The Nutritional Status of Older Adults with and without Venous Ulcers: A Comparative, Descriptive Study

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The nutritional requirements of healthy people differ from those who have chronic wounds and while it is generally suggested that the nutritional status of persons with chronic wounds must be addressed, actual data about the nutritional status of older adults with venous ulcers is limited. The nutritional status of hospitalized older adults (n = 40, average age 77 ± 7.4) with vascular disease was compared to randomly selected outpatients with venous insufficiency ulcers (n = 37, average age 70.4 ± 8.13) using the Mini Nutritional Assessment instrument. Among all patients assessed, 37 (48%) were at risk for malnutrition or were malnourished. No differences between nutritional status and age or gender were found. The proportion of patients at risk for malnutrition or currently malnourished was significantly higher in the venous ulcer (24 out of 37) than in the control group (13 of 40, chi² = 15.51, P <0.05). Statistically significant differences were found between the control and venous ulcer group for all anthropometrical assessment variables (BMI, arm circumference, calf circumference, and weight loss in past 3 months), use of more than three prescription drugs, dietary history/assessment (appetite, fluid consumption, independent feeding), and patient self-rated health. The results of this study confirm that a complete patient assessment must include evaluating patient nutritional status and that nutritional disorders are a serious problem among the elderly, especially those with venous ulcers. Additional studies to help optimize the nutritional assessment and management of older adults with venous ulcers are needed.

KEYWORDS: nutritional assessment, malnutrition, venous ulcer, elderly, comparative study

Ostomy Wound Management 2008;54(9):34–42

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Wound healing requires optimal nutritional status. Studies performed on animal models have shown that energy deficiencies and chronic protein malnutrition significantly inhibit the healing process. In humans, malnutrition even for a short time has been found to require a two-fold increase in collagen synthesis time and impairs granulation tissue formation. Every stage of the healing process— inflammation, granulation tissue formation, epithelialization, and remodeling — requires the distribution of nutrients in correct proportion.

Intensive proliferation processes and building materials for new cells require energy, obtained through carbohydrates and lipids, to prevent catabolism and avoid protein depletion that could lead to uncontrolled loss of muscle mass and severe malnutrition.

Carbohydrates provide approximately 55% to 65% of an organism’s energy needs, which equates to 35 to 40 kcal/kg/day in a healthy person. Patients with ulcers or in a catabolic state require increases of 25 to 30 kcal/kg/day over normal requirements. Glucose, the main carbohydrate, is necessary in adequate amounts for leucocyte chemotaxis, fibroblast activation, and numerous cell divisions. Lipids cover the remaining 20% of energy needs. These substances provide a concentrated source of energy and build cell membranes of all new cells. Proteins cover the remaining 15% of energy needs.

Amino acids and nucleic acids delivered in the form of protein products provide fundamental building materials and support new protein synthesis. If these substances are not consumed in the recommended amount (1.2 to 1.5 g/kg/day), collagen synthesis and fibroblast activity will be inhibited. Fibroblasts produce a number of proteins that participate in cell proliferation — eg, they are components of primary extracellular matrices including proteoglycans, glucosaminoglycans, collagen fibers, cytokines, and growth factors.

Vitamins, minerals, and water play a role in cellular metabolism. Vitamins A, B, and C and such elements as zinc, copper, magnesium, and iron are particularly important. Isolated deficiency of only one nutrient is rare; thus, when deficiency is suspected, vitamins and mineral supplements should be recommended.

Malnutrition often is associated with dehydration, which also inhibits the healing process. Fluid intake should be equal to what is lost through evacuation and other fluid-loss processes.

Evaluation of the nutritional status of leg ulcer patients facilitates early intervention such as nutrient supplementation in patients with cachexia or malnutrition and may control potential deficiencies associated with highly exudative wounds. To assess and compare the nutritional status of older adults with vascular disease to patients with chronic venous insufficiency ulcers, a comparative, descriptive study was conducted among elderly in- and randomly selected venous ulcer outpatients at two healthcare facilities in Poland.

Material and Methods

The study was performed with prior ethical approval from the local Bioethical Commission and written informed consent was obtained from participants before participation. All patients were receiving either in- (control group) or outpatient (study group) care at the Collegium Medicum in Bydgoszcz, Poland. Patients eligible to participate in the study group had to be older than 18 years of age and have a diagnosed venous ulcer (eg, skin breakdown, associated tissue damage, with etiology confirmed by ultrasonography, and ankle-brachial
pressure index = 0.9 to 1.3). Patients with ulcers of mixed or other etiology (diabetes, atherosclerosis, arterial hypertension, auto-immunologic diseases) were excluded. Patients also were excluded if they had serious chronic active diseases such as cancer, AIDS, or any illness that could compromise nutrition. All consecutive patients presenting to the outpatient clinic and whose patient number was even were invited to participate in the study group.

