



Evaluation of the effect of fish oil in the prevention of pressure ulcers in patients admitted to the intensive care unit

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ABSTRACT

Introduction: Today, the anti-inflammatory property of fish oil is used to heal wounds, but this property has not been investigated to prevent the occurrence of pressure ulcers. So the research team decided to evaluate this feature as well.

Materials and methods: This clinical trial study was performed on 102 patients admitted to the intensive care unit located at Besat Hospital in 2020. Samples were assigned to three groups control, placebo, and intervention using permutation blocks. Before the intervention, the questionnaire of demographic and clinical variables, level of consciousness, Braden scale, and short nutritional status questionnaire was completed by the main researcher. In the intervention group, in addition to routine care, 2 cc of fish oil was gently rubbed into the sacrum once a day for 5 days. The same intervention was repeated in the placebo group, with the difference that soybean oil was used instead of fish oil, and the control group received only the usual care. The daily evaluation of pressure ulcers by one of the ICU nurses lasted up to 6 days.

Results: The results showed that there was a significant difference in the incidence of pressure ulcers in the three groups ($P = 0.043$). The risk of pressure ulcers in the control group was 11.9 and 2.7 times higher than the fish oil group and placebo group ($P = 0.023$) & ($P = 0.132$).

Conclusion: The use of topical fish oil can be effective in preventing pressure ulcers.

1. Background

Patients hospitalized in the intensive care unit face many problems and complications during their hospitalization [1,2], one of the most important complications in the intensive care unit is the development of pressure ulcers. A pressure ulcer is a skin ulcer caused by pressure and tension [3]. A pressure ulcer appears when the soft tissue is compressed between two layers (the bony prominence of the patient and an external surface). Pressure ulcers are more common in any part of the body with bony prominences (hips, sacrum, heels). It seen in elderly people, immobile patients, and neurological disorders [4].

The prevalence of pressure ulcers in intensive care units varies from

14 to 61% and its incidence is 1–56%, which is 2–3 times more than that of patients hospitalized in normal wards)5). Usually, 60% of pressure ulcers occur in the first two weeks of hospitalization and 70% of ulcers occur in people over 70 years old. 30% of these wounds are in the heel and 36% in the sacrum. In Iran, 5% of pressure ulcers in general wards and 10.1–21% in critical care wards have been reported [6].

Various methods have been developed for the prevention and treatment of pressure ulcers, which include: frequent position changes, physiotherapy, ultrasound, olive oil, almond oil, and a large number of articles on the preventive effect of hyper oxygenated fatty acids in causing pressure ulcers or delaying them. Have shown [3,7–12].

One of the substances that can have effects similar to hyper

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oxygenated fatty acids and olive oil is fish oil [5]. Due to the presence of fatty acids, omega-3, eicosapentaenoic acid, and docosahexaenoic acid, fish oil is a special eicosanoid precursor that helps reduce body inflammation. These acids cannot be synthesized by the human body and fish oil can help in providing them [13,14]. One of the important properties of this substance are its anti-inflammatory, angiogenesis, and repair properties [5,15], which have been proven in many studies [5, 16–18]. Fish oil, which is rich in omega-3 fatty acids, through changes in the production of growth factors, cytokines, and collagen production, controls the inflammatory stage of the wound, reducing prostaglandins, dilating blood vessels, increasing blood supply and oxygen delivery to the wound site, increasing cell proliferation and accelerating angiogenesis exert their healing effects [19]. Few reports did not show the beneficial effects of fish oil in wound healing [20,21]. Understanding the importance of preventing pressure ulcers and considering that fish oil is an available, natural, and cheap substance compared to expensive treatments, considering the similar properties of this oil with olive oil and hyper oxygenated fatty acids [22,23] and the effectiveness of dressings containing fish oil in preventing pressure ulcers [8], and the lack of a study on the effect of fish oil alone in preventing Pressure ulcers, this study was conducted to determine the effect of using fish oil on the skin in preventing pressure ulcers in the intensive care unit.

