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Undernutrition in nursing home rehabilitation patients

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SUMMARY

Objective: To examine the prevalence of undernutrition, received dietetic treatment and self-perception of nutritional status in older patients admitted to Dutch nursing home rehabilitation wards.
Methods: Between December 2012–February 2014, we included 190 patients (≥65 y) admitted to seven nursing home rehabilitation wards. Nutritional status in the first week of admission was characterized as: severely undernourished (>10% unintentional weight loss in the past six months and/or >5% unintentional weight loss in the past month and/or BMI < 20 kg/m^2), moderately undernourished (5–10% unintentional weight loss in the past 6 months and/or BMI 20–22 kg/m^2), well-nourished (<5% unintentional weight loss in the past 6 months and BMI 22–28 kg/m^2) and overweight (BMI>28 kg/m^2). Primary diagnosis was categorized as: trauma, elective orthopaedics, stroke and other. Perceived nutritional status was determined with the question: 'Do you currently consider yourself undernourished?' (yes/no). Information regarding dietetic treatment was obtained from medical records.
Results: A complete dataset was obtained from 179 patients (70% female, age 81 ± 8 y). 26% of the patients was found to be severely undernourished and 14% moderately undernourished. Prevalence of undernutrition did not differ by sex or age. Of all undernourished patients, 56% had been treated by a dietitian. Only one out of five of undernourished patients considered themselves undernourished. Elective orthopaedics patients had the lowest prevalence of undernutrition (19%) while patients categorised as 'other' had the highest prevalence (51%).
Conclusion: More than one in three older patients in Dutch nursing home rehabilitation wards are moderately to severely undernourished. Out of these patients the majority does not consider themselves undernourished and almost half has not received dietetic treatment. More attention to undernutrition in nursing home rehabilitation patients seems necessary.

1. Introduction

Rehabilitation in Dutch nursing homes consists of integrated multidisciplinary care, focussing on the recovery of function and participation in frail older adults after an acute illness or functional decline, with the aim of returning to the pre-admission living situation. The geriatric rehabilitant is characterized by multiple comorbidities and frailty. Treating complications and controlling comorbidities (e.g. diabetes mellitus, renal impairment, cognitive and mood disorders, heart failure, COPD and arthritis) is of major importance in the rehabilitation process [1]. Geriatric rehabilitation aims are commonly described in terms of physical recovery, improvement in functional performance and quality of life.

Older adults are known to be at high risk of undernutrition [2]. Undernutrition is described as chronic or acute condition of the body in which a deficiency or imbalance of energy, protein and other nutrients leads to negative effects on function, clinical outcomes and body composition [3]. Considering the consequences of undernutrition, it is most likely that undernutrition has a negative effect on the rehabilitation process of elderly patients. It may

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influence the clinical results, but also affect the progress towards rehabilitation goals [4].

Prevalence rates of (high risk of) undernutrition range from 6 to 68% [5–9], depending on the definition used to determine undernutrition and the specific study population. Recent research in Dutch rehabilitation clinics has shown that 6% of the older patients were moderately undernourished and 23% severely undernourished. These rehabilitation patients often suffered from both undernutrition and obesity [10]. However, it is not known whether these prevalence rates can be extrapolated to nursing home rehabilitation patients. Estimates of the prevalence of undernutrition and its treatment among the older adults in nursing home rehabilitation wards are lacking.

The aim of the present study was to investigate the prevalence of undernutrition of older patients admitted to Dutch nursing home rehabilitation wards, to examine self-perceived undernutrition, to assess the dietetic treatment they received and to identify the differences in characteristics between well-nourished and undernourished patients.

2. Materials and methods

2.1. Subjects

This cross sectional study was carried out at the nursing home rehabilitation wards of *Zorgpartners Midden-Holland (Ronssehof Rehabilitation Centre)* and *Amstelring (Sint Jacob*, *Vreugdehof*, *De Drie Hoven*, *Leo Polak*, *Groenelaan*, *Bornholm*), both located in the Netherlands. These rehabilitation wards provide temporary care for patients recovering from their illness or injuries. From December 2012 until February 2014, patients 65 years-of-age or older admitted to any of the rehabilitation wards were screened within the first week of admission to determine eligibility based on current medical records. A sample was recruited by identifying all patients admitted to the wards within the preceding 24 h at the time that the researcher was available (usually two days a week).

Patients with severe cognitive impairment (as judged by health care providers or family), patients with an expected length of stay less than two weeks and non-Dutch/English speaking patients were excluded. All patients received written and verbal information on the purpose of the study so that informed consent could be given prior to participation to the study. The research protocol had been previously approved by the ethics committee of *Zorgpartners Midden-Holland* and the Ethics Review board of the VU University Medical Center. Data was collected by experienced dietitians and trained interns.

