

## SENILE ANOREXIA IN ACUTE-WARD AND REHABILITATION SETTINGS

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**Abstract:** The most common pathological change in eating behaviour among older persons is anorexia, which accounts for a large percent of undernutrition in older adults. The main research aims are to determine, in a sample of acute and rehabilitation elderly subjects, the prevalence of anorexia of aging and the causes most impacting on senile anorexia. **Methods:** four different Units cooperated to this research study. Patients were recruited from geriatric acute and rehabilitation wards in Italy. Each Research Unit, for the estimation of the prevalence of anorexia in elderly subjects evaluated all the patients aged over 65 recruited from April 2006 to June 2007. Nutritional status, depression, social, functional and cognitive status, quality of life, health status, chewing, swallowing, sensorial functions were evaluated in anorexic patients and in a sample of “normal eating” elderly subjects. **Results:** 96 anorexic subjects were selected in acute and rehabilitation wards (66 women; 81.5±7 years; 30 men: 81.8±8 years. The prevalence of anorexia in the sample was 33.3% in women and 26.7% in men. Anorexic subjects were older and more frequently needed help for shopping and cooking. A higher (although not statistically significant) level of comorbidity was present in anorexic subjects. These subjects reported constipation and epigastrium pain more frequently. Nutritional status parameters (MNA, anthropometry, blood parameters) were significantly worst in anorexic subjects whereas CRP was higher. Chewing and swallowing efficiencies were significantly impaired and eating patterns were different for anorexic subjects with a significant reduction of protein rich foods. **Conclusions:** consequences of anorexia can be extremely serious and deeply affect both patient’s mobility, mortality and quality of life. Therefore, it is of utmost importance to perform a special evaluation of the nutritional risk, to constantly evaluate the nutritional status and feeding intake of older patients, to identify and treat the underlying disease when possible, to institute environmental and behavioural modifications, to organise staff better in order to produce higher quality feeding assistance during mealtimes, to plan early nutrition rehabilitation and nutritional education programs for caregivers. There is also the necessity to develop diagnostic procedures easy to perform, able to identify the pathogenesis of anorexia and, therefore, treatment strategies exactly fitting the patients’ needs.

### Introduction

Several studies have shown that malnutrition occurs in 20-60% of elderly patients admitted to hospitals (1-4), and an estimated 30-50% of nursing home patients (5). Moreover, some estimates have placed the level of malnutrition of home-bound, hospitalized, and nursing home patients as high as 85% (6). It has also been established that many cases of malnutrition go undiagnosed, even when the nutritional status influences the progression of the disease course and treatment options (7). Malnutrition and its influence on treatment outcomes is an essential consideration for the estimated 35% of the population over 65 that will enter a nursing home or other long-term care facility, especially when we realize that 42% of nursing home first admissions terminate in death from all causes (8). In elderly persons, nutritional status influences also the outcome of rehabilitation programs considerably (9). In geriatric rehabilitation setting the incidence of Adverse Clinical Events and mortality in malnourished subjects is higher than that in well nourished patients (10, 11).

The most common pathological change in eating behaviour among older persons is anorexia, which accounts for a large

percent of undernutrition in older adults (12).

Several of the major factors implicated in onset of geriatric anorexia are fairly well established in the literature (13-15) (oral and dental disease, swallowing dysfunction, depression and loss of motivation to eat, perceptual or cognitive impairment, alteration of neurotransmitters involved in appetite control and gastrointestinal factors, polypharmacy, or polypharmacy).

There are currently no set criteria for geriatric anorexia diagnosis with a recognized reference source (e.g. DSM-4 (16)). One of the reasons for this lack of overt criteria is that geriatric anorexia is not solely a psychiatric disorder, but a multifactorial physiological manifestation of aging.

The main research aims are to determine, in a sample of acute and rehabilitation elderly subjects, the prevalence of anorexia of aging and the causes most impacting on senile anorexia. No previous study has undertaken a multifactorial approach to identify the influence and contribution of specific factors in the pathogenesis of senile anorexia in order to optimize treatment of anorexic patients.

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### Methods

Four different Units cooperated to this research study. Patients were recruited from geriatric acute and rehabilitation wards in Italy. They were located in Rome (Rehabilitation Clinical Institute "Villa delle Querce" – Nemi), Bologna (S.Orsola-Malpighi Hospital), Padova (Department of Medical and Surgical Sciences, Geriatrics Section) and Palermo (Geriatric Unit, Dept. of Internal Medicine and Emergent Pathologies).

Each Research Unit, for the estimation of the prevalence of anorexia in elderly subjects evaluated all the patients aged over 65 recruited from April 2006 to June 2007.

Anorexia was diagnosed in case of absence of oral disorders preventing mastication and "normoral" eating (i.e., dysphagia, oral pain, reduced wakefulness) together with three or more days of reduction in food intake, equal or greater than 50% of a standard meal. Food intake was recorded for three days using the "Club Francophone de Gériatrie et Nutrition" (<http://mapage.noos.fr/cfgn/grille.htm>) form.

