of enzyme catalase gives honey an antioxidant property. Because of these qualities, honey is a great and affordable dressing for healing the patients with superficial burn.

Key words: Superficial burn, Honey, Anti-inflammatory, Therapeutic effect.

INTRODUCTION

A burn is a heat-induced acute trauma [1]. It is often brought by chemical, electrical, friction, or radiation, physical, and chemical (organic or inorganic) agents [2]. Burn injury uniformly involves local and systemic adverse impacts on any living creature, including humans, with short- and long-term consequences [3, 4]. Severe burns have been observed to upset cardio-vascular physiology resulting in hypovolemic and distributive shock [1]. It also involves the immune and metabolic systems and causes disastrous inflammatory retaliation to catalyze diversiform organ failure and promote sepsis [1, 5, 6]. Burn causes not only bodily damage but also causes physical limitation, with promotes cosmetic issues. Nevertheless, it also damages psychological and emotional well-being, impairing the patient's future quality of life [4, 7, 8]. Thermal burn wounds are common among pediatric cases and a significant cause of childhood trauma [9-11]. Burn management frequently needs multidisciplinary care [12, 13]. It often causes fatal outcomes, especially among children, everlasting indelible defacement, mutilation, and anatomical and physiological malfunction [4, 14-17]. Despite recent advances in antimicrobial chemotherapy and wound management, infection continues to be an important problem in the treatment of burns. A variety of topical agents such as silver sulphadizine, 5% silver nitrate, and sulphamylon have been used, but none have eliminated the problem of infection [18-20]. Besides multiple natural substances, traditionally used as medication, especially honey, have been used to aggrandize burn-induced trauma alleviating, especially for about 8,000 years [21, 22].

Honey is a mixture of sugars prepared by honey bees from the natural sugar solutions called nectar obtained from flowers or other plant secretions. By inverting the sucrose in the nectar, the bee increases the attainable density of the final product, and thus raises the efficiency of the process in terms of caloric density. The higher osmotic pressure thus obtained precludes bacterial growth [23]. It has been reported that honey's valuable contributions to burn are its anti-inflammatory, antioxidant, and anti-microbial properties that ensure the success of skin grafting and wound mitigating process [24, 25]. Honey comprises various subcategories of carbohydrates, lipids, amino acids, proteins, vitamins, and minerals that are predominant in burn-trauma curative effect and minimizes further injury throughout the dressing process. Vitamin C, monophenolics, flavonoids, and polyphenolics like watery and lipotropic anti-oxidants are commonly available in honey [26, 27]. Many research papers have postulated several mechanisms regarding honey's anti-inflammatory effect. Those are suppression of synthesis of nitric oxide and complement, impediment of macrophage activity, curbing and squashing of reactive oxygen species (ROS) by phagocytes, minimizing free radical formation reducing oxidative stress, and availability of apalbumina-1 in honey because this chemical moiety secreted by the honeybees. Apalbumina-1 is known to possess an immuno-stimulatory effect [28-31].

In this study we aimed to evaluate the therapeutic effects of honey among children aged less than 1 to 12 years old in treatment of superficial burn.

Objective of the study

The main objective of the study was to evaluate the therapeutic effect of honey in treatment of superficial burn among children.

METHODOLOGY & MATERIALS

This was a retrospective study and was conducted in the Department of Burn & Reconstructive Surgery, Bangladesh Shishu Hospital & Institute and Shefa Hospital, Shamoly, Dhaka, Bangladesh during the period from January, 2015 to December, 2016. Data of 57 cases of children involving superficial thermal burns less than 40 per cent of the body surface were collected from hospital records. These children were treated with pure, unprocessed, undiluted honey obtained from hives, after the wounds had first been cleaned with normal saline. An application of 15-30 ml honey was made to the surface of the burn depending on its size. After spreading the honey was covered with dry sterile gauze and bandaged. Honey was applied daily and at the time of dressing the amount of discharge, foul smell, slough, type of granulation tissue, oedema of the surrounding area and signs of healing were noted.

