

Comparing the Effect of Henna Oil and Olive Oil on Pressure Ulcer Grade One in Intensive Care Units Patients

Abstract

Background: One of the most common problems in the intensive care unit (ICU) is the incidence of pressure ulcer or bedsore. This research was conducted with the aim to compare the effect of henna and olive on pressure ulcer grade one in ICU patients hospitalized in the selected hospitals of Isfahan University of Medical Science in 2016. **Materials and Methods:** This study conducted on 108 ICU patients with pressure ulcer. Patients were randomly divided into three groups. The two intervention groups were treated with olive oil and henna oil, respectively, and the third group was the control group. Data were collected using a demographic information questionnaire, Braden pressure ulcer risk assessment scale, and a table for daily record of the skin temperature before and within 1 week of the study. Data were analyzed in SPSS 22 using independent *t*-test, repeated-measures ANOVA, and Fisher's exact test. **Results:** The results showed a significant difference between the two henna and olive groups in the mean score of pressure ulcer measured through the pressure ulcer scale for healing tool ($P < 0.05$). The mean area of the ulcer on days 4 and 7 in the henna oil group was lower than that in the olive oil and control groups ($P < 0.001$). **Conclusion:** The results of this study showed that both henna and olive oils were effective in healing the pressure ulcer. However, henna oil showed better results in reducing the area of pressure ulcers over time.

Keywords: Braden scale, henna oil, intensive care unit, olive oil, pressure ulcer, pressure ulcer scale for healing tool

Introduction

Pressure ulcer is a nursing diagnosis and requires major nursing care in patients admitted to intensive care units (ICUs). In addition to postponing recovery, these ulcers impose much cost on the patients and their families.^[1-4] Despite the advances in medical technology, and the use of prevention programs, the incidence of pressure ulcers during hospitalization is increasing.^[5] In Iran, the pressure ulcer rate is reported to be 5% in general wards and 10.1%–21% in ICUs.^[2] In general, pressure ulcer grade two involves loss of the surface area of the dermis, grade three involves the loss of full thickness of the tissue, and grade four involves loss of complete tissue thickness in a way that bone, tendon, or muscle is distinctly exposed.^[4] Pressure ulcers are one of the most common complications in ICU patients. Despite the advancements in modern technology and preventive equipment, the incidence of these ulcers in patients admitted to these

wards has not decreased.^[1] Pressure ulcer incidence is still a major problem in all health-care systems.^[6,7] Patients admitted to ICUs are at risk for skin lesions because they often have limited movement on a bed as they receive tranquilizers or continuous long-term mechanical ventilation. Due to the use of good preventive methods, there is no incidence of pressure ulcers in some ICUs.^[8,9]

The main groups at the risk of developing pressure ulcers include patients with spinal cord injuries, elderly patients, hospitalized patients, especially those undergoing orthopedic surgeries, and patients admitted to ICUs. The latter group is more susceptible than others because they often experience long periods of immobility. Pressure ulcers cause pain, depression, decreased performance and independence, increased incidence of infection, sepsis, and surgical procedures, all of which potentially increase the length of hospitalization.^[10]

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Similarly, some studies have shown that the occurrence of pressure ulcers increases the expected length of hospital stay.^[5,10] Therefore, prevention is the most effective way to solve this problem, and the high quality of nursing care is a key factor in removing this problem.^[4]

The most important issue in the prevention of pressure ulcers is the identification of people at risk. A useful tool for predicting pressure ulcers should be highly sensitive and specific, have good predictive value, and be easy to use.^[11] Due to medical advances, the number of patients at the risk of pressure sores is increasing. Despite the use of the best prevention methods, pressure ulcers may still appear, so the best way is to quickly diagnose high-risk patients and take preventive measures at the earliest possible time.^[12] One of the preventive methods is maintaining skin integrity. At present, methods such as changing the position of the patient repeatedly and the use of certain devices such as specific beds, seats, chairs, mattresses, and pads are used to prevent pressure ulcers.^[13] Skin massage with vegetable oils is an important tradition in some countries. Each year more than 3 million Bangladeshi infants are taken care of using mustard, olive, and coconut oil according to a common method. This is done for a variety of reasons, such as preventing infections, improving skin condition, and regulating body temperature. Olive oil has many therapeutic properties.^[14] Regarding the importance of bedsores prevention, it is very important to conduct this study, and it is not only easy to access olive and henna oil, but they can also reduce the cost of treatment and pain in patients, so this study can be a step toward focusing on preventing this injury and removing the burden from health-care providers.

