Nutrition in the Elderly

Module 36.1

Malnutrition in the Elderly: Epidemiology and Consequences

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Learning Objectives

- Know the prevalence of malnutrition according to the subject’s life setting;
- Know the main medical consequences of malnutrition;
- Know that elderly subjects are at risk for micronutrient deficiency.

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2. What is the prevalence of malnutrition in elderly subjects living in the community, in nursing homes and in elderly hospitalised patients?
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Key Messages

- The prevalence of protein-energy malnutrition is relatively low in community-dwelling elderly (~ 4%); malnutrition is more common in nursing homes (~ 30%) and frequent in hospitalised elderly patients (~ 50%);
- Protein energy malnutrition is associated with an increase in mortality and longer stays in the hospital. Malnutrition also increases the risk for hip fractures, nosocomial infections and pressure ulcer development;
- Elderly subjects are at risk of micronutrient deficiency. Low calcium intake and low vitamin D status increase the risk for osteoporosis. The dietary intake of many other micronutrients may be low, but the clinical consequences of these are not fully known as intervention studies have shown conflicting results.
1. Introduction

There is a physiological decline in food intake from the ages of 20 to 80 years (1). This has been termed the “anorexia of aging” and in most cases is an appropriate response to the decrease in physical activity that occurs over the lifespan (2). However, low food intake place older men and women at high risk for developing pathological weight loss when they develop disease states.

2. What is the prevalence in protein-energy malnutrition in the community, in nursing homes and in the hospital?

As in younger adults, the estimation of the prevalence of malnutrition in elderly subjects depends on the tools used to evaluate the nutritional status, and on the setting of the studied population. Authors have used anthropometry, reports of recent weight loss, biochemical markers, the Mini Nutritional Assessment or other composite nutritional evaluation tools. Studies have been performed in elderly subjects living at home, in nursing homes or in hospitalised elderly patients.

Large epidemiological studies have been conducted in the community. In Europe, the Euronut-SENECA study included, in 1988, 2600 subjects born between 1913 and 1918 (aged 70-75 years), living in 19 towns in 12 countries. Data was collected on their food intake and nutritional status (anthropometry and biochemical measurements). The initial cross-sectional study showed that 10% of these subjects had a body mass index (BMI) < 20 and 2% had albumin levels < 35 g/L. Women in 7 centres had energy intakes lower than required, with a difference of more than 10% in 2 centres (3). Overall, the prevalence of malnutrition is estimated at 4% in community-living elderly subjects. Malnutrition is likely to be more frequent in elderly subjects who are living at home but that need help from domiciliary care services, suggesting probable loss of autonomy. Unintentional weight loss is reported in 8 to 13% of elderly free-living elderly subjects (4, 5), and in 25% of functionally dependent elderly persons living in the community (6).

In nursing homes, the prevalence of malnutrition ranges from 19% (7) to 38.6% (8). The National Diet and Nutrition Survey, based on 1368 subjects aged 65 and over, showed that 21% of institutionalised persons were malnourished, based on a composite measure of low BMI and recent weight loss (9).

In the hospital, the prevalence of malnutrition ranges from 30 to 90% according to the tools that are used. Malnutrition was defined with regard to the level of mid arm circumference and albuminemia in 324 hospitalised patients aged ≥ 70. Moderate malnutrition (MAC < 10th percentile or albuminemia < 35 g/L) was observed in 30% of the males and 41% the females, and severe malnutrition (MAC < 10th percentile and albuminemia < 35 g/L) in 15.6% of the males and 21.4% of females (10). Thirty-two % of patients hospitalised in a geriatric unit had BMI < 20 (11). Among sub-acute care elderly patients, 18% had a BMI < 19, and 53% of the subjects had albuminemia < 35 g/L (12). Different tools were used to assess malnutrition in a sample of 60 hospitalised subjects: the frequency of malnutrition degree varied from 63.3% as assessed by the Subjective Global Assessment to 90% with the Nutritional Risk Index (13).

3. What are the consequences of malnutrition in the elderly?

Studies have consistently reported an association between mortality and nutritional status in elderly subjects, as assessed by BMI, weight loss, plasma levels of albumin or food intake. However, especially in older people, it is important to take into account other potential predictors of adverse outcomes, such as illness severity, comorbidity and functional status.

