

The Effect of Dietary Supplements on Wound Healing Progression of Pressure Ulcer Patients: Retrospective Study

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Abstract

Background: Trials on dietary supplement for the treatment of pressure ulcers (PUs) have been small. **Objective:** to investigate the efficiency of the intake of dietary supplement by hospitalized PUs patients on the progression of wound healing. **Design:** single-center, retrospective trial. 85 adult patients with stage II, III, and IV PUs, were divided into two groups, group A and group B, group A receiving daily the standard hospital diet which is prescribed by physician based on patients' medical conditions plus one of the wound healing supplement that hospital provides (CUBITAN and ABOUND) and group B receiving daily the standard hospital diet and kept without any dietary supplement due to the contraindication of the dietary supplement with their medical conditions. The progression in wound size and nutritional parameters (hydration status, total energy, and protein intake during) were documented. **Results:** treatment group (n = 47) resulted in a greater increase in serum albumin level ($[25.1 \pm 5.2$ to $32.2 \pm 5.8]$; CUBITAN), ($[26.3 \pm 6.0$ to $28.1 \pm 5.2]$; ABOUND) than with the control groups (n = 38) ($[27.3 \pm 7.0$ to $27.1 \pm 6.4]$). A more frequent reduction in wound size was also seen in treatment group ($[25.0 \pm 42.7$ to $14.5 \pm 28.5]$; CUBITAN), ($[21.4 \pm 55.1$ to $15.8 \pm 54.4]$; ABOUND) than with the control groups (n = 38) ($[17.6 \pm 27.4$ to $17.9 \pm 27.4]$). No difference was found in terms of the other variables. **Conclusion:** The wound healing supplement facilitated the healing of pressure ulcers since the total serum albumin and wound healing progression were significantly higher in the groups compared with those in the control group.

Keywords: wound healing supplement, Pressure ulcers.

DOI: 10.7176/JHMN/105-05

Publication date: January 31st 2023

Introduction

Pressure ulcers (PUs) are a major health care problem around the world, although prevalence varies across different healthcare settings, PUs affects approximately 10–20% of patients and negatively affect patients' prognosis, medical resources use, and healthcare costs (BoykoTatiana et al., (2018); Song et al., (2020)). The link between wound healing and patients' nutritional status is widely known and accepted. Particularly for patients with PUs, dietary intake and nutrition have been recognized as an intrinsic risk factor for impaired wound healing (Saghaleini et al., 2018). Wound healing may delay in starved or undernourished patients. This raises the question of whether supplementation of selected nutrients might be helpful, either in therapy or prevention of PUs. We are conducting this study to investigate the efficiency of supplement on the progression of wound healing in hospitalized PUs patients.

Material and method:

In this a single-center, retrospective trial. 85 adult patients with stage II, III, and IV PUs met the preliminary eligibility to complete the trial after reviewed their Electronic Medical Record.

All PUs patients were under the care of wound care team, and during their clinical rounds they evaluated the wound healing status by looking size of pressure ulcer and a scoring scale from 6 to 23, a lower score indicated a worse condition of the PU. The size and severity of the PUs would be measured at baseline and at different intervals during the follow-up visits of the wound care team based on the plan of care for each patient. The PUs patients were divided into two groups, group A receiving daily the standard hospital diet which was prescribed by physician based on patients' medical conditions plus one of the supplemented that hospital provides (CUBITAN and ABOUND) and group B receiving daily the standard hospital diet and kept without any dietary supplement due to the contraindication of the dietary supplement with their medical conditions.

For CUBITAN, each 24-g powder contains; β -hydroxy- β -methyl butyric acid (HMB) 1.2 g, L-arginine 7 g, L-glutamine 7 g, carbohydrates 7.9 g, sugar 1 g, calcium 200 mg, and Energy 79 kcal, (The Glory Medicina / Abbott). While for ABOUND, each 200 ml liquid contains; L-arginine 3 g, protein 17.6 g, carbohydrates 29 g, sugar 14.2 g, calcium 450 mg, Vit. C 250 mg, Vit. E 38 mg, Zinc 9 mg, Selenium 64 μ g, and Energy 248Kcal / (Nutricia).

Food and fluid intake were documented in the patients' electronic medical record (EMR) which was either completed by the nursing staff based on their daily monitoring or by dietitians during their nutritional assessment.

These records would be used to evaluate patient's daily intake of calories, protein, and fluid during the study period. The nutritional analysis of the daily oral food intake would be done manually using a food exchange list, while for the supplemented formulas the nutritional data sheet of the prescribed product would be used for nutritional analysis.

Results:

Baseline characteristics

The mean age of the study population was 59.3 ± 17.6 years. There were 20% females and 80% males, 3.5% underweight, 23.5% normal weight, 35.3% overweight and 37.6 obese. Mean height was 1.62 ± 0.9 m, mean weight was 78.3 ± 19.6 kg. Other characteristics (Nationality and COVID-19) are given in **Table 1**.

Table 1. Characteristics of the investigated patients ($n = 85$).