Therefore, the present study was conducted to determine and compare the effect of olive oil and henna on the prevention of bedsores in patients admitted to the ICUs of selected hospitals of Isfahan University of Medical Science in 2016.

Materials and Methods

This quasi-experimental study was conducted to evaluate the effectiveness of olive oil or henna on the patients with pressure ulcers/sores. The study population consisted of all patients hospitalized in ICUs of teaching hospitals affiliated to the Isfahan University of Medical Sciences (Al-Zahra, Amin, Ayatollah Kashani, Noor, and Ali Asghar), Iran, in 2016. In this study, the individuals were selected by convenience sampling method. A total of 108 patients older than 18 years, with a grade one pressure ulcer on the scapula, sacrum, heel, or other areas, participated in the study. The study inclusion criteria were as follows: (1) no history of skin disease or allergic disease, (2) no food or drug allergy, (3) no history of substance abuse, and (4) signing informed consent to participate in the study. All patients (or their guardians) who did not wish to continue the study or did not follow-up successfully during the study were excluded from the study (no cases found).

This study was approved by the Ethics Committee of Isfahan University of Medical Sciences (Code: IR.MUI.REC.1396.198). Written informed consent was obtained from all patients (or guardians). The participants were divided into three groups ($n = 36/\text{group}$) by random allocation software. The baseline demographic and clinical characteristics of patients such as age, sex, level of consciousness, smoking, hemoglobin level, hematocrit level, albumin level, systolic and diastolic blood pressures, pressure ulcers on the upper and lower limbs, past medical history such as respiratory diseases, heart disease, mental disorders, cancer, etc., and risk of developing the pressure ulcer risk were recorded.

The Braden Scale was used to assess the pressure sore development risk. There are six categories within the Braden Scale: sensory perception, moisture, activity, mobility, nutrition, and friction/shear. It uses the scores from 6 (the highest risk for developing an acquired ulcer/injury) to 23 (the lowest risk for developing an acquired ulcer/injury).^[15] The Braden Scale has been validated by previous studies.^[16,17]

Henna leaves and stems were collected around Yazd, and after being approved by a botanist in the Agricultural Research Center of Shahrekord the gathered plants were dried for a week in normal temperature in the shade. The decoction operation was carried out by soaking. A herbarium sample was prepared; the sample is available under No. 234 in the Herbarium Unit of Medicinal Plants Research Center of Shahrekord University of Medical Science. In the intervention group, to test the allergic reaction to henna, a mixture of 1 g henna and 10 ml distilled water was applied on the inner part of the forearm to see an allergic reaction in 10 min; the mixture was applied on the ulcer for 30 min if no reaction occurred. The place was then washed with lukewarm water, and the skin was dried. Henna was applied only once on the ulcer. Olive oil was extracted from high-quality olives from the orchards around Isfahan. The oil was extracted with a special oil extraction device. After being approved by a botanist in the Agricultural Jihad Research Center of Isfahan, a herbarium sample bearing No. 22134 HUI was kept in the Medicinal Plants Research Center of Isfahan University of Medical Science. A volume of 15 ml of the olive oil was gently applied once a day on the ulcer area without any massage.

It should be noted that the bed, mattresses, and sheets were designed according to the standard of bedsores prevention in any patient group. The three groups were matched for nutritional status and excretion. In addition, pressure ulcer care, such as changing the patient's position at least once every 2 h was done by the nurse.