Sample Exclusion Criteria have been:

- patients requiring parenteral and enteral nutrition
- patients with medical conditions precluding reliable nutritional assessment [being affected by: liver, renal and heart failure, severe edema] or affected by all grade "4" diseases (severely incapacitating or life-threatening conditions) according to the Cumulative Illness Rating Scale (CIRS) (17).

In anorexic subjects and in a random selected sample of subjects without anorexia a further evaluation has been performed: nutritional status, depression, social factors, health, functional and cognitive status, quality of life, chewing, swallowing, olfaction and taste functions:

1. the nutritional status of the subjects was assessed by:

- Mini Nutritional Assessment – Short Form (18)
- anthropometric parameters: body mass index (BMI), triceps skinfold thickness (TSF), arm circumference (AC), arm muscle circumference (AMC) The anthropometric measurements were performed according to the Standard Manual for Anthropometric Measures (19)
- blood parameters: prealbumin, albumin, transferrin, C-Reactive Protein (CRP), mucoprotein, lymphocyte count
- hand grip strength (dynamometer)

2. depression was evaluated using a subjective (Geriatric Depression Scale) (20) and an objective scale (Cornell Scale for Depression) (21)

3. social status: anamnestic data regarding the last 6 months before the admittance have been collected. The investigations have focused in particular on civil status and on presence of people helping to shop and/or to cook.

4. health status : the grading of clinical status, comorbidity and severity levels was done using the Cumulative Illness

Rating Scale (CIRS) (17). This scale classifies comorbidities by 13 organ systems and grades, each condition from 0 (no problem) to 4 (severely incapacitating or life-threatening condition). The Comorbidity Index is given by the number of situations graded => 3. The Severity Index is the mean value of the severity scores for the 13 organ systems.

Prescribed Drugs : number and type of medications taken by the patients were recorded and examined for their impact on anorexia and malnutrition. These have included especially FANS, dietary supplements, medications that alter central nervous system, taste and smell functions, drugs acting on respiratory and cardiovascular systems.

Gastrointestinal Symptoms: symptoms potentially affecting food intake have been registered: constipation (weekly frequency of bowel movement), diarrhea (yes/no) and complaints of pain in epigastrium.

Pain, potentially affecting food intake, has been evaluated using the following questionnaire:

a. I can bear pain without using drugs. My normal activities of daily living are not aggravated by pain and are not influenced by pain.

b. I feel pain, but I am still able to lead a normal life without drugs.

c. Drugs give me relief from pain, and just using them I can manage my daily activities.

d. Drugs give me moderate relief from pain. I need help, but I can do most of my activities of daily living by myself.

e. Drugs give me a little bit of relief, but I need help to do all but the simplest activities of daily living.

f. Drugs don't help me. I cannot do any activities of daily living

5. functional and cognitive impairment were assessed using Activities of Daily Living (ADL) (22), Instrumental Activities of Daily Living (IADL) (23) and Mini Mental Status Examination (MMSE) (24) tests

6. quality of life (social function, physical symptoms, cognitive status, depression, autonomy) was evaluated by SF-36 scale (25)

7. chewing function : the number of natural teeth have been counted by a research staff member. Presence, fit, and usage of dentures were also assessed.

8. swallowing function was evaluated using the SWAL-QOL instrument (26)

9. olfaction and taste functions were assessed using an ascending-series staircase methodology. The task is a two alternative (test stimulus & control) forced-choice ascending concentration single series procedure. The stimuli presented during this task were menthol dissolved in light odorless mineral oil and phenethyl alcohol dissolved in deionized water. Taste thresholds have been assessed for basic tastes using sucrose (sweet), sodium chloride (salty), citric acid (sour), and quinine hydrochloride (bitter). Similar to the olfaction thresholds, the tastes were assessed in ascending-series with replications for each concentration.

Basic statistical analyses have been performed to assess differences in groups means and to compare the observed frequencies of categories to the expected frequencies. Statistical significance has been set at the  $\alpha = 0.05$  level. Data have been examined with SPSS 10.0 statistical software.

**Results**

We selected 96 subjects in acute and rehabilitation wards (66 women; 81.5±7 years; 30 men: 81.8±8 years. The school education level was low both in men and women (70% of men and women 68.2% of women attended the primary school). Most of the subjects were single or widowed (66.7% of men and 54.7% of women). The clinical status was characterised by a high level of comorbidity and severity both in men and women (table 1).

**Table 1**  
General characteristics of the sample

|                        |                   | Men     | Females | p    |
|------------------------|-------------------|---------|---------|------|
| Age                    | (years)           | 81,8±8  | 81,5±7  | 0,8  |
| School education level | Primary (%)       | 70      | 68,2    | 0,43 |
|                        | Secondary (%)     | 23,3    | 28,6    |      |
|                        | Graduate (%)      | 6,7     | 3,2     |      |
| Marital status         | Single (%)        | 16,7    | 17,2    | 0,48 |
|                        | Widowed (%)       | 50      | 37,5    |      |
| Clinical status        | Comorbidity Index | 3,4±2   | 2,6±2   | 0,03 |
|                        | Severity Index    | 1,8±0,4 | 1,7±0,5 |      |
|                        | N drugs           | 6,3±2   | 6±3     |      |
| Anorexia               | (%)               | 26,7    | 33,3    | 0,64 |

The prevalence of anorexia in the sample was 33.3% in women and 26.7% in men. Anorexic subjects (AS) were older (86±6 vs 79.6±7 years of normal eating subjects – NES) and, more frequently, needed help for shopping and cooking. We did not any difference for school education level and marital status (table 2).