2. Materials and methods

This study was a three-group clinical trial. This research was conducted in 2019 for one year in the critical care ward of Besat Hospital. The samples were selected as available and were assigned to three fish oil groups with the letter A, the placebo group with the letter B, and the control group with the letter C. To calculate the sample size of the confidence level of 95% and the power of the test equal to 80% and the ratio of pressure ulcer observation to 0.341 and Ten percent possible loss of samples, the sample size in each group was estimated to be at least 26 people. Which was increased to 34 people The inclusion criteria include having a stable hemodynamic status, having healthy skin, and not having pressure ulcer in each group to increase the power of the tests [11]. Diabetes, not being allergic to the substances used, Braden's criteria of 15–18, which indicates an average risk for pressure ulcers, and people with an age range of 18–85 years. Exclusion criteria include the occurrence of any skin sensitivity due to drug sensitivity, receiving any other topical ointment in the pressure areas in both groups, the occurrence of any sensitivity following the use of fish oil, non-satisfaction of the participant to continue participating in the study, transfer or death of the patient. It should be noted that no adverse effects were observed in connection with oil and fish oil [32]. And according to the recommendation of the pharmacist consultant of the study, it was used as a placebo due to the similar nature of soybean oil to fish oil.

2.1. Data collection tools

The data collection tool included a personal information questionnaire including age, gender, type of disease, weight, height, underlying disease, number of days hospitalized in the ward, medications received, level of consciousness, etc. Braden scale to check pressure ulcer risk: Braden scale was used to check pressure ulcer risk. Braden's scale includes 6 subcategories of sensory perception, humidity, activity, mobility, nutrition, friction, and tensile force. Each patient scores a total of 23–6. A score of 19–23 is classified as no risk, 15–18 as moderate risk, 13–14 as high risk, and below 12 as very high risk [24,25]. Short nutritional assessment tool: The short nutritional assessment tool was used to screen for the risk of malnutrition and includes 18 items that are divided into two subscales, the first part includes 6 screening questions and the second part has 12 evaluation questions. In this study, only the first part was used. Its score is from 0 to 14 points, according to the scoring of the questionnaire, the samples are divided into three groups with normal nutrition, those at risk of malnutrition, and suffering from

malnutrition [26,27]. Regarding the nutritional status of the patients, it should be mentioned that due to the diversity of the statistical population of the variable research, the patients had different levels of nutritional status and the effect of this limitation in the research was reduced by statistical tests. Of course, the nutritional status was also screened by the study questionnaire. These three parts were completed by the main researcher to compare the nutritional status before the intervention. Modified Pressure Ulcer Staging System Checklist: This tool is used to check the occurrence and grading of pressure ulcers, which has 4 stages, and one stage that cannot be staged and is divided into very deep pressure injuries [28]. In this staging system, stage one pressure ulcer includes skin with localized inflammation that cannot turn pale or white. In this study, only stage one pressure ulcer was considered, and if a pressure ulcer occurred at this stage, the study was stopped at any stage [28]. This tool was completed by one of the nurses who did not know about the study groups.

2.2. Validity and reliability of tools

The sensitivity of the Braden scale is 70–90% and its specificity is 60–80% [24,25]. The reliability of the Braden scale modified pressure ulcer staging system checklist, and the nutritional assessment short the scale was checked by the inter-rater reliability method. The correlation coefficient between classes was 91.94 and 0.97, respectively. It was estimated that due to the high score of 0.7, it has high reliability [29].

3. Data collection method

3.1. Demographic information, nutritional status, and braden score of the participants were checked by the

Main researcher. In the intervention group, in addition to the usual care, which included changing the position every 3 h, daily 2 cc of fish oil was applied to the Sacrum of the patient for 30 s by the hand of the researcher. Considering that massaging the area could affect the wound healing process, this time was reduced to 30 s and once a day. Due to changing the position of the patient every 3 h, we were sure that the fish and soybean oil would remain in the area for at least 3 h and this amount would probably be enough to have an effect.