Patients were eligible to participate in the control group if they had never received a diagnosis of venous ulceration, were hospitalized, and had a diagnosis of chronic vascular disease (eg, atherosclerosis, arterial hypertension). All consecutive patients were referred to the investigators by the nurses in various departments.

Nutritional assessment. Direct observation and the Mini Nutritional Assessment (MNA) developed by Guigoz et al were used to collect study data. The nutritional assessment tool consists of: 1) anthropometric data including body mass index (BMI), mean arm circumference, calf circumference, and weight loss in the past 3 months; 2) general biopsychosocial variables including physical activity, living arrangements, neuropsychological disorders, drugs, and incidents of psychological distress; 3) dietary intake history (what kind of meat, how many full meals, and how many cups of fluid does the patient consume daily); and 4) self-assessment of health and nutritional state. Following completion of the MNA, all individual question scores (minimum 0, maximum 3) are summed and patient nutritional status categorized as good (score >24), at risk (17 to <24) or malnourished (<17) (see Figure 1). Additional demographic data (name, gender, age, and primary diagnosis) were collected from the medical

Appendix 1

Mini Nutritional Assessment (MNA) by Guigoz Y., Vellas B. et al, 1994

I. Anthropometrical data

1. BMI [kg/m²]
   0=BMI<19  1=BMI<21  2=BMI<23  3=BMI<25

2. Mean arm circumference (MAC [cm])
   0=MAC<21  0.5=MAC<22  1=MAC>22

3. Calf circumference (CC [cm])
   0=CC<31  1=CC<31

4. Weight loss in past 3 months
   0=loss > 3 kg  1=not known  2=loss 1-3 kg  3=no loss

II. General assessment

5. Does patient live in his own home?
   0=no  1=yes

6. Does patient use more than 3 drugs a day?
   0=yes  1=no

7. Has patient had an incidents of psychological distress or serious disease during the last 3 months?
   0=yes  1=no

8. Degree of physical activity
   0=lack of mobility  1=mobility possible only at home  2=full mobility

9. Neuropsychological disorders
   0=severe dementia/depression  1=mild dementia  2=no disorders

10. Presence of epithelial lesions or ulcers
    0=yes  1=no

III. Dietary assessment

11. How many full meals does patient eat daily?
    0=1 meal  1=2 meals  2=3 meals

12. Does patient eat:
    -at least one dairy product daily (milk, yoghurt)? Yes-No
    -beans, peas, eggs more than 2 times per week? Yes-No
    -meat or fish every day? Yes-No
    0=0  0.5=1x yes  1=2x yes  1.5=3x yes

13. Does patient eat more than 2 meals with fruits or vegetables per week?
    0=no  1=yes

14. Is decrease of meal consumption connected with lack of appetite or dysphagia/digestion disorders/chewing disorders in last 3 months?
    0=severe lack of appetite  1=moderate lack of appetite  2=lack of appetite

15. How many cups of drinks does patient drink daily?
    0=<3 cups  0.5=3-5 cups  1>=5 cups

16. Way of feeding assessment
    0=need to be fed  1=eat independently but with troubles  2=full independence

IV. Subjective self-assessment

17. Is patient able to assess nutritional state?
    0=severe malnutrition  1=not able to assess/moderate malnutrition  2=no malnutrition

18. What is patient’s opinion about his/her own health state in comparison with other people in the same age?
    0=not as good  0.5=don’t know  1=the same 2=better

Interpretation of final result:
> 24 good nutritional state
17-23.5 risk of malnutrition
< 17 malnutrition

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Two investigators conducted the assessments in both patient groups.

**Data analysis.** Data were collected and entered into a computer program (Microsoft Excel 2000). All data analyses were performed in the Department of Surgery (Collegium Medicum in Bydgoszcz) using basic descriptive statistics — ie, mean values (X), standard deviation (SD), median (Me), confidence interval (CI), and percentages. Outcome variables between the two patient groups were compared using the following statistical tests: student t-test (age, gender, nutritional status, and ulcer presence/absence), nonparametric Pearson chi-square test (association between the presence of an ulcer and MNA subscores), and Mann-Whitney test for comparison of results and MNA subscore totals. Statistical significance of U distribution was assessed on the basis of standardized value of normal Z distribution (approximate value of U distribution). A significance level of P <0.05 was used for all analyses.