**Table 2**  
General characteristics of patients affected by senile anorexia

|                               |               | Anorexic patients | Normal eating subjects | p      |
|-------------------------------|---------------|-------------------|------------------------|--------|
| Age                           | Years         | 86±6              | 79,6±7                 | < 0,01 |
| School education level        | Primary (%)   | 70,4              | 68,2                   | 0,5    |
|                               | Secondary (%) | 25,9              | 27,3                   |        |
|                               | Graduate (%)  | 3,7               | 4,5                    |        |
| Marital status                | Single (%)    | 25                | 13,6                   | 0,4    |
|                               | Widowed (%)   | 35,7              | 43,9                   |        |
| Presence of people helping to | Shop          | 83,3              | 63,6                   | 0,06   |
|                               | Cook          | 73,3              | 59,1                   |        |

A higher (although not statistically significant) level of comorbidity was present in anorexic subjects. These subjects reported constipation and epigastrium pain more frequently (respectively 73.3 and 36.7% vs 53 and 21.2%). No difference

was found for quality of life, functional and cognitive status (table 3).

**Table 3**  
Clinical, quality of life, depression, cognitive and functional status of patients affected by senile anorexia

|   |                              | Anorexic patients | Normal eating subjects | P    |
|---|------------------------------|-------------------|------------------------|------|
| Clinical status                             | Comorbidity Index            | 3,1±1,7           | 2,7±1,6                | 0,2  |
|   | Severity Index               | 1,8±0,4           | 1,7±0,6                | 0,2  |
|   | N drugs                      | 6±2               | 6±3                    | 0,9  |
|   | Constipation (%)             | 73,3              | 53                     | 0,05 |
|   | Epigastrium pain (%)         | 36,7              | 21,2                   | 0,1  |
|   | Pain (≥ level 3) (%)         | 45,5              | 70,3                   | 0,02 |
| Depression                                  | GDS score                    | 5±3               | 6±5                    | 0,2  |
|   | CORNELL score                | 11±7              | 10±8                   | 0,6  |
| Functional status                           | IADL score                   | 6,7±4             | 9±4                    | 0,01 |
|   | ADL (> 2 lost functions) (%) | 27,6              | 43,8                   | 0,3  |
|   | MMSE score                   | 22,3±6            | 24,2±4                 | 0,07 |
| Cognitive status<br>Quality of life (SF-36) | Role limitations – physical  | 4,4±1             | 5,4±1                  | 0,02 |
|   | Physical functioning         | 16,7±6            | 22,2±7                 | 0,04 |
|   | Role limitations – emotional | 4,7±1             | 4,9±1                  | 0,6  |
|   | Bodily pain                  | 6,6±3             | 5±2                    | 0,04 |
|   | General medical health       | 17,7±2            | 15,3±5                 | 0,02 |
|   | Vitality                     | 17,1±2            | 16,6±2                 | 0,3  |
|   | Social functioning           | 6,3±1             | 5,5±1                  | 0,05 |
|   | Mental health                | 21,7±2            | 20,5±3                 | 0,1  |

Legend: IADL: Instrumental Activities of daily living; ADL Activities of daily living; GDS: Geriatric Depression Scale; MMSE: Mine Mental State Examination

Nutritional status parameters (MNA, anthropometry, blood parameters) were significantly worst in anorexic subjects whereas CRP was higher (37.6±46 vs 15.3±18 mg/l). In particular MNA score was significantly lower (15.1±5 vs 23.4±4) while anthropometric measurements (AC, AMC, TSF, CC) were more frequently affected in anorexic subjects (table 4).

Chewing and swallowing efficiencies were significantly impaired in anorexic subjects, while no difference was found for sensorial perceptions (taste and olfaction). In particular swallowing difference was present in 11.1% (vs 4.8%) of anorexic subjects and the number of natural teeth was significantly lower (5±7 vs 10±11) (table 5).

Eating patterns were different for anorexic subjects with a significant reduction of protein rich foods (21.8 vs 15.3% assumes milk < 1/day, 44.8 vs 14.6% eat red meat < 4/week, 96.3 vs 56.4% eat fish less than 3/week, 78.6 vs 37.3% assumes pulses < 2/week). Anorexic subjects therefore more frequently receive dietary supplements (25 vs 10.7%) and reduced consistency meals (51.7 vs 16.7%) (table 6).