2.2. Self-perceived undernutrition and nutritional status

Before anthropometric measurements were taken, patients answered two questions about their perception of nutritional status and current weight: 1) 'What do you think of the weight that you have right now?' With the possible replies: underweight, normal weight, overweight 2) 'Do you currently find yourself undernourished?' with answering categories yes and no.

Nutritional status in the first week of admission was defined as severely undernourished when they met one or more of the following criteria: $\geq$10% unintentional weight loss in the past six months and/or $\geq$5% unintentional weight loss in the past month and/or BMI <20. Patients were defined as moderately undernourished when they met the following criteria: 5–10% unintentional weight loss in the past six months and/or BMI 20–22. Patients were defined as well-nourished when <5% unintentional weight loss in the past 6 months and BMI 22–28 kg/m^2 and patients were defined as overweight when BMI>28 kg/m^2 [11–13].

Information about receiving dietetic treatment was retrieved from patient records. Unintentional weight loss was obtained by either asking the patient or, when available, comparing recorded body weights in the patient files (n = 12).

2.3. Anthropometric measurements

All patients were weighed by a nurse during the first week of admission on a calibrated weighing chair or platform. Weight was measured to the nearest 0.1 kg. Height was measured with the knee height method (distance from the sole of the foot to the anterior surface of the thigh with ankle and knee each flexed to a 90° angle) to the nearest 0.5 cm with a flexible, non-stretchable measuring tape (Seca). The total body height was calculated using the LASA formula [14].

When it was not possible to measure knee height due to patients being unable to take off their shoes or due to the presence of bandages, the height documented on an identity card or a passport was used (n = 24). Body mass index (BMI) was calculated as weight (kg) divided by height (m) squared.

Mid upper arm circumference (MUAC) was measured twice to the nearest 0.5 cm using a flexible, non-stretchable measuring tape (Seca). The circumference of the non-dominant arm midway between the bony protrusion on the shoulder (acromion) and the point of the elbow (olecranon) was measured. Bioelectrical impedance analysis (BIA) was used to estimate fat free mass index (FFMI). Body resistance (R, Ohm) was measured using a Bodystat 1500 MDD (Euromedix, Belgium) at a frequency of 50 kHz. Fat free mass (kg) was predicted with the equation of Kyle $[-4.104 + (0.518 * height^2/resistance) + (0.231 * weight) + (0.130 * reactance) + (4.229 * sex)]$ [15]. Fat free mass index was calculated as fat-free mass (kg) divided by height (m) squared.

2.4. Medical factors

Of each participant a list of all primary diagnoses (reasons for admission) was obtained from the current medical records and hospital discharge records. The patients were divided in four main categories, according to their primary diagnosis: 1) Trauma, 2) Elective orthopaedics, 3) Cerebrovascular accident (CVA) and 4) Other. Trauma included patients with an operative hip fracture, vertebral fractures, fractures of the femur, humerus fractures, pelvic fractures or other fractures. Elective orthopaedics included patients with a replacement, generally a hip and knee or a revision of a previously placed prosthesis. The category CVA consisted of patients with a stroke or brain haemorrhage. The category 'other' contained a variety of conditions mostly concerning the cardiovascular, pulmonary and musculoskeletal systems.

2.5. Functional factors

Functional ability was measured with the Barthel-index (BI) [16] and the Functional Ambulant Classification (FAC) [17]. The BI gives an indication of a patients performance on ten activities of daily living (ADL): bowel and bladder care, feeding, grooming, toilet use, transfers, ambulation, dressing, stair climbing and bathing. The total score ranges from 0 to 20; 0–4 points: Total dependence, 5–9 points: Severe dependence, 10–14 points: Moderate dependence, 15–19 points: Slight dependence, 20 points: ADL Independence. Ambulatory ability was defined using FAC as one of six functional levels of ambulation: FAC 0: Non functional Ambulation; FAC 1: Ambulator-Dependent for physical assistance Level II, FAC 2: Ambulatory-Dependent for physical assistance Level I, FAC 3: Ambulator-Dependent for supervision, FAC 4: Ambulator-Independent level surfaces only, FAC 5: Ambulator-Independent.

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Handgrip strength (kg) was measured using a calibrated hydraulic hand dynamometer (Saehan, Masan corporation, Korea). Each participant performed two maximum grip strength trials with each hand, while seated with the shoulders adducted, elbows flexed 90° and the forearms in neutral position according to the American Society of Hand Therapists recommendations [18].