**Results**

Study participants included 37 outpatients (mean age 70.4 years) with ulcers and 40 control group inpatients (mean age 77.1 years) without ulcers. The majority of participants were women and 40 of the 77 patients (52%) assessed had a good nutritional status; seven (9%) were malnourished. Five women (11%) and two men (6.5%) were found to be malnourished (total MNA score <17); 21 women (46%) and 19 men (61%) had a good nutritional status. These differences were not statistically significant (Chi-square test = 5.6). The average age of patients with a good nutritional state (score >24) was 72.87 ± 8.91 years compared to 74.46 ± 7.71 years for patients at risk for malnutrition (30) and 77.28 ± 7.91 (seven) who were found to be malnourished. These differences were not statistically significant.

Mini nutrition assessment risk group scores showed a significantly lower prevalence of nutritional disorders in the control than in the study group (68% versus 35%, P<0.05 [chi\(^2\) = 15.51]) (see Table 1). The mean MNA test scores (individual question scores as...
**TABLE 3**

PERCENTAGE DISTRIBUTION OF MNA SCORES BY ULCER PRESENCE/ABSENCE.

<table>
<thead>
<tr>
<th>Score</th>
<th>Anthropometric parameters</th>
<th>General assessment</th>
<th>Diet</th>
<th>Subjective health state assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>0 points</td>
<td>NU (G)</td>
<td>0%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>U (S)</td>
<td>0%</td>
<td>5%</td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>0%</td>
<td>8%</td>
<td>18%</td>
</tr>
<tr>
<td>0.5 points</td>
<td>NU (G)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>U (S)</td>
<td>X</td>
<td>5%</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>X</td>
<td>29%</td>
<td>X</td>
</tr>
<tr>
<td>1 points</td>
<td>NU (G)</td>
<td>5%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td></td>
<td>U (S)</td>
<td>35%</td>
<td>43%</td>
<td>73%</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>19%</td>
<td>62%</td>
<td>82%</td>
</tr>
<tr>
<td>2 points</td>
<td>NU (G)</td>
<td>10%</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>U (S)</td>
<td>41%</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>25%</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3 points</td>
<td>NU (G)</td>
<td>85%</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>U (S)</td>
<td>24%</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>56%</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Chi-square  
Mann-Whitney test

| Score | p=0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 | p<0.05 |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0 points | <2.49,35 | 32.32 | 4.55 | 39.26 | NS | <4.24 | 0.05 | NS | NS | NS | <2.05 | 15.74 | 0.05 | <2.57 | 0.05 | NS | <2.71 | 0.05 |
| 0.5 points | Z=3.16 | p<0.05 | NS | Z=2.54 | p<0.05 | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |

*a = No ulcer (Department of Geriatrics); bb = Ulcer (Department of Surgery) MNA = Mini Nutritional Assessment tool.*
well as score sums) also were significantly different between groups. Mean final MNA test score of patients with ulcers was three points higher than the mean final score of patients without ulcers (21.38 versus 24.53) (z = 3.15; P <0.05) (see Table 2). To determine which individual MNA assessment variables were significantly different, associated inter-group differences between individual item scores were analyzed. Statistically significant differences were found between patients who did and who did not have an ulcer for all anthropometrical assessment variables (BMI, arm circumference, calf circumference, and weight loss in the past 3 months), use of more than three prescription drugs (general assessment), dietary history/assessment (appetite, fluid consumption, independent feeding), and patient self-rated health. Patients without ulcers assessed their health state as good/better more often than patients with an ulcer (see Table 3).