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**Table 4**  
Nutritional status of patients affected by senile anorexia

|                                    |  | Anorexic patients | Normal eating subjects | P       |
|------------------------------------|--|-------------------|------------------------|---------|
| MNA (score)                        | Screening                                  | 6,9±2             | 10,5±2                 | 0,00    |
|                                    | Global                                     | 8,3±3             | 12,9±2                 | 0,00    |
|                                    | Complete                                   | 15,1±5            | 23,4±4                 | 0,00    |
| Anthropometry                      | BMI (Kg/m <sup>2</sup> )                   | 24±5              | 26±3                   | 0,03    |
|                                    | Hand grip (Kg)                             | 9,7±5             | 14,5±5                 | 0,06    |
|                                    | AC (≤ 22 cm) (%)                           | 17,2              | 7,1                    | 0,4     |
|                                    | AMC (≤ 18,9 cm in women, 22 cm in men) (%) | 22,2              | 7,4                    | 0,2     |
|                                    | TSF (≤ 9,7 mm in women, 5,2 mm in men) (%) | 22,2              | 14,8                   | 0,7     |
|                                    | CC (≤ 31 cm) (%)                           | 65,5              | 28,9                   | 0,005   |
|                                    | Blood parameters                           | Albumin (g/dl)    | 3,2±0,6                | 3,5±0,5 |
| Prealbumin (mg/dl)                 |  | 0,011±0,004       | 0,014±0,005            | 0,5     |
| Transferrin (mg/dl)                |  | 155±23            | 209±61                 | 0,08    |
| Mucoprotein (mg/dl)                |  | 1±0,1             | 1,6±0,3                | 0,2     |
| CPR (mg/l)                         |  | 37,6±46           | 15,3±18                | 0,02    |
| Red Blood cells count (million/uL) |  | 4,095±0,7         | 4,299±1,5              | 0,5     |
| Haemoglobin (g/dl)                 |  | 11,9±1            | 12,5±2                 | 0,16    |

Legend: MNA: Mini Nutritional Assessment; BMI: body mass index; TSF: triceps skinfold thickness, AMC: arm muscle circumference; AC: arm circumference; CPR: C-reactive protein

**Table 5**  
Sensorial perceptions and chewing, swallowing functions of patients affected by senile anorexia

|                                   |   | Anorexic patients | Normal eating subjects | P    |
|-----------------------------------|---|-------------------|------------------------|------|
| Chewing efficiency                | Number of natural teeth                       | 5±7               | 10±11                  | 0,05 |
|                                   | Prosthesis wearing (%)                        | 77,8              | 62,9                   | 0,3  |
| Swallowing test                   | SpO <sub>2</sub> post test (%)                | 94±3              | 96±2                   | 0,02 |
|                                   | Swallowing difficulties (%)                   | 11,1              | 4,8                    | 0,3  |
| Sensorial perceptions – taste     | Sweet (sucrose) (>0,01M)                      | 27,3              | 29,4                   | 0,09 |
|                                   | Salty (NaCl) (>0,01M)                         | 71,4              | 81,3                   | 0,15 |
|                                   | Sour (citric acid)                            |                   |                        |      |
|                                   | 70  | 81,3              | 0,2                    |      |
| Sensorial perceptions – olfaction | Bitter (quinine-HCl) (0,32x10 <sup>-5</sup> ) | 76,2              | 64,7                   | 0,4  |
|                                   | Menthol                                       | 59,2              | 31,3                   | 0,08 |
|                                   | Phenetyl alcohol                              | 47,3              | 41,2                   | 0,8  |

**Table 6**  
Eating habits of patients affected by senile anorexia of patients affected by senile anorexia

|                     |                           | Anorexic patients | Normal eating subjects | P       |
|---------------------|---------------------------|-------------------|------------------------|---------|
| Food frequency      | Milk (< 1/day)            | 21,8              | 15,3                   | 0,5     |
|                     | Red meat (<4/week)        | 44,8              | 14,6                   | 0,02    |
|                     | Poultry (< 5/week)        | 78,5              | 30,4                   | 0,01    |
|                     | Fish (<3/week)            | 96,3              | 56,4                   | <0,001  |
|                     | Eggs (<2/week)            | 85,7              | 88,2                   | 0,06    |
|                     | Cereals (< 4/day)         | 34,3              | 62,5                   | 0,01    |
|                     | Pulses (<2/week)          | 78,6              | 37,3                   | 0,001   |
|                     | Fruit (< 2/day)           | 79,2              | 95,4                   | 0,01    |
|                     | Vegetables (>2/day)       | 68,9              | 93,8                   | < 0,001 |
| Dietary supplements |                           | 25                | 10,7                   | 0,05    |
|                     | Reduced consistency meals | 51,7              | 16,7                   | 0,001   |

**Discussion**

The main findings of the present study are two. Firstly, the study demonstrates a very high prevalence of senile anorexia in a sample of acute-ward and rehabilitation elderly patients, with subsequent important consequences on nutritional status. Secondly, it shows that the elderly anorexic subjects, as a consequence of probably impaired masticatory efficiency, feeding dependency and medical conditions, change their own eating pattern reducing in particular the whole protein intake.