In the community, in a prospective study including 247 men aged 65 and over, the annual incidence of a 4% or more weight loss was 13.1%. Although these patients were similar to non-weight losers for age, BMI, health status and albumin and cholesterol measurements, they had a significantly greater 2-year mortality rate (RR = 2.43; 95% CI = 1.34 - 4.41) (5). In 288 elderly patients receiving home help services, weight loss was a significant predictor of mortality in a multivariate analysis including age, sex, BMI, weight loss and functional status (RR = 1.76 ; 95%CI 1.15 - 2.71) (14). A statistical model was used to determine the predictive value of BMI, albumin and variables related to inflammation for mortality in 245 elderly subjects. When all variables were included in the model, and after adjustment for sex, BMI and albumin in the lowest tertiles (< 22.8 and < 36 g/L respectively) were both independently and significantly associated with an increase in 6-year mortality (RR = 2.3; 95%CI 1.3 - 4.4 and RR = 2.1; 95% CI 1.1 - 3.9 respectively) (15). In 4116 men and women who were followed for a mean duration of 3.7 years, hypoalbuminemia (< 35 g/L) was associated with a significantly increased risk of mortality in comparison with the reference group.
(i.e. those with albumin levels greater than 43 g/L) after adjusting for age, race, education, chronic conditions and disability status (men RR = 1.9; 95% CI 1.1 - 3.1 women RR = 3.7; 95% CI 2.5 - 5.5) (16).

Mortality was studied as a function of BMI in 8428 hospitalised patients. In patients aged 20-40 years, mortality doubled in the most underweight (BMI < 18) compared to BMI groups 20-40; however, in patients aged 70-79 years, there was a tripling mortality for BMI < 18 compared to the BMI groups 32-40 (17) (Fig. 1). That work suggests that being very underweight is more lethal the older the age of the patient is.

![Figure 1 Association between BMI and mortality as a function of age in 8428 hospitalised patients. Reproduced from (17).](image)

In 109 patients admitted to a geriatric rehabilitation unit, the best predictor of 1-year post admission and 1-year post hospital discharge mortality was percent of usual body weight lost in the year previous to admission (18). It was still predictive for mortality up to 4.5 years after discharge (19). In the hospital, both age and albumin have significant effects on mortality. In 15511 hospitalised patients, the lower the albumin level on admission, the higher the risk of death, the older the patient, the higher the risk of death. After adjustment for sex, age and all laboratory values, the odds ratio for dying was 0.27 (95%CI 0.23 - 0.31) for a 10-g/L increment in albumin level and 1.35 for a 10-year increment in age (20). As for food intake, a total of 102 patients (21%) out of a total of 497 patients 65 years or older had an average daily in-hospital nutrient intake of less than 50% of their calculated maintenance energy requirements. Admission illness severity, average length of stay, and admission albumin and transthyretin levels for this low nutrient group did not differ significantly from those of the remaining patients. However, the low nutrient intake group had a higher rate of in-hospital mortality (RR = 8.0; 95% CI 2.8-22.6) and 90-day mortality (RR = 2.9; 95% CI 1.4-6.1) (21).

In elderly subjects, weight loss and malnutrition have also been associated with other adverse outcomes such as length of stay in the hospital, hospital discharge location or time to readmission, infections, gait disorders, falls and fractures and poor wound healing. Herrmann et al (20) showed that in elderly hospitalised patients, low albumin levels were associated with longer hospital stays and increased the risk for one-year readmission in the hospital (Fig. 2).
Figure 2 Association between plasma albumin levels and mortality and length of stay as a function of age in 15511 hospitalised patients. Reproduced from (20).

In another study, after controlling for acute illness severity, comorbidity, and functional status on admission, severely malnourished hospitalised elderly patients as assessed by the SGA were more likely than well nourished patients to be dependent in activities of daily living 3 months after discharge and to spend time in a nursing home during the year after discharge (22). Episodes of sepsis occurred significantly more often in severely undernourished hospitalised elderly patients as assessed by BMI and corrected muscle area (23). In 185 elderly hospitalised patients, low energy intake, as well as age, length of hospital stay and the presence of a urinary catheter, was an independent risk factor for nosocomial infections (24, 25).

In the elderly, malnutrition is also associated with gait disorders, falls and fractures. These fractures may be favoured by:
- the effect of low protein and calcium intake and vitamin D depletion on bone mass;
- the effect of the decrease in muscle mass on gait disorders and the risk of falls;
- the decrease in fat mass that protects the bone in the case of a fall.