Any difficulties with chewing and/or swallowing were identified with the question 'Do you experience difficulties with chewing or swallowing?' with answering categories yes and no.

2.6. Statistics

Descriptive statistics were used to express means, standard deviations, frequencies and percentages to describe the characteristics of the study population. Chi-square tests were used to assess the relationship of patients' characteristics and nutritional status and to assess differences in the prevalence of overweight patients between primary diagnoses. Differences between undernourished and well-nourished patients were identified using the independent-samples t-test (continuous variables) and chi-square tests (categorical variables). Differences were considered statistically significant at $p < 0.05$. All analyses were performed using IBM SPSS statistics 22.0.

3. Results

Between December 2012 and February 2014, 432 patients were admitted for rehabilitation of whom 41 were younger than 65 years and 146 patients were admitted on days the researcher was not available. A total of 245 patients were assessed for eligibility of which 42 were excluded and of which 13 refused to participate (Fig. 1).

Patients characteristics are presented in Table 1. Mean age was 81.1 y (SD 7.9) and varied between 65 and 101 years and 73 patients (41%) were older than 85 years. Out of the 190 eligible patients 179 provided a complete dataset on nutritional status.

A total of 51 patients (26%) were found to be severely undernourished and 27 patients (14%) were moderately undernourished. The prevalence of undernutrition was similar in men (44%) and women (43%, $p = 0.88$) and similar between age groups (65–75 y: 30%, 75–84 y: 50% and ≥85 y: 43%, $p = 0.11$).

Almost 25% of patients was found to be overweight (BMI >28 kg/m2). There were no statistically significant differences in the prevalence of overweight patients between primary diagnoses (trauma 24%, elective orthopaedics 31%, CVA 28% other 17%, $p = 0.413$). Six (8%) overweight patients were found to be also undernourished. Primary diagnosis for these undernourished overweight patients was diverse: trauma (n = 3), CVA (n = 2) and other (n = 1).

The majority of patients (66%) were undernourished based on unintentional weight loss criterion. Out of the severely undernourished, 16% was undernourished based solely on low BMI.

Out of all patients, 36% had been treated by a dietitian. Although undernourished patients were significantly more often treated by a dietitian than well-nourished patients (56% vs 21%, $p = <0.001$), about 44% of undernourished patients had received no dietetic