Nutritional surveys show a low to moderate prevalence of frank nutrient deficiencies in free living elderly groups. The SENECA-EURONUT study, enrolling cognitively intact and free living elderly from twelve European nations, found that dietary intakes were often below the recommended levels established for younger adults but this was not reflected upon the indicators of nutritional status (27). The National Health and Nutrition Examination Survey has clearly shown a linear decline in food intake from 20 to 80 years in both men and women even if this change could be caused by a greater incidence of pathological causes in elderly people (28).

In our sample the prevalence of anorexia is quite high (31.3%). One of the possible interpretations may be the age of the patients (more than 80 years on average age) - as verified also by others authors (29) - and the number of the presented pathologies which are characterized by a high level of comorbidity.

Few papers analyse the eating patterns of patients affected by senile anorexia. The relevant decrease in food intake is generally attributed to a reduction in fat rather than in carbohydrate (29). In our study we found that foods representing a source of whole proteins (meat, fish, eggs and pulses) are significantly affected in anorexic subjects while cereals, fruits and vegetables consumption is not reduced. Masticatory reduced efficiency, leading in particular to avoid meat consumption, and caregivers' foods manipulations may explain the preference for this second group of foods of anorexic elderly.

Moreover it has been found that the number of teeth and the masticatory efficiency (not improved by the presence of dental prosthesis) were more affected in anorexic subjects than controls. In literature poor dentition or ill fitting dentures are often mentioned as a factor affecting nutrition of elderly people and even masticatory efficiency of removable denture is much less than that of complete natural dentition. According to most studies, a functionally inadequate dental status affects micronutrient intake: for edentulous subjects in the SENECA study intakes of carbohydrates and vitamin B6 especially, but also to a lesser extent for vitamins C and B1, dietary fibre, calcium and iron, were reduced (30-31).

Senile anorexia is commonly attributed also to alterations in the hedonic qualities of food. In fact aging is characterized by a reduction in sensorial perceptions: visus sharpness decreases, olfactory and gustative thresholds increases, hearing and tactile discriminative capacity decreases. In particular taste and smell

are key determinants of the palatability of food. With advancing age taste and smell changes occur and the impairment is mainly related to chemosensory losses which can lead to poor appetite, inappropriate food choices and lower nutrient intake (32-33). In the sample studied no differences in flavour or taste perceptions between anorexic and normal-eating subjects have been found. These data may be attributed to the impossibility to administer the sensory perceptions test because of a high rate of cognitive impaired subjects.

One of the causes of anorexia of aging is the loss of motivation to eat that may be due to depression and social networks loss or deterioration.

Social factors, like poverty, inability to shop, to feed one's self, to prepare and cook meals, may contribute to decreased food intake in the elderly. Less energy is acquired during meals taken alone respect to meals eaten in company, being the difference in energy intake of 30% circa (34-36).

The data examined show that anorexic subjects were more dependent for food purchase and cooking while any difference between anorexic and non-anorexic subjects related to school education level, to marital status and to live-in typology have been found.

Depression has been shown to be one of the most important treatable causes of weight loss in both community and institutional settings. Depression is related to loneliness, low self-esteem, intolerance against the environment, retirement from job, loss of a relative or a pet, hospitalisation or retirement in a nursing home. The prevalence of depression is high in the elderly. Geriatric Depression Scale (GDS) scores above the cut-off of 5 were found in about 12% of the men and 28% of the women enrolled in the SENECA study. There was a significant negative correlation between GDS score and cholesterol blood levels. Successful treatment of depression in nursing home residents results in reversal of weight loss. Weight loss and senile anorexia were found to be important symptoms related to increased mortality in depressed elderly (37-40).

The scales used to analyse depression, in the present study, give conflicting results: the GDS score is lower in anorexic subjects while the score to the Cornell Depression scale is higher. One of the possible reason may be due to the different characteristics of the scales: subjective the first and objective the second one. The GDS is thus more probably affected, and by this way distorted, by cognitive status resulted frequently impaired in the sample.

Decline in food intake in the elderly may be due also to several medical conditions such as: 1. disability (even if little information exists on the association of disabilities and macronutrient intakes while limitations in daily life activities are considered a key cause of weight loss); 2. gastrointestinal disorders and malabsorption deficiencies (swallowing disorders are both associated with aspiration and decreased food intake; dyspepsia is extremely common in older persons and it is associated with anorexia; persons with intestinal bacterial overgrowth have been shown to lose weight associated with

both anorexia and malabsorption and helicobacter pylori infection prevalence increases with age and may play a role in anorexia); 3. acute and chronic infections (chronic obstructive pulmonary disease, for example, produces anorexia secondary to oxygen desaturation and increased metabolism due to increased activity of the respiratory muscles); 4. hypermetabolism and hypercatabolism (causing increased energy and protein requirements and producing their anorectic and wasting effects by releasing cytokines) (41-48).

These data have been confirmed by severity and comorbidity indexes found in the sample studied which resulted higher in anorexic subjects. Moreover elevated PCR levels have been more frequently detected explaining recent hypermetabolic pathologies affections. As regard the number of medications used it was similar in both anorexic and non-anorexic subjects. It should be noted that certain symptoms, like pain and constipation, seem to represent, in the sample, a link between clinical status and anorexia.