In the Study of Osteoporotic Fractures, 6754 women were weighed at baseline and after a mean of 5.7 years. After adjustment for age, cigarette smoking, physical activity, estrogen use, medical conditions, health status, body weight, femoral neck bone mass, and rate of change in calcaneal bone mass, the women who had lost weight had a significant increased risk of fracture of the proximal femur, pelvis and proximal humerus (age adjusted RR per 10% decrease in weight 1.68; 95% confidence interval 1.17 - 2.41) (26). Moreover, the nutritional status of 75 elderly women admitted to the hospital for hip fractures (Fig. 3) was compared to that of an aged-matched independent-living group of females attending local day centres. Hip fracture patients had significantly lower BMI, mid upper arm circumference, triceps skinfold thickness, albumin, protein, energy and calcium intake (27).
Last but not least, malnutrition increases the risk for the occurrence of **pressure sores** (Fig. 4). Low protein and energy intake, BMI and albuminemia are risk factors for the development of pressure sores in elderly patients (28-30). Additionally, a meta-analysis of 4 clinical studies showed that oral nutritional supplements could significantly reduce the incidence of pressure ulcer development in at-risk patients (odds ratio 0.75, 95% CI 0.62-0.89) (31). As for the effect of nutritional status on the healing of existing pressure ulcer, published data are scarce and not entirely convincing (32); however, they suggest that malnutrition slows down the healing process and that an increase in protein and energy intake increases the rate of healing. Overall, there is a consensus that nutrition is important for wound healing (33).

**Figure 4 Stage 3 pressure sore in a malnourished elderly patient**

All these may partly account for the association between malnutrition and poor quality of life in elderly persons (8, 34-36).

4. What about micronutrients?

Elderly persons are at risk for micronutrient deficiency. This may be due to low food intake, chronic diseases or drugs. The second evaluation of the Euronut-SENECA study population took place in 1993, when subjects were aged 74 - 79 years (n = 1005). In this population, 23.9% of the men and 46.8% of the women had low dietary intakes for at least one of the following micronutrients: calcium, iron, retinol, β-carotene, thiamin, pyridoxine or vitamin C (37). Vitamin D plasma levels were low in 36% of the men and 47% of the women. Cobalamin deficiency was described in 23.8% of the subjects (38). In institutionalised and in hospitalised elderly persons, the prevalence of micronutrient deficiency appears to be higher, especially for thiamin, pyridoxine, cobalamin, folates, vitamin C, vitamin E and selenium (39).
Low calcium intake and low vitamin D plasma levels increase the risk for osteoporosis. The intervention studies have shown calcium and vitamin D supplementation can reduce the incidence of hip fractures in elderly populations (40, 41). However, the efficacy of calcium and vitamin D supplementation that is observed in a general population has not been reproduced in selected samples of elderly subjects that either had already had a hip fracture (42) or that were at high risk for fractures (43).

As in younger adults, severe micronutrient depletion leads to specific well-known clinical symptoms and must be treated. However, in the elderly, mostly mild micronutrient deficiencies are described, the consequences of which are difficult to assess. For example, micronutrient and especially antioxidant vitamin and trace element deficiencies affect immunity (44). However, intervention studies designed to assess the efficacy of micronutrient supplementation to prevent the occurrence or improve the clinical outcome of infections have shown conflicting results. Chandra (45) reports a significantly lower number of days with infection in the group of elderly subjects taking a multivitamin supplement versus placebo. In another study, the effect of the supplementation with either vitamins (vitamin C, E and β-carotene) or trace elements (selenium and zinc), both or placebo during 2 years was studied in a population of 725 elderly institutionalised subjects. Trace elements supplementation reduced the incidence of respiratory tract. However, the incidence of uro-genital infections was lower in patients that received only placebo. Survival analysis for the 2 years did not show any difference between the 4 groups (46). In 652 non-institutionalized elderly individuals, physiological doses of multivitamin-minerals, 200 mg of vitamin E, both, or placebo were given for 2 years. Severity of infections was not influenced by multivitamin-mineral supplementation. For vitamin E vs no vitamin E, severity was worse in terms of illness-duration, number of symptoms, presence of fever and restriction of activity (47).

References


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