We included the patient aged 1 to 12 years old with superficial partial thickness burn covering 5-40% of TBSA. Burns involving the face, hands, feet, genitalia, perineum, and major joints, patients who arrived to hospital after 24 hours of burn (as there was chance of wound infection), children with known allergies to honey and children with other systemic illnesses, (e.g., protein energy malnutrition and cerebral palsy) were excluded from our study.

Statistical Analysis: Subjective factors such as relief of pain, local irritation were also noted and quantitative data was expressed as mean and standard deviation and qualitative data was expressed as frequency distribution and percentage. In this study culture and sensitivity determinations were performed on swabs taken from the surface at the time of admission. This was repeated on days 7 and 21 in all cases or until the wound healed. Statistical analysis was performed by using SPSS 23. Probability value <0.05 was considered as level of significance.

RESULTS

In Figure 1 we showed the age distribution of our study subjects. Majority (49%) of children were aged between 1-4 years old. Followed by 25% & 23% were aged 5-8 years & 9-12 years respectively. The least prevalence was found among 7% children.

In Table 1 we showed the distribution of our study subjects based on sociodemographic variables. The mean ±SD of age was 6.08 ± 3.02. Majority of children were boys (63%) compared to girls (37%) . We found the mean ±SD of weight was 11.06 ± 4.18. Among of all causes of burn 58% were scald, 21% were cooking related burn, 14% & 7% were flame & explosives respectively.

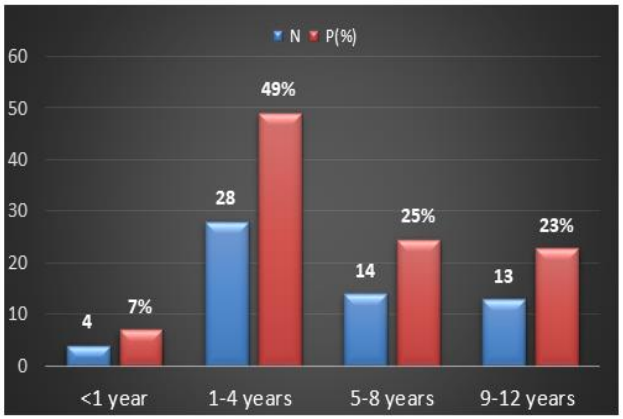

Figure 1: Age distribution of study subjects

Table 1: Distribution of our study subjects based on sociodemographic variables (n= 57)

Variables	**N**	**P(%)**	**P-value**
Age(years)			
<1 year	4	7.02	0.034
1-4 years	28	49.12	
5-8 years	14	24.56	
9-12 years	13	22.81	
Mean ±SD	6.08 ± 3.02		0.001
Sex			
Boys	36	63.16	0.040
Girls	21	36.84	
Weight(kg)			
Mean ±SD	11.06 ± 4.18		0.001
Causes of burn			
Scald	33	57.89	0.054
Cooking related burn	12	21.05	
Flame	8	14.04	
Explosives	4	7.02	

Table 2: Distribution of our study subjects based on their extent of burn

Extent of burn	N	P(%)	P- Value
<10%	7	12.28	0.012
10-20%	11	19.30	
21-30%	14	24.56	
31-40%	19	33.33	
>40%	6	10.53	

Table 3: Distribution of our study subjects based on the presence of slough & exudate

Treatment effects	*Present*		*Absent*	
	N	***P(%)***	***N***	***P(%)***
Slough				
At 3 days	41	71.93	16	28.1
At 5 days	15	26.32	42	73.7
At 7 days	0	0.00	57	100.0
Exudate				
At 3 days	39	68.42	18	31.6
At 5 days	14	24.56	43	75.4
At 7 days	0	0.00	57	100.0

Table 4: Time required for healing among our study subjects

Time required	*N*	*P(%)*	*P- Value*
0-10 days	14	24.56	0.034
11-20 days	22	38.60	
21-30 days	12	21.05	
>30 days	9	15.79	

Table 2 showed the distribution of study subjects based on burn extents. Majority (33%) of burn extents were 31-40%, followed by 25% were 21-30% and 19% were 10-20% respectively. The least prevalence 12% & 11% were less than 10% & more than 40% respectively.