Any correlation between certain type of drugs administered and the reduction of food intake have not been found, even if in the literature the side effects of drugs have been reported as a major cause of weight loss in older persons both free-living or institutionalised. Mechanism behind drugs related nutritional intake affection are decrease of appetite (digoxin, amiodarone, spironolactone, cimetidine, amitriptyline, most antibiotics, metronidazole, ...), malabsorption, nausea or vomiting (sorbitol, theophyllin elixir, laxatives, ...), increase of metabolism (excess thyroxine replacement, theophylline, ...), depletion of body's mineral stores (aluminium or magnesium hydroxide antacids, ...). In addition drugs induced depression, cognitive impairment and constipation may cause food refusal (43, 44, 46, 47, 49). Over 250 drugs have been clinically reported to alter taste and/or smell and, compared to young individuals, the average detection thresholds for elderly individuals, with one or more medical conditions and assuming an average of 3.4 medications, were 11.6 times higher for sodium salts, 4.3 times higher for acids, 7.0 times higher for bitter compounds, 2.7 times higher for sweeteners (32, 48).

Anorexia of aging represents a cause of malnutrition and, by this way, is consistently associated with increased mortality and functional disability (50). In particular malnutrition (whether energetic or protein-energy) which may negatively influence the clinical outcome of rehabilitation programmes, confirming that a convenient nutritional status helps the achievement of such a condition and it is absolutely essential when recovering from acute illnesses (51). The present study show that malnutrition risk - assessed by MNA - and parameters commonly used as indexes of malnutrition (albumin, transferrin, calf circumference, haemoglobin in particular) were severely affected in anorexic subjects.

A further demonstration of the importance of nutritional status has been pointed out by several studies showing that, after the age of sixties, weight loss is associated to a decline in muscle mass and consequently in muscle strength. The picture

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just mentioned is well-known as sarcopenia, which plays a main role in the beginning of: frailty, functional and metabolic impairments, physical disabilities that expose the elderly to an increased risk of falls and protein-energy malnutrition. The obese elderly also affected by protein malnutrition configure the so called fat frail who obtains worse outcomes in rehabilitation programmes (52). The study confirms these data: muscle strength – assessed with hand grip test - and IADL score were lower in anorexic subjects.

Quality of life may be both a cause of anorexia or a consequence of the worsening of nutritional status. Quality of life (social function, physical symptoms, cognitive status, depression, autonomy) assessed with the SF-36 (25) was characterised, in the sample, by an impairment in 5 out of the 8 scales (“bodily pain”, “general health”, “vitality”, “social functioning” and “mental health”).

Consequences of anorexia can be extremely serious and deeply affect both patient’s morbidity, mortality and quality of life. Therefore, it is of utmost importance to insert a special evaluation of the nutritional risk in the Comprehensive Geriatric Assessment, to constantly evaluate the nutritional status and feeding intake of older patients, to identify and treat the underlying disease when possible, to institute environmental and behavioural modifications, to organise staff better in order to produce higher quality feeding assistance during mealtimes, to plan early nutrition rehabilitation and nutritional education programs for caregivers (47, 54-56). In the sample 25% of anorexic subjects received oral supplement while 51.7% had a consistency modified diet. In most cases, however, these interventions were not related to the cause of anorexia. These last data confirm the necessity to develop diagnostic procedures easy to perform, able to identify the pathogenesis of anorexia and, therefore, treatment strategies exactly fitting the patients’ needs.

**Acknowledgments:** This work was supported by the Italian Research Ministry grants COFIN-MIUR 2005067913. The following coauthors have contributed to the recruitment/evaluation of patients and to the preparation of the manuscript by providing useful comments: 1. Departments of Medical Physiopathology (Food Science Section) and Clinical Medicine – “Sapienza” University of Rome (Italy) and Rehabilitation Clinical Institute “Villa delle Querce” - Nemi (Rome – Italy): M Cuzzolaro, A Laviano, A Cascino, C Ramaccini, B Neri, C Civalo, P Ceccarelli, AL Tassi, A Pinto. 2. S.Orsola-Malpighi Hospital, Bologna (Italy): E Strocchi. 3. Department of Medical and Surgical Sciences, Geriatrics Section, University of Padua (Italy): G Enzi, F Miotto, M Simonato. 4. Geriatric Unit, Dept. of Internal Medicine and Emergent Pathologies, University of Palermo (Italy): G Di Bella, M De Leo