Progress in ulcer healing was also measured using the pressure ulcer scale for healing (PUSH tool) in the 1st, 4th, and 7th days after the intervention. The PUSH tool consists

of three parameters of surface area (Length × Width), exudate, and type of wound tissue, and finally, the healing rate was measured by combining all three criteria of pressure ulcer. The PUSH tool uses a total score of 0, indicating a healed wound with 17 the worst possible score. The tool was designed by the National Pressure Ulcer Advisory Panel. The 97%–100% reliability of PUSH tool has been reported by several previous studies.^[18,19]

In addition, skin temperature and tropical ulcers were measured using the microlife NC100 infrared thermometer (Switzerland) in the 1st, 4th, and 7th days after the intervention.

Finally, the collected data were entered into SPSS (version 22; SPSS Inc., Chicago, Ill., USA). The quantitative data were presented as mean ± standard deviation, and the qualitative data were expressed as numbers (%). At the inferential statistics level, according to the results from the Kolmogorov–Smirnov test of the normality of the data, parametric inferential statistics, such as independent *t*-test, repeated-measures ANOVA (by adjusting for confounding variables including sex, age, body temperature, an ulcer's area, and temperature) and the Fisher's exact test was used. $P < 0.05$ was considered statistically significant.

Results

The current study included 17 men (47.2%) and 19 women (52.8%) (mean age = 57.53 ± 16.32 year) as the control group; 19 men (52.8%) and 17 women (47.2%) (mean age = 57.67 ± 17.25 year) as the henna group; and 16 men (44.4%) and 20 women (55.6%) (mean age = 65.39 ± 19.21 year) as

the olive group ($P > 0.05$). Other baseline and clinical characteristics were similar in these three groups [Table 1].

On the one hand, there was no difference in body and ulcer temperatures of patients on 1st, 4th, and 7th days of treatment ($P > 0.05$) [Table 2].

On the other hand, the evaluation of ulcer area and pressure ulcer scores for 1st, 4th, and 7th days of treatment using repeat measure ANOVA adjusted for confounders such as age, body temperature, ulcer temperature, ulcer site, and mobility demonstrated that intervention (for study groups), time, interaction between time and the group could significantly affect scores of ulcer area and pressure ulcer [Table 3].

A more detailed evaluation of these two variables revealed that on 1st day, there was no significant difference among groups ($P = 0.271$). However, on the 4th day, the ulcer areas in both groups (including henna and olive groups) indicated a significantly lower values compared to control group ($P < 0.001$). In addition, on 4th and 7th days of treatment, mean ulcer areas in henna group were 9.80 ± 13.39 and 4.51 ± 4.94 , respectively. These values were significantly lower than those in olive group (16.70 ± 16.01 and 11.72 ± 16.62 , respectively) ($P < 0.001$). Over time and after 7 days, we observed significant reductions in ulcer area scores of both interventional groups ($P < 0.001$) (it should be noted that the reduction was more considerable in henna group than olive group) but no significant change in control group ($P = 0.719$) [Table 4].

Moreover, the evaluation of mean scores of pressure ulcer (using PUSH tool) over time showed no

Table 1: Comparing baseline and clinical characteristics of patients among three groups (n=36)

Characteristics	Control	Olive oil	Henna oil	<i>P</i>
Sex, <i>n</i> (%)				
Male	17 (47.2)	19 (52.8)	16 (44.4)	0.771
Female	19 (52.8)	17 (47.2)	20 (55.6)	
Age (years)	57.53 ± 16.32	57.67 ± 17.25	65.39 ± 19.21	0.101
BMI (kg/m ²)	26.85 ± 4.82	25.19 ± 4.82	26.16 ± 5.72	0.391
Smoking, <i>n</i> (%)	10 (27.8)	7 (19.4)	7 (19.4)	0.335
Level of consciousness (GCS)	8.53 ± 4.38	10.28 ± 4.56	9.44 ± 4.47	0.256
Hemoglobin (g/dl)	12.59 ± 1.55	12.84 ± 1.53	12.71 ± 2.16	0.201
Hematocrit (g/dl)	38.28 ± 4.73	36.73 ± 3.85	37.85 ± 4.60	0.067
Albumin (g/dl)	4.07 ± 0.59	4.26 ± 1.05	4.04 ± 1.29	0.641
Systolic blood pressure (mmHg)	124.36 ± 17.46	120.61 ± 17.84	123.97 ± 18.82	0.626
Diastolic blood pressure (mmHg)	74.25 ± 7.65	72.03 ± 8.35	74.58 ± 9.37	0.109
Past medical history*, <i>n</i> (%)	13 (36.1)	22 (61.1)	16 (44.4)	0.315
Location of ulcer, <i>n</i> (%)				
Upper limb	27 (75)	22 (61.1)	24 (66.7)	0.557
Lower limb	9 (25)	14 (38.9)	12 (33.3)	
Mobility, <i>n</i> (%)	11 (30.6)	13 (36.1)	13 (36.1)	0.976
Braden tool (6-23)	13.58 ± 5.50	15.11 ± 4.74	13.53 ± 4.69	0.315