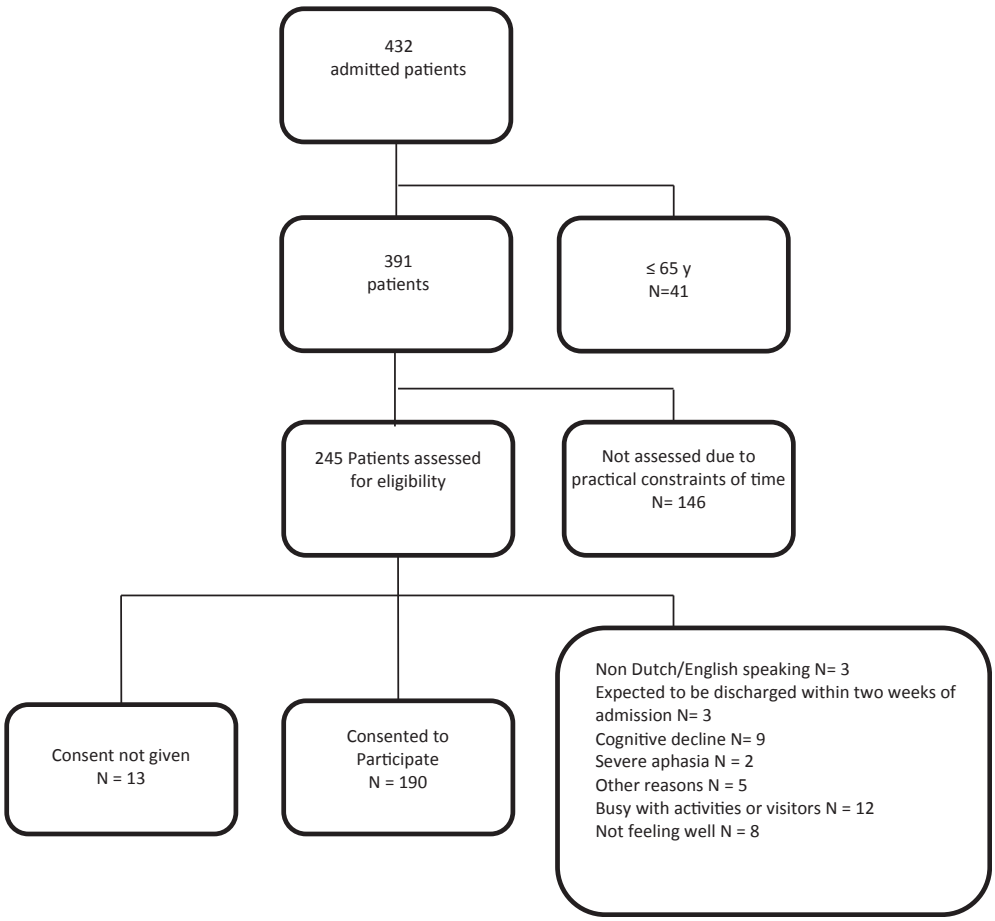

Fig. 1. Flow-chart.

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Table 1
Characteristics of rehabilitation patients.

	All (179)	Undernourished (78)	Well-nourished (101)
Age (Y)	81.1 ± 7.9	81.7 ± 7.7	80.7 ± 8.1
BMI (mean ± SD)[a]	25.2 ± 5	21.8 ± 3.6	27.6 ± 4.7
Percentage weight loss 6 months (mean ± SD)[a]	3.6 ± 5.8	7.7 ± 7	0.6 ± 1.5
FFMI (mean ± SD)[a,b]	16.2 ± 2.9	15.2 ± 2.9	17.6 ± 2.5
MUAC (mean ± SD)[a,c]	27.7 ± 4.2	25.2 ± 3.5	29.4 ± 4
Handgrip strength (mean ± SD)[d]	20.4 ± 8.3	19.8 ± 8.6	20.9 ± 8.1
Sex, female n (%)	125 (70)	71 (70)	54 (69)
Loss of appetite n (%)	92 (51)	44 (56)	48 (48)
Difficulties with chewing or swallowing n (%)[a]	15 (8)	12 (15)	3 (3)
BMI <20 n (%)	21 (12)	21 (27)	–
BMI 20–22 n (%)	28 (15)	28 (36)	–
BMI 22–28 n (%)	89 (50)	23 (30)	66 (65)
BMI>28 n (%)	41 (23)	6 (8)	35 (35)
Self-perceived undernutrition n (%)[a]	15 (8)	14 (18)	1 (1)
Self-perceived underweight n (%)[a]	41 (23)	35 (35)	6 (6)
Self-perceived overweight n (%)[a]	38 (21)	4 (5)	34 (34)
Barthel score n (%)	7 (4)	4 (5)	3 (3)
Total dependence			
Severe dependence	51 (28)	24 (31)	27 (27)
Moderate dependence	74 (41)	34 (44)	40 (49)
Slight dependence	46 (26)	16 (20)	30 (30)
ADL independence	1 (1)	–	1 (1)
FAC score n (%)			
Fac 0	31 (16)	13 (17)	15 (15)
Fac 1	31 (16)	12 (15)	14 (14)
Fac 2	30 (16)	10 (13)	19 (19)
Fac 3	54 (29)	25 (32)	29 (28)
Fac 4	39 (21)	16 (20)	23 (23)
Fac 5	4 (2)	2 (3)	1 (1)
Dietetic treatment n (%)[a]	65 (36)	44 (56)	21 (21)

BMI, body mass index; FFMI, fat free mass index; MUAC, mid-upper arm circumference; FAC, functional ambulation categories.
[a] Indicates significance.
[b] Data missing for 43 patients; undernourished n = 21, well-nourished n = 22.
[c] Data missing for 3 patients; undernourished n = 1, well-nourished n = 2.
[d] Data missing for 54 patients; undernourished n = 24, well-nourished n = 30.

treatment. When we compared the presence of measured undernutrition with self-perceived undernutrition, results showed that only one out of five (severely and moderately) undernourished patients considered themselves undernourished.

Elective orthopaedics patients were less likely to be undernourished than the other patients groups (OR 0.2 (95% CI: 0.98–0.59)). There were no further statistically significant differences in the prevalence of undernutrition between patient groups (trauma 48%, stroke 46%%, and other 37%, Fig. 2). The category 'Other' contained mostly cardiovascular diseases (17%), musculoskeletal system disorders (15%), respiratory diseases (10%) and oncology (10%).

BIA data was missing for 43 patients due to various reasons, mostly due to patients having a pacemaker (23%) or being bandaged (26%). Mean FFMI of well-nourished patients was found to be 2.33 kg (95% CI, 1.42 to 3.26) higher than undernourished patients ($p < 0.001$).