The intervention of the placebo group was the same as the fish oil group, with the difference that in this group, 2 cc of soybean oil was used instead of fish oil, and the control group only received routine care, which included changing positions every 3 h, to prevent receiving a pressure wound and the routine of changing the position was the same for all three groups. Only the incidence or non-occurrence of first-degree pressure ulcers was checked using the pressure ulcer assessment tool, daily, at 8:00 a.m., when the patients changed their positions, and the final evaluation was done on the morning of the sixth day. 1000 mg fish oil without mercury produced by Livar Company under the license of Canadian NutriSentry The company, produced in Tehran Daru Pharmaceutical Company, contains 100 mg Ω 3, 120 mg DAC, and 180 mg DAC. The fish oil of this company was poured by Drarasz into plastic containers of the same shape and size as soybean oil, and it was marked with the letter A. The reason for using soybean oil was its harmlessness, its safe use in traditional Iranian medicine, And also because of the similar nature of soybean oil to fish oil, which was recommended by the pharmacist of the research team. Also, the moist and greasy nature of the topical material can be effective in healing bed sores. For this purpose, about four kilos of soybeans were purchased and the oil was extracted by a pharmacist at the Faculty of Pharmacy using the spiral press method, which is one of the oldest methods used to extract soybean oil. This method is completely mechanical. In mechanical methods of oil extraction from soybean oil seeds, liquid oil is separated from the soybean residue, which is called cake. Because its color is similar to fish oil and it has no side effects when used topically, this oil was used, which was stored in plastic containers of the same color and shape as fish oil,

which was marked with the letter B by the pharmacist.

3.2. Data analysis method

For data analysis, using SPSS version 19 software and chi-square test, Fisher's exact test, one-way analysis of variance test, logistic regression was performed and a significance level of 0.05 was considered.

3.3. Ethical considerations

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1397.776 was obtained and the study was registered in the trial registration center with the code.

IRCT20160110025929N23. Before starting the sampling, the researcher introduced himself to the patient's guardian or guardian, the procedure was explained, and written informed consent was obtained from them. No fee was added to the patient's expenses.

3.4. Findings

Using the Kolmogorov-Smirnov test, it was found that all the data in all three groups had a P value higher than 0.05, so all the data had a normal distribution, and we were able to use parametric tests to

Compare the groups. The three groups were matched in terms of demographic and clinical variables, including age, gender, underlying disease, number of hospitalization days, drug addiction, Braden scale, level of consciousness, and nutritional status score. No statistically significant difference was observed between the three groups ($p > 0.50$).

4. Data statement

The results of Fisher's exact test show that there is a statistically significant difference between the three groups of control, placebo, and fish oil in terms of the occurrence of pressure ulcers ($P = 0.020$). So that the occurrence of pressure ulcers in the control group is more than in the other two groups. Also, the incidence of pressure ulcers in the soybean oil group is higher than in the fish oil group. To determine the difference between the groups, the logistic regression analysis test was used (Table No.1). Table No. 2 logistic regression analysis to determine the difference in the incidence of pressure ulcers in the three groups of control, fish oil and placebo shows that there is a statistically significant difference in the incidence of pressure ulcers in the three groups ($P = 0.043$). The risk of developing pressure ulcers in the control group was (11.9) times higher than in the fish oil group. The risk of developing pressure ulcers in the control group (2.7) were higher than in the placebo group, but this difference was not statistically significant ($P = 0.132$). The risk of developing pressure ulcers in the placebo group (4.4) was higher than in the fish oil group, but this difference was not statistically significant ($P = 0.196$).

The results of Fisher's exact test show that there is a statistically significant difference between the three groups of control, placebo, and fish oil in terms of the incidence of pressure ulcers ($P = 0.020$) (see Table 1). So the incidence of pressure ulcers in the control group is higher than in the other two groups. Also, the incidence of pressure ulcers is higher in the soybean oil group than in the fish oil group. To determine the difference between the groups, the logistic regression analysis test was used, the results of which are given below in Table 2.

5. Discussion

Pressure Ulcers in patients admitted to the intensive care unit are a major challenge for the patient and the health care team, especially the nursing staff. The results of the present study showed that the use of fish oil can be an effective substance in the prevention of pressure ulcers, which is consistent with the results of the study of Karimi et al. (2020)

Table 1

Distribution of absolute and relative frequencies of the studied units in the three groups according to the incidence of pressure ulcers.