*The history of underlying disease such as respiratory and cardiovascular illnesses, mental disease, cancer, and so on. BMI: Body mass index, GCS: Glasgow Coma Scale

significant difference in groups on 1st day ($P = 0.553$), but pressure ulcer scores were significantly lower in interventional groups (henna and olive groups) than control group ($P = 0.001$). In addition, on 4th and 7th days of treatment, the mean scores of pressure ulcers were, respectively, 6.28 ± 2.80 and 3.39 ± 3.54 in henna group. These values were significantly lower than those in olive group, respectively, 7.50 ± 2.823 and 5.44 ± 3.806 . However, over time and after 7 days, there was a significant reduction in both groups of intervention ($P < 0.001$) but no change in the control group ($P = 0.052$) [Table 5].

Discussion

According to the results of this study, the assessment of the mean ulcer area scores in the 1st, 4th, and 7th days after the treatment by adjusting for confounding variables such as age, body temperature, ulcer's area, and temperature and mobility showed that the intervention treatment (groups), passing time, group-by-time interaction had a significant effect on the improvement of ulcer area and pressure ulcer score ($P < 0.05$). There was no significant difference in the mean ulcer area score among all groups in 1st day after the treatment ($P = 0.271$), but the mean ulcer area score in olive oil group was significantly higher than henna group in 4th and 7th days after the treatment ($P < 0.001$). In addition, the mean ulcer area score in henna and olive oil groups was significantly higher than the controls ($P < 0.05$).

Table 2: Comparing the mean body and ulcer of temperature between two groups (n=36)

Temperature	Control	Olive oil	Henna oil	P^a
Body temperature				
First day	37.18±0.86	37.30±0.59	37.19±0.68	0.747
Fourth day	37.15±0.51	37.07±0.46	37.07±0.39	0.717
Seventh day	37.18±0.66	37.34±0.87	37.04±0.50	0.201
P^b	0.948	0.039	0.294	
Ulcer temperature				
First day	37.41±0.86	37.39±0.61	37.34±0.84	0.924
Fourth day	37.31±0.52	37.19±0.49	37.13±0.56	0.238
Seventh day	37.38±0.72	37.45±0.96	37.12±0.43	0.175
P^b	0.681	0.100	0.097	

^aSignificant level of one-way ANOVA, ^bSignificant level of repeat measure ANOVA

Table 3: Factors affecting on the ulcer area and pressure of ulcers

Variables	Time	Group	Time × group
Ulcer area			
F statistics	6.65	10.59	13.26
P^*	0.043	<0.001	<0.001
Ulcer pressure			
F statistics	14.50	26.3	27.99
P^*	<0.001	<0.001	<0.001

*Significant level of repeat measure ANOVA by adjusting age, body and ulcer of temperature, mobility and location of ulcer

On the other hand, the mean ulcer area score was significantly decreased in henna and olive oil groups in 7th day after the treatment ($P < 0.001$), but, the mean ulcer area scores in henna group was significantly lower than the olive group, and also no significant change in the control group was observed ($P = 0.719$). Therefore, it is revealed that henna extract contains numerous chemicals such as phenolic glycosides (such as coumarin, xanthone, quinoids and sitosterol glucoside-β, and tannins and alkaloids) can exert a positive effect on an ulcer's healing process. The presence of glycosides in henna inhibits macrophage activity, thereby inhibiting the production of chemical mediators and ultimately reducing the inflammation. Moreover, the presence of alkaloids in henna can have strong physiological effects on an ulcer's healing.^[20,21] In addition, the results of a study conducted by Towfik *et al.* demonstrated that henna can affect an ulcer's area.^[21]