Variable	Mean \pm SD or n (%)
Age	59.3 \pm 17.6
Gender	
Male	68 (80.0)
Female	17 (20.0)
BMI	
Underweight	3 (3.5)
Normal weight	20 (23.5)
Overweight	30 (35.3)
Obese	32 (37.6)
Weight	78.3 \pm 19.6
Height	162.9 \pm 17.1
Nationality	
Qatari	22 (25.9)
Arab Non-Qatari	18 (21.2)
Non-Arab	45 (52.9)
COVID-19	
Negative	66 (93.8)
Positive	19 (6.2)

Table 2. Serum concentrations (means \pm SD) for albumin, hhemoglobin, wound size and hydration status in participant ingestion wound healing supplement within different period.

Variable	CUBITAN (n = 22)		ABOUND (n = 25)		control (n = 38)		2 \times 2 ANOVA	
	Before	After	Before	After	Before	After	Time p-value	T \times G p-value
Albumin (g/L)	25.1 \pm 5.2	32.2 \pm 5.8	26.3 \pm 6.0	28.1 \pm 5.2	27.3 \pm 7.0	27.1 \pm 6.4	0.00*	0.00*
Hemoglobin (g/dl)	9.5 \pm 2.00	12.8 \pm 2.	9.8 \pm 2.2	12.8 \pm 1.5	9.5 \pm 2.4	12.7 \pm 2.6	0.00*	0.95
Wound size (cm)	25.0 \pm 42.7	14.5 \pm 28.5	21.4 \pm 55.1	15.8 \pm 54.4	17.6 \pm 27.4	17.9 \pm 27.4	0.01*	0.05*
Hydration status (mosm/kg)	305.3 \pm 20.6	300.2 \pm 14.2	314.2 \pm 19.2	309.4 \pm 18.7	316.7 \pm 20.4	304.7 \pm 25.8	0.01*	0.42

Values are means \pm SD. Data were analyzed using repeated-measures ANOVA. the time \times treatment groups were significant $P < 0.05^*$.

Serum concentrations (means \pm SD) for albumin, hemoglobin, wound size and hydration status in participant before and after ingestion supplement (CUBITAN and ABOUND) and control shown in **Table 2**. Albumin shown significant differences within (0.00, $P < 0.05$) and between study groups (0.00, $P < 0.05$).

Also, significant differences were shown in wound size (0.01, $P < 0.05$) within ($P = 0.64$) and between study groups (0.05, $P < 0.05$). hemoglobin and hydration statuses were shown significance within study groups with no significant changes were noticed between study groups ($P = 0.95, 0.42$).

Results of independent sample t-test showed that there were significant ($P < 0.05$) differences in the means of Healing % (-481.1 ± 2904.5 vs. 51.3 ± 52.7 ; $P < 0.05$) between control and treatment groups. There was no significant difference between the means of age, weight, calories, and protein as well as length of healing and staying in hospital as mentioned in **Table 3**.

Table 3. Comparison between participant ingestion treatment supplement (CUBITAN and ABOUND) and control group.

Variables	Control (n = 38)	Treatment formula (n = 47)	p Value
Age	59.1 ± 18.9	59.4 ± 16.6	0.13
Weight	78.1 ± 19.6	78.5 ± 19.9	0.96
% Calories	75.2 ± 25.5	74.0 ± 21.2	0.37
% Protein	72.8 ± 27.7	76.7 ± 26.3	0.13
% Healing	-481.1 ± 2	51.3 ± 52.7	0.03*
% Healing / week	12.35 ± 23.14	24.94 ± 28.67	0.08
Hospital stay length	23.3 ± 18.1	20.3 ± 16.7	0.42

Values are means ± SD. Data were analyzed using independent sample t-test. *Statistically significant P <0.05.

Discussion

Nutritional deprivation and insufficient dietary intake are the key risk factors for the development of pressure ulcers and impaired wound healing. A number of studies including The National Pressure Ulcer Long-Term Care Study revealed that weight loss and inadequate nutritional intake were associated with a higher risk of developing pressure ulcers (Posthauer *et al.*, (2015); Saghaleini *et al.*, (2018); Munoz *et al.*, (2020)). Stratton *et al.* in (2005) in a systematic review and meta-analysis investigated the advantages of nutritional support in patients at risk of developing pressure ulcers, Oral and enteral support was their main focus in bedsore prevention.

In this retrospective and single-center study, it was aimed to investigate the effect of dietary supplement on wound healing progression of Pressure Ulcer patients in Hazm Mebaireek General Hospital-Qatar. Albumin is the most abundant visceral protein in the blood synthesized in the liver, and its levels are therefore considered to reflect protein synthesis and it also plays other physiologic roles, including the maintenance of oncotic pressure which may influence tissue tolerance (Sindgikar *et al.*, 2017). In fact, oncotic pressure serves as the main driving pressure (together with hydration status) for vascular refill, and subsequent lowering of albumin levels may be responsible for decreasing skin perfusion (Soeters *et al.*, 2019). A recent study on wound healing showed that in the management of patients in an acute care setting, PU healing was improved by providing protein supplements to keep serum albumin level greater than 2.8 g/dl (Sung & Park, 2011). In our study, there was a close positive association between serum albumin and supplement with no significance was shown between two types of supplement (cubitan and abound).