Handgrip strength was performed in 128 patients. The mean handgrip strength was 22.5 kg (SD 7) in men and 15.2 kg (SD 6.5) in women. Mean handgrip strength of well-nourished patients was 1.04 kg (95% CI −2.01 to 4.08) higher compared to undernourished patients. However, this difference was not found to be statistically significant ($p = 0.50$). The undernourished and well-nourished group did not differ in physical functioning according to the Barthel-index and FAC score.

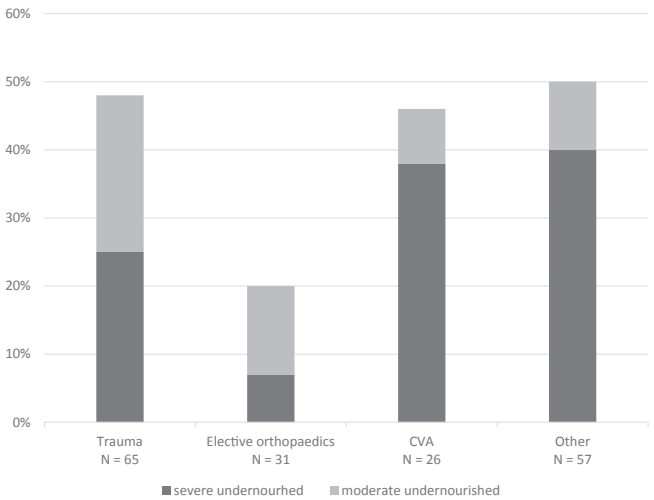

Fig. 2. Nutritional status by primary diagnosis.

4. Discussion

This is one of the first studies examining the nutritional status of older adults admitted to nursing home rehabilitation wards. More than one in three older patients in Dutch nursing home rehabilitation wards were moderately or severely malnourished. Unintentional weight loss was present in two-thirds of the undernourished patients.

The prevalence of severe and moderate undernutrition identified in the present study (43%) is lower than that reported in hospital settings in which rates between 53% and 97% are documented [5–9]. However, most previous studies used the Mini Nutritional Assessment (MNA) for defining undernutrition. When using the

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same criteria as used in the MNA, the present study shows a prevalence of 65% moderate and severe undernutrition. The number of patients who are not only undernourished, but also overweight is similar compared with the older adults of the study of Hertroijs et al. [10] carried out in 11 Dutch rehabilitation centres (8% vs 13%).

Good nutritional status is likely to contribute to the successful rehabilitation of geriatric patients, however, half of the undernourished patients had not been treated by a dietitian. When we compared presence of measured undernutrition to self-perceived undernutrition, we found that only one out of five undernourished patients considered themselves undernourished. Raising awareness of the condition, early recognition and referral for dietetic treatment may contribute to improving patients rehabilitation.

Data on nutritional status in rehabilitation wards of nursing homes is scarce. For this reason, the strength of this study lies in its unique study population. However, there are some limitations to our study. In this population body height was often difficult to assess. We used estimated standing height from knee height, or height mentioned on an identity card or a passport. It is possible that height on identity cards or passports was based on height measurements when the patients were young and people lose height as they age. Thus, for some patients current height may have been overestimated. Documented records of weight changes were often not available. Instead patients were asked whether they had lost or gained weight in the previous few months. This could have biased the results because people could over- or underestimate their weight. Another limitation is that it was not possible to study consecutive series of patients admitted to the rehabilitation wards. Although there were no differences in age and sex between those assessed and not assessed for eligibility, these groups may have differed in other parameters reducing the generalizability of our results.

Furthermore, patients with severe cognitive impairment were excluded from this study. It is possible that these patients are more often undernourished than patients without cognitive decline [19]. This may have caused the prevalence of undernutrition to be underestimated, however, the number of patients excluded due to cognitive decline was rather small ($n = 9$).

Data on comorbidities and severity of diseases could have provided a better description of our sample, but such data was not available. This study will importantly contribute to raising greater awareness of undernutrition in this setting and to the need for more research. This includes research to better describe the characteristics of undernourished patients in this setting and the relationship with clinical outcomes. Additionally, future research is required to investigate whether nutritional treatment in those with undernutrition can effectively support the rehabilitation process.

In conclusion, this study indicates that the prevalence of undernutrition in older nursing home rehabilitation patients is substantial. The majority of the undernourished patients do not consider themselves undernourished and almost half of these patients had not received dietetic treatment. More attention to undernutrition in nursing home rehabilitation patients seems necessary.

Conflict of interest

No conflict of interest.

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