Finally, the assessment of mean pressure ulcer score using PUSH tool showed that there was no significant difference in the mean pressure ulcer score among all groups in the 1st day after the treatment ($P = 0.553$), but the mean pressure ulcer score in olive oil and henna groups were significantly lower than the controls in the 4th and 7th days after the treatment ($P < 0.001$). In addition, the mean pressure ulcer score in olive oil group was significantly higher than the henna group in the 4th and 7th days after treatment ($P < 0.001$). On the other hand, the mean pressure ulcer score was significantly decreased in henna and olive groups in the 7th day after treatment ($P < 0.001$),

Table 4: Comparing the mean score of ulcer area between two groups (n=36)

Ulcer area	Control	Olive oil	Henna oil	P^a
First day	43.22±43.95	28.75±25.71	34.49±41.72	0.271
Fourth day	44.75±46.92	16.70±16.01 [†]	9.80±13.39 ^{†*}	<0.001
Seventh day	46.76±48.34	11.72±16.62 [†]	4.51±4.94 ^{†*}	<0.001
P^b	0.719	<0.001	<0.001	

^aSignificant level of one-way ANOVA, ^bSignificant level of repeat measure ANOVA, [†]Significant differences in comparison with the control group, ^{*}Significant differences in comparison with the olive group

Table 5: Comparing the mean score of pressure ulcer using the pressure ulcer scale for healing tool control and intervention groups on different days (n=36)

Pressure ulcer score measured by the PUSH tool	Control	Olive oil	Henna oil	P^a
First day	9.08±1.422	9.00±1.242	8.75±1.25	0.553
Fourth day	9.50±1.732	7.50±2.823 [†]	6.28±2.80 ^{†*}	<0.001
Seventh day	9.83±2.864	5.44±3.806 [†]	3.39±3.54 ^{†*}	<0.001
P^b	0.052	<0.001	<0.001	

^aSignificant level of one-way ANOVA, ^bSignificant level of repeat measure ANOVA, [†]Significant differences in comparison with the control group, ^{*}Significant differences in comparison with the olive group. PUSH: Pressure ulcer scale for healing

and also no significant change in the control group was observed ($P = 0.052$).

In this regard, the results of past studies have demonstrated the effect of peppermint gel,^[22] aloe vera gel,^[23] honey,^[24,25] and coconut oil^[26] on pressure ulcer healing.

The results of this study are in line with the study conducted by Rafiei *et al.* suggesting that henna extract can have a direct effect on the reduction of an ulcer's area and the mean pressure ulcer score using PUSH tool.^[27]

Furthermore, another study conducted in 2018 indicated that henna can prevent diabetic foot ulcers in patients admitted to ICUs.^[20]

On the other hand, the results obtained from the studies of Miroliaei *et al.* (2018)^[28] and Yucel and Guzin^[29] who evaluated the effect of henna on the wound healing demonstrated that henna has anti-inflammatory, antibacterial, analgesic, and anti-inflammatory properties which can be effective in the reduction of scarring, redness, edema, and blisters on a person's hands or feet. Henna can also stimulate the collagen production, fast the wound contraction, angiogenesis, and vascular dilatation. Although these two studies evaluated inflammation, edema, bleeding, etc., in the ulcer areas, our study evaluated the pressure ulcer status in terms of area and depth of the wound, which was not consistent with their results. However, their studies and also our work showed the effect of henna on the pressure ulcer recovery and its quality. In addition Ahmadian (2016) evaluated the effect of henna on prevention of pressure ulcer patients hospitalized in ICU, and the results showed that henna can lower the local temperature of the sacral region and prevent the pressure ulcers.^[30]