Variables		Study groups Number (percent)			Total Number (percent)
		Fish Oil	Placebo	Control Group	
Occurrence of pressure ulcers	Yes	1 (2.9)	4 (11.8)	9 (26.5)	14 (13.7)
	No	33 (97.1)	30 (88.2)	25 (73.5)	88 (86.3)
Gender	Male	21 (61.8)	23 (67.6)	20 (58.8)	64 (62.7)
	Female	13 (38.2)	11 (32.4)	14 (41.2)	38 (37.3)
Age (year)		53.24	58.78	52.21	54.74
Height (cm)		168.59	169.68	165.44	167.90
Weight (kg)		71.85	72.79	69.00	71.22
BMI		25.18	25.75	25.21	25.38
Braden Scale Number	18	12 (35.3)	13 (38.2)	13 (38.2)	42 (41.2)
	16–17	13 (38.2)	10 (29.4)	14 (41.2)	37 (36.3)
	15	9 (26.5)	7 (20.6)	7 (20.6)	23 (23.5)

despite the differences in the intervention method. They showed that using a dressing impregnated with 4 cc of fish oil for 7 days prevents pressure ulcers, which confirms the results of the present study [8]. Elahi et al. (2012), studied the effect of fish oil on stage 1 pressure ulcer injury in 60 patients admitted to the intensive care unit, and showed that the use of topical fish oil every 2–3 h for 7 days, significantly accelerated the healing process of these wounds [5].

Despite the difference in the time of use of fish oil, it confirms the findings of the present study. Because in the present study it was used as a prevention but in their study, it was used to heal pressure ulcers. Also, a study by Taghavi et al. (2003) entitled "Accelerating the healing of skin wounds of chronic diabetic rats with topical fish oil" was conducted at Semnan University of Medical Sciences.

They concluded that fish oil, which is rich in omega-3 fatty acids, was effective in accelerating wound healing in mice with chronic diabetes, while corn oil, due to its omega-6 fatty acids, delayed wound healing [30]. The results of Shariati et al.'s (2002) study also showed that treatment with fish oil increased the wound healing rate from the ninth day onwards, in both diabetic and diabetic animals with denervation. The time required for complete wound healing in the diabetic groups treated with fish oil was shorter than the control group [31]. The study samples somehow confirm the results of the present study. Studies have shown that 95% of pressure ulcers are preventable [32]. Therefore, fish oil can be used easily, without serious complications, and at a much lower cost than other pressure ulcer treatments.

Fish oil is used when changing positions and can have a significant effect in reducing these wound complications. Important properties of this substance are anti-inflammatory, vascularization, and repairing properties [5,15] which have been proven in many types of research on these properties of fish oil [5,16–18]. One of the strengths of the study was the presence of a placebo group that can cover the psychological effects of the intervention. Another strength of the study was the selection of patients with a score of 15–18 with a moderate risk of pressure ulcers.

6. Conclusion

The use of topical fish oil and soybean oil can be effective in preventing pressure ulcers. This method can be used as an independent intervention by nurses as an effective, easy, and low-cost method to reduce and prevent the occurrence of pressure ulcers to care for patients who are at risk of developing pressure ulcers.

Table 2

Logistic regression analysis to determine the difference in the incidence of pressure ulcers in the three groups of control, fish oil, and placebo shows that there is a statistically significant difference in the incidence of pressure ulcers in the three groups ($P = 0.043$).

Groups	Regression coefficient	Parent statistics	Degrees of Freedom	(P) The significance level	Ratio Risk	Odds ratio	95% confidence interval	
							Min	Max
Control		6.288	2	0.043				
Fish Oil	- 2.475	5.184	1	0.023	0.084	11.9	0.1	0.709
Placebo	- 0.993	2.271	1	0.132	0.37	2.7	0.102	1.348

Statement of ethics

Before sampling, the researcher introduced herself to the patients and their supervisors and explained the procedure to them, and informed written consent was obtained from them. No cost was added to the patient's costs.

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Data availability statement

Due to the nature of this research, participants of this study did not agree for their data to be shared publicly, so supporting data is not available.

Ethical review board

The license of the ethics committee of Hamadan University of Medical Sciences with the code IR. UMSHA.REC. 1397.776 was obtained and the study was registered in the experimental registration center with the code IRCT20160110025929N23.

Author contributions

Samira Sadat Sadeghi: the main researcher who did the research sampling, Seyed Reza Borzou: Scientific research consultant, Hiva Azami: Scientific research consultant, Farshid Rahimi Bashar: Scientific research consultant, Rasool Haddadi: Scientific research consultant, Leili Tapak: Statistical research consultant.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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