Our findings demonstrate that a dietary supplement was beneficial for the wound healing. These results support the findings of similar studies which showed a decrease in cost of antibiotic use and an improvement in wound appearance and depth score (Cereda *et al.*, (2015); Cereda *et al.*, (2017)).

The strong positive effects of supplementation can be synergistic as a result of the appropriate intake of all the nutrients together since studies on supplementing with only one or two nutrients showed fewer positive effects (Afzali *et al.*, (2019); Razzaghi *et al.*, (2018)).

It was difficult to standardize factors such as sex, BMI, nationality, COVID-19 for all patients in different groups which showed A strong correlation with studied variables. On the other hand, as the pressure ulcers severity and location were variable, we could not enforce a standard hospital regimen for PUs patients. For that, we recommend future research works on the limitation of this study (small sample, other confounders).

Conclusion

The wound healing supplement facilitated the healing of pressure ulcers for treatment group since the total serum albumin and wound healing progression were significantly higher in the group compared with those in the control group.

Declaration of interest

The authors declare no conflicts of interest. The authors alone are responsible for the content and writing of the article.

References

- Afzali, H., Jafari Kashi, A. H., Momen-Heravi, M., Razzaghi, R., Amirani, E., Bahmani, F., ... & Asemi, Z. (2019). The effects of magnesium and vitamin E co-supplementation on wound healing and metabolic status in patients with diabetic foot ulcer: A randomized, double-blind, placebo-controlled trial. *Wound Repair and Regeneration*, 27(3), 277-284.
- BoykoTatiana, V., LongakerMichael, T., & YangGeorge, P. (2018). Review of the current management of pressure ulcers. *Advances in wound care*.
- Cereda, E., Klersy, C., Andreola, M., Pisati, R., Schols, J. M., Caccialanza, R., & D'Andrea, F. (2017). Cost-

- effectiveness of a disease-specific oral nutritional support for pressure ulcer healing. *Clinical Nutrition*, 36(1), 246-252.
- Cereda, E., Klersy, C., Seriola, M., Crespi, A., D'Andrea, F., & OligoElement Sore Trial Study Group*. (2015). A nutritional formula enriched with arginine, zinc, and antioxidants for the healing of pressure ulcers: a randomized trial. *Annals of internal medicine*, 162(3), 167-174.
- Munoz, N., Posthauer, M. E., Cereda, E., Schols, J. M., & Haesler, E. (2020). The role of nutrition for pressure injury prevention and healing: the 2019 international clinical practice guideline recommendations. *Advances in skin & wound care*, 33(3), 123-136.
- Posthauer, M. E., Banks, M., Dorner, B., & Schols, J. M. (2015). The role of nutrition for pressure ulcer management: national pressure ulcer advisory panel, European pressure ulcer advisory panel, and pan pacific pressure injury alliance white paper. *Advances in skin & wound care*, 28(4), 175-188.
- Razzaghi, R., Pidar, F., Momen-Heravi, M., Bahmani, F., Akbari, H., & Asemi, Z. (2018). Magnesium supplementation and the effects on wound healing and metabolic status in patients with diabetic foot ulcer: a randomized, double-blind, placebo-controlled trial. *Biological trace element research*, 181(2), 207-215.
- Saghaleini, S. H., Dehghan, K., Shadvar, K., Sanaie, S., Mahmoodpoor, A., & Ostadi, Z. (2018). Pressure ulcer and nutrition. *Indian journal of critical care medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine*, 22(4), 283.
- Saghaleini, S. H., Dehghan, K., Shadvar, K., Sanaie, S., Mahmoodpoor, A., & Ostadi, Z. (2018). Pressure ulcer and nutrition. *Indian journal of critical care medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine*, 22(4), 283.
- Sindgikar, V., Basavaraj Narasanagi, T. V., Ragate, A., & Patel, F. A. (2017). Effect of serum albumin in wound healing and its related complications in surgical patients.
- Soeters, P. B., Wolfe, R. R., & Shenkin, A. (2019). Hypoalbuminemia: pathogenesis and clinical significance. *Journal of Parenteral and Enteral Nutrition*, 43(2), 181-193.
- Song, Y. P., Wang, L., Yu, H. R., Yuan, B. F., Shen, H. W., Du, L., ... & Chen, H. L. (2020). Zinc Therapy Is a Reasonable Choice for Patients with Pressure Injuries: A Systematic Review and Meta-Analysis. *Nutrition in Clinical Practice*, 35(6), 1001-1009.
- Stratton, R. J., Ek, A. C., Engfer, M., Moore, Z., Rigby, P., Wolfe, R., & Elia, M. (2005). Enteral nutritional support in prevention and treatment of pressure ulcers: a systematic review and meta-analysis. *Ageing research reviews*, 4(3), 422-450.
- Sung, Y. H., & Park, K. H. (2011). Factors affecting the healing of pressure ulcers in a Korean acute care hospital. *Journal of Wound Ostomy & Continence Nursing*, 38(1), 38-45.