Furthermore, several studies investigating the effect of olive oil on pressure ulcer healing and have demonstrated that olive oil can reduce levels of lipid hydroperoxides, which can be effective in pressure ulcer recovery, and therefore, it as an inexpensive product can prevent the occurrence and prevalence of pressure ulcers in patients.^[31-33]

One of the strengths of this study was that it also controls the confounding factors such as age, sex, body temperature, an ulcer's area, and temperature in the assessment of healing status of the ulcer's area and pressure ulcer scores; therefore, the results of this study indicated that olive oil or henna can be effective in pressure ulcer healing. It is therefore recommended that further studies should be conducted to evaluate the effectiveness of different doses of olive oil and henna on pressure ulcer recovery, and comparing their effects on different grades of pressure ulcer.

Conclusion

According to the results of this research, it seems that henna and olive oil can be effective in grade one pressure

ulcer recovery in patients hospitalized in ICU; however, the effect of henna was significantly higher than the olive.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Leigh IH, Bennett G. Pressure ulcers: Prevalence, etiology, and treatment modalities. A review. *Am J Surg* 1994;167:25S-30S.
2. Jalali R. *The Principle of Wound Cure and Care*. Tehran: Salemi Publication; 2003.
3. Cox J. Predictors of pressure ulcers in adult critical care patients. *Am J Crit Care* 2011;20:364-75.
4. European Pressure Ulcer Advisory Panel, National Pressure Ulcer Advisory Panel. *Pressure Ulcer Prevention. Quick Reference Guide*; 2009. p. 1-24.
5. Elliott R, McKinley S, Fox V. Quality improvement program to reduce the prevalence of pressure ulcers in an intensive care unit. *Am J Crit Care* 2008;17:328-34.
6. Allman RM. Pressure ulcer prevalence, incidence, risk factors, and impact. *Clinics in geriatric medicine*. 1997;13 (3):421-36.
7. Iranmanesh S, Rafiei H, Foroogh Ameri G. Critical care nurses' knowledge about pressure ulcer in Southeast of Iran. *Int Wound J* 2011;8:459-64.
8. Keller BP, Wille J, van Ramshorst B, van der Werken C. Pressure ulcers in intensive care patients: A review of risks and prevention. *Intensive Care Med* 2002;28:1379-88.
9. Bolourchifard F, Abdollahi M, Yaghmaei F, Baghban AA. Incidence of pressure ulcer and its risk factors in patients at orthopedic wards. *Adv Nurs Midwifery* 2008;19:1-5.
10. Souzani A, Hassani MR. The effect of continuous training on the knowledge of caregivers and the healing of pressure ulcer in patients with SCI in Shahrood. *Horizon of Knowledge. J Fac Med Sci Health Service Gonabad Univ Med Sci* 2006;12:62-55.
11. Lindgren M, Unosson M, Krantz AM, Ek AC. A risk assessment scale for the prediction of pressure sore development: Reliability and validity. *J Adv Nurs* 2002;38:190-9.
12. Vollman KM. Ventilator-associated pneumonia and pressure ulcer prevention as targets for quality improvement in the ICU. *Crit Care Nurs Clin North Am* 2006;18:453-67.
13. Al-Razi MI. *Al-Hawi Book*. Translated by Afsharipour S. Tehran: Iranian Academy of Medical Sciences; 2005. p. 329-30.
14. Abbas Ali Madadi Z, Zeighami R, Azimiyan J, Javadi A. The effect of topical olive oil on prevention of bedsore in intensive care units patients. *Int J Res Med Sci* 2015;3:2342-7.
15. Kottner J, Dassen T. Pressure ulcer risk assessment in critical care: Interrater reliability and validity studies of the Braden and waterlow scales and subjective ratings in two intensive care units. *Int J Nurs Stud* 2010;47:671-7.
16. Serpa LF, Santos VL, Peres GR, Cavicchioli MG, Hermida MM. Validity of the Braden and waterlow subscales in predicting pressure ulcer risk in hospitalized patients. *Appl Nurs Res* 2011;24:e23-8.
17. Amirifar S, Reza Masouleh S, Pourshikhian M, Monfared A, Kazemnejad Leili E. Predictive value of Braden scale in pressure ulcer occurrence in hospitalized patients. *J Holistic Nur Midwifery* 2013;23:8-15.
18. Stotts NA, Rodeheaver GT, Thomas DR, Frantz RA,