Discussion

Malnutrition is defined as a deficiency of basic nutrients caused by insufficient supply, malabsorption, or incorrect distribution of nutrients.\textsuperscript{11} Patients with acute or chronic diseases are often malnourished or have nutritional deficiencies.\textsuperscript{2,11,15,16} A review of five prospective studies\textsuperscript{2,17} (from 60 to 300 patients) have found that >50% of hospital patients and >85% of patients from long-term care centers are malnourished. The majority of patients are elderly people >65 years old with multi-organ or chronic diseases that place them at extremely high risk of malnutrition.\textsuperscript{2,13,16,18} Malabsorption, dysphagia, or difficulties preparing or consuming meals also have been found to increase the risk of malnutrition; small appetite (a common characteristic of age-related senility) increases with higher medication use and disease, further lowering nutrient absorption to <60%.\textsuperscript{7,18} Retrospective studies\textsuperscript{19,20} performed among elderly people found that 28% of women and 10% of men >65 years old consume <1,500 kcal daily (ie, less than minimum daily requirement (the normal daily requirement is 2,000 to 2,300 kcal) owing not only to disease, but also to psychosocial factors such as financial problems, difficulties obtaining food, disability, dementia and psychiatric diseases, and limited knowledge about proper nutrition.\textsuperscript{11,13,11,22}

Results of the current study confirm these findings. Of the 77 elderly patients studied (mean age 73.9 years), 37 (48%) were at risk for malnutrition or were malnourished. Although the majority (82%) said they consume three meals per day, only 58% of patients consumed fish/meat or one dairy product daily, or at least two meals including eggs or beans per week. Fluid consumption was also insufficient, increasing risk for dehydration that may occur when a patient drinks less than 1,500 mL a day.\textsuperscript{11}

In addition to albumin, prealbumin, transferrin, BUN, electrolyte, and hemoglobin levels and physical symptoms such as the condition of hair, skin, nails, mouth, and teeth,\textsuperscript{7,16} important measurable characteristics of malnutrition are BMI, history of weight loss, or fatty tissue volume assessed by arm/leg circumference.\textsuperscript{2,4} A BMI of <21 may indicate malnutrition.\textsuperscript{2,4,9,11,16,18} In the authors’ patient population, 25% had a BMI of 21 to 23, and 19.5% had a BMI <19. While any weight loss during the previous 3 months was observed more often among patients without ulcers (48%), the BMI in patients with venous ulcers was <23 in 76% of patients and patients with ulcers also had significantly lower scores for arm and calf circumference. It is possible that variables not assessed may explain the discrepancy between recent history of weight loss and the other anthropometric variables. Alternatively, weight loss in the leg ulcer patient population may have occurred >3 months previous.

Decreased meal consumption due to lack of appetite, dysphagia, digestion, or chewing disorders were noted more often among patients with ulcers than without ulcers. Nutrient deficiency, especially proteins and energy, may increase the risk of non-healing; reduced nutrient consumption and low BMI have been correlated to pressure ulcers development.\textsuperscript{2,3,6,23-25} In a prospective study by Wissing et al,\textsuperscript{26} nutritional status, activities of daily living, and mobility were found to potentially influence and modify venous ulcer healing. Venous ulcers are usually highly exudative wounds. Experts\textsuperscript{13} have observed that wound exudate is rich in proteins,
further increasing the need for adequate protein intake. The results of the current study suggest that older adults with venous ulcers are significantly more likely to be malnourished than older adults with vascular disease without ulcers. Although it is unknown whether malnutrition preceded ulcer development or occurred as a result of increased energy needs, these results confirm the importance of assessing the nutritional status of venous ulcer patients. Instruments such as the MNA used in this and other venous ulcer studies may help diagnose malnutrition and evaluate its potential causes, such as dietary habits and eating problems.

The external validity of these study results is limited by the comparison of inpatients to outpatients and a lack of laboratory data confirming the presence of protein and other nutrient deficiencies. However, the differences between the two groups of patients were consistent and statistically significant. Although additional studies examining the relationship between venous ulcers, nutritional status, and healing are needed, nutritional assessments of all venous ulcer patients seem warranted.

**Conclusion**

Results of a random, parallel observational study indicate that malnutrition and risk for malnutrition (especially lack of protein) are common among elderly patients with venous ulcers. Compared to older adults without ulcers, patients with venous ulcers had significantly lower nutritional scores, lower BMIs, and a smaller arm and leg circumference. The proportion of patients who used more than three prescription medications, had a reduced appetite, drank limited amounts of fluids, and had trouble eating was also significantly higher in the venous ulcer than in the control group, suggesting that in older adults, patients with venous ulcers had significantly lower nutritional scores, lower BMIs, and a small-arm and leg circumference. The proportion of patients who used more than three prescription medications, had a reduced appetite, drank limited amounts of fluids, and had trouble eating was also significantly higher in the venous ulcer than in the control group, suggesting that in clinical practice a complete nutritional assessment of all elderly patients with venous ulcers is needed. - 00W

**References**