## References

1. Bienia, R., Ratcliff, S., Barbour, G.L., et al., (1982). Malnutrition in hospitalized geriatric patients. *J. Am. Geriatr. Soc.* 30, 433-436.
2. Bistran, B.R., Blackburn, G.L., & Naylor, J. (1974). Protein status of surgical patients. *JAMA*, 230, 858-860.
3. Albiin, N., Asplund, K., & Bjerner, L. (1982). Nutritional Status of medical patients on emergency admission to hospital. *Acta Med. Scand.*, 212, 151-156.
4. Covinsky, K.E., Martin, G.E., Beyth, R.J., Justice, A.C., Sehgal, A.R., & Landefeld, C.S. (1999). The relationship between clinical assessments of nutritional status and adverse outcomes in older hospitalized medical patients. *J. Am. Geriatr. Soc.* 47, 532-538.
5. Lipschitz, D.A. (1991). Malnutrition in the elderly. *Semin. Dermatol.* 10, 273-281.
6. Guigoz, Y., & Vellas, B.J. (1997). Malnutrition in the elderly: the mini nutritional assessment (MNA). *Ther. Umsch.* 54, 345-350.
7. Mowé, M., & Bøhmer, T. (1991). The prevalence of undiagnosed protein-calorie undernutrition in a population of hospitalized elderly patients. *J. Am. Geriatr. Soc.*, 39, 1089-1092.
8. Dick, A., Garber, A.M., & MaCurdy, T.A. (1994). Forecasting nursing home utilization of elderly Americans. In D.A. Wise (Ed.), *Studies in the Economics of Aging* (pp. 365-394). Chicago: The University of Chicago Press
9. Vellas, B.J., Hunt, W.C., Romero, L.J., Koehler, K.M., Baumgartner, R.N., & Garry, P.J. (1997). Changes in nutritional status and patterns of morbidity among free-living elderly persons: a 10-year longitudinal study. *Nutrition*, 13, 515-519.
10. L De Bernardini, L.M. Donini, A Tagliacocca, MR De Felice, A Palazzotto, L Girvasi (2002). Un'esperienza di Riabilitazione Geriatrica. *Giorn Gerontol* 2002, 50, 95-107
11. Donini, L.M., De Bernardini, L. De Felice, M.R., Savina, C., Coletti, C. & Canella, C.T. (2002). Impact of nutritional status on clinical outcome in a population of geriatric rehabilitation patients. In press: *Aging Clin Exp Res* 2004
12. Morley, J.E. & Silver, A.J. (1988). Anorexia in the elderly. Causes range from loose dentures to debilitating illness. *Neurobiology of Aging*, 9, 9-16
13. Morley, J.E., & Thomas, D.R. (1999). Anorexia and aging: pathophysiology. *Nutrition*, 15, 499-503.
14. MacIntosh, C., Morley, J.E., & Chapman, I.M. (2000). The anorexia of aging. *Nutrition*, 16, 983-995.
15. Morley, J.E. (2001). Anorexia, sarcopenia, and aging. *Nutrition*, 17, 660-663.
16. American Psychological Association (2000). *Diagnostic and Statistical Manual of Mental Disorders DSM-IV*. Washington, DC: APA.
17. Parmelee PA, Thuras PD, Katz IR, Lawton MP. Parmelee PA, Thuras PD, Katz IR, Lawton MP. Validation of the Cumulative Illness Rating Scale in a geriatric residential population. *J Am Geriatr Soc.* 1995 Feb;43(2):130-7
18. Guigoz Y et al: The Mini Nutritional Assessment: a practical assessment tool for grading the nutritional state of elderly persons (Third Edition). Facts, research and intervention in gerontology. Serdi Publishing Company – 1997, Paris (France) pag. 15-60); Rubenstein LZ et al: *J Gerontol A Biol Sci Med Sci.* 2001 Jun;56(6):M366-72
19. Lohman TG, Roche AF, Martorell R. *Manuale di riferimento per la standardizzazione antropometrica*. Milano: EDRA, 1992
20. Yesavage JA, Brink TL, Rose TL: Development and validation of a geriatric depression rating scale. *J Psych Res* 1983, 17, 27
21. Alexopoulos GS, Abrams RC, Young RC, Shamoian CA Use of the Cornell scale in nondemented patients. *J Am Geriatr Soc.* 1988 Mar;36(3):230-6.
22. Katz S: Progress in the development of the index of ADL. *Gerontologist* 1970;1: 20-30
23. Lawton MP, Brody EM: Assessment of older people: self-maintaining and instrumental activities of daily living. *Gerontologist.* 1969 Autumn;9(3):179-86
24. Folstein MF, Folstein SE, McHugh PR “Mini-Mental state”. A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res.* 1975 Nov; 12(3):189-198
25. Ware JE, Sherbourne CD: The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care.* 1992 Jun;30(6):473-83.
26. McHorney CA, Bricker DE, Kramer AE, Rosenbek JC, Robbins J, Chignell KA, Logemann JA, Clarke C.: The SWAL-QOL outcomes tool for oropharyngeal dysphagia in adults: I. Conceptual foundation and item development. *Dysphagia.* 2000 Summer;15(3):115-21
27. Euronut-SENECA De Groot CGPM, Van Staveren WA, Hautvast JGAG eds: A concerted action on nutrition and health in Europe. *Eur J Clin Nutr* 1991, 45 suppl, 3, S1-196
28. Anonymous. Daily dietary fat and total food energy intakes. 3rd NHANES, phase III 1988-1991. *MMWR Morb Mortal Wkly Rep* 1994, 43, 116-25
29. Wurtmann JJ, Lieberman H, Tsay R: Calorie and nutrient intakes of elderly young subjects measured under identical conditions. *J Gerontol* 1988, 43, B174-180
30. De Groot CPGM, van Staveren WA, de Graaf C: Determinants of macronutrients intake in elderly people. *Eur J Clin Nutr* 2000, 54, S3, 70-6
31. Haller J, Weggemans RM, Lammi-Keefe CJ, Ferry M: Changes in the vitamin status of elderly Europeans. *Eur J Clin Nutr* 1996, 50, S2, 32-46
32. Schiffman SS, Graham BG: Taste and smell perception affect appetite and immunity in the elderly. *Eur J Clin Nutr* 2000, S3, 54-63
33. Mulligan C, Moreau K, Brandolini M, Livingstone B, Beaufrère B, Boire Y: Alterations of sensory perceptions in healthy elderly subjects during fasting and refeeding. *Gerontology* 2002, 48, 39-43
34. McIntosh WA, Shifflett PA, Picou JS: Social support, stressful events, strain ,dietary intake and the elderly. *Med Care* 1989, 27, 140-53
35. Rosenbloom CA, Whittington FJ: The effects of bereavement on eating behaviours and nutrient intakes in elderly widowed persons. *J Gerontol* 1993, 48, S223-9
36. Thompson MP, Morris LK: Unexplained weight loss in the ambulatory elderly. *JAGS* 1991, 39, 497-500
37. Haller J, Weggemans RM, Ferry M, Guigoz Y: Mental health: MMSE and GDS of elderly Europeans in the SENECA study of 1993. *Eur J Clin Nutr* 1996, 50, S2, 112-6
38. Morley JE, Kraenzel D: Weight loss. *JAGS* 1995, 43, 82-3
39. Pulska T, Pahkala K, Laippala P; Kivela SL: Depressive symptoms predicting six-