- Bartolucci AA, Sussman C, *et al.* An instrument to measure healing in pressure ulcers: Development and validation of the pressure ulcer scale for healing (PUSH). *J Gerontol A Biol Sci Med Sci* 2001;56:M795-9.
19. Gardner SE, Hillis SL, Frantz RA. A prospective study of the PUSH tool in diabetic foot ulcers. *J Wound Ostomy Continence Nurs* 2011;38:385-93.
 20. Hekmatpou D, Ahmadian F, Eghbali M, Farsaei S. Henna (*Lawsonia inermis*) as an inexpensive method to prevent decubitus ulcers in critical care units: A randomized clinical trial. *J Evid Based Integr Med* 2018; 23:1-9.
 21. Towfik AI, Hamza AS, Munahi AK. The effect of henna *Lawsonia inermis* on the wound healing of local Arabian horses. *J Kerbala Univ* 2015;13:78-91.
 22. BaBamohammadi H, Ansari Shiri Z, Nobahar M. The effect of mint gel on the incidence of compression wound in patients with cerebral palsy admitted to intensive care units. *Int Congress Complement Altern Med* 2016;1:1-5.
 23. Sabzaligol M, Safari N, Baghcejeghi N, Latifi M, Koohestani HR, Bekhradi R, *et al.* The effect of Aloe vera gel on prineal pain and wound healing after episiotomy. *CMJA* 2014;4:766-75.
 24. Mehrabani M, Hosseini M.A, Nourozi Tabrizi K, Karimloo M. Comparison of Honey dressing with Hydrocolloid dressing effects on pressure ulcer healing of ICU hospitalized patients. *JHPM*. 2012; 1 (3):37-45.
 25. Yapucu Güneş U, Eşer I. Effectiveness of a honey dressing for healing pressure ulcers. *J Wound Ostomy Continence Nurs* 2007;34:184-90.
 26. Dhikhil CD, Lubna KM, Scholar LE. Effect of coconut oil usage in risk of pressure ulcers among bedridden patients of selected hospitals in North India. *IP Planet* 2014;1:71-8.
 27. Rafiei Z, Mazaheri M, Eghbali-Babadi M, Yazdannik A. The effect of henna (*Lawsonia inermis*) on preventing the development of pressure ulcer grade one in intensive care unit patients. *Int J Prev Med* 2019;10:26.
 28. Miroliaei M, Chelongar R, Aminjafari A, Talebi A, Ghiyas M. Histopathological evaluation of non-infectious skin deep wound healing activity of herbal extract. *J Cell Mol Res (Iran J Biol)* 2018;30:1-10.
 29. Yucel I, Guzin G. Topical henna for capecitabine induced hand-foot syndrome. *Invest New Drugs* 2008;26:189-92.
 30. Ahmadian F. Prevention of Pressure Ulcer in Intensive Care Units. Master's Thesis for Nursing; 2016.
 31. Lupiáñez-Pérez I, Morilla-Herrera JC, Ginel-Mendoza L, Martín-Santos FJ, Navarro-Moya FJ, Sepúlveda-Guerra RP, *et al.* Effectiveness of olive oil for the prevention of pressure ulcers caused in immobilized patients within the scope of primary health care: Study protocol for a randomized controlled trial. *Trials* 2013;14:348.
 32. Paymard A, Salehian T, Behnammoghadam M, Ali Madadi ZA, Shahnavaizi A, Allahyari E, *et al.* The effect of local olive oil on prevention of pressure ulcers in patients hospitalized in the intensive care unit of Shahid Beheshti Hospital, Yasuj: A double-blind randomized clinical trial. *J Anesthesiol Pain* 2017;6:54-61.
 33. Donato-Trancoso A, Monte-Alto-Costa A, Romana-Souza B. Olive oil-induced reduction of oxidative damage and inflammation promotes wound healing of pressure ulcers in mice. *J Dermatol Sci* 2016;83:60-9.

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