In table 3 we showed the distribution of our study subjects based on their treatment effects. We found the presence of slough at 3 days was 72%, at 5 days was 26% and at 7 days we found 100% absence of slough. The presence of exudate at 3 days was found 68%, at 5 days was 25% and at 7 days we found 100% absence of exudate among children respectively.

In table 4 we distributed our study subjects based on time required for healing. Majority (39%) of children required 11-20 days, followed by 25% & 21% required <10 days & 21-30 days respectively. The remaining 16% children required more than 30 days.

DISCUSSION

In our study we found the majority (49%) of children were aged between 1-4 years old. Followed by 25% & 23% were aged 5-8 years & 9-12 years respectively. The least prevalence was found among 7% children (Figure 1). Subrahmanyam (1991) found that among 104 patients with burns, 70 patients were in the age group of 21-30 years. The youngest patient was year Old and the Oldest was 65 Years [32]. Bangroo *et al*., found that out of 64 patients, 9 patients were under 1 year of age, and the youngest patient treated was 6-month old [33].

The mean ±SD of age was 6.08 ± 3.02. Majority of children were boys (63%) compared to girls (37%). We found the mean ±SD of weight was 11.06 ± 4.18. Among of all causes of burn 58% were scald, 21% were cooking related burn, 14% & 7% were flame & explosives respectively (Table 1). Subrahmanyam (1991) found that among 104 patients 82 were males and 22 females. The mechanism of injury was due to scalds in 32 patients and dry flames in 45, contact burn, explosives and chemicals in others [32]. Bangroo *et al*., found that out of 64 patients 48 were males and 16 females. Nine patients were under 1 year of age, and the youngest patient treated was 6-months old. Fifty-six patients suffered injury due to wet burns, while eight patients had burns caused by dry heat [33].

In the current study we found that majority (33%) of burn extents were 31-40%, followed by 25% were 21-30% and 19% were 10-20% respectively. The least prevalence 12% & 11% were less than 10% & more than 40% respectively (Table 2). Subrahmanyam (1996) found the burn surface area ranged from 10 to 40 per cent [23]. Bangroo *et al*., found the sustained superficial thermal burns involving less than 50% of the body surface area [33]. In this study we found the presence of slough at 3 days was 72%, at 5 days was 26% and at 7 days we found 100% absence of slough. The presence of exudate at 3 days was found 68%, at 5 days was 25% and at 7 days we found 100% absence of exudate among children respectively (Table 3). Majority (39%) of children required 11-20 days, followed by 25% & 21% required <10 days & 21-30 days respectively to heal the wound. The remaining 16% children required more than 30 days (Table 4). Subrahmanyam (1996) found that honey-treated wounds healed in 20 patients by 7 days, and by 10 days in 16 patients, and in 11-15 days in 14 patients. Thus in all the patients the wounds healed by 15 days (mean 10.4 days) [23]. Bangroo *et al*., found that wound healing took 10 days in 26 patients of treatment with honey, while in six patients it took 2 weeks or more to heal [33].

Limitations of the study

In our study we did not evaluate the therapeutic effects between honey and any other natural or chemical substances in our study because of our short study period. After evaluating once those children we did not follow-up them for a long period and have not known other possible interference that may happen in the long term with these children.

CONCLUSION AND RECOMMENDATIONS

In our study, we come to a conclusion that honey acts mainly as a hyperosmolar medium and prevents bacterial growth. It can form a physical barrier because of its high viscosity and the presence of enzyme catalase gives honey an antioxidant property. Its high-nutrient content improves substrate supply in local environment promoting epithelialization and angiogenesis. Because of these qualities, honey is a great and affordable dressing for healing the patients with superficial burn. So further study with a prospective and longitudinal study design needs to be done to identify more therapeutic effects of honey in treatment with burns.

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