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- year mortality in depressed elderly finns. *Int J Geriatr Psych* 2000, 15, 940-6
40. McIntoch JL, Hubbard RW: Indirect self-destructive behaviour among the elderly. *J Gerontol Soc Work* 1988, 13, 37-48
41. Reynish W, Andrieu S, Nourhashemi F, Vellas B: Nutritional factors and Alzheimer's disease. *J Gerontol A Biol Sci Med Sci* 2001 Nov;56(11):M675-80
42. Young KW, Greenwood CE: Shift in diurnal feeding patterns in nursing home residents with Alzheimer's disease. *J Gerontol A Biol Sci Med Sci* 2001 Nov;56(11):M700-6
43. Chrischilles EA, Foley DJ, Wallace RB, Lemke JH, Semla TP, Hanlon JT: Use of medications by persons 65 and over. *J Gerontol* 1992, 47, M137-144
44. Carr-Lopez SM, Phillips SM: The role of medications in geriatric failure to thrive. *Drugs Aging* 1996, 9, 221-5
45. Bernstein M, Tucker K, Ryan M: Higher dietary diversity is associated with better nutritional status in frail elders. *FASEB J* 1999, A695
46. Kane RA, Caplan AL, Urv-Wong EK: Everyday matters in the lives of nursing home residents. *JAGS* 1997, 45, 1086-93
47. Marcus EL, Berry EM: Refusal to eat in the elderly. *Nutr Rev* 1998, 56, 163-171
48. Schiffman SS: Perception of taste and smell in elderly persons. *Crit Rev Food Science Nutr* 1993, 33, 17-26
49. Morley JE: Anorexia of aging. *Am J Clin Nutr* 1997, 66, 760-73
50. Horwitz BA, Blanton CA, McDonald RB: Physiologic determinants of the anorexia of aging. *Annu Rev Nutr* 2002, 22, 417-43
51. Gazewood JD, Mehr DR: Diagnosis and management of weight loss in the elderly. *J Fam Pract* 1998, 47, 19-25
52. Stevens J: Impact of age on association between weight and mortality. *Nutr Rev* 2000, 58, 129-137
53. Morley JE: Decreased food intake with aging. *J Gerontol A Biol Sci Med Sci* 2001 Oct;56 Spec No 2(2):81-8
54. Rivière S, Gillette-Guyonnet S, Voisin T, Reynish E, Andrieu S, Lauque S, Salva A, Frisoni G, Nourhashemi F, Micas M, Vellas B: A nutritional education program could prevent weight loss and slow cognitive decline in Alzheimer's disease. *J Nutr Health Aging* 2001, 5, 295-9
55. Thomas DR, Ashmen W, Morley JE, Evans WJ: Nutritional management in long-term care: development of a clinical guideline. Council for Nutritional Strategies in Long-Term Care. *J Gerontol A Biol Sci Med Sci* 2000 Dec;55(12):M725-34
56. Wilson MM, Purushothaman R, Morley JE: Effect of liquid dietary supplements on energy intake in the elderly. *Am J Clin Nutr* 2002 May;75(5):944-7