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Original article

Prevalence and determinants for malnutrition in geriatric outpatients

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SUMMARY

Background & aims: Few data is available on the nutritional status of geriatric outpatients. The aim of this study is to describe the nutritional status and its clinical correlates of independently living geriatric older individuals visiting a geriatric outpatient department.
Methods: From 2005 to 2010, all consecutive patients visiting a geriatric outpatient department in the Netherlands were screened for malnutrition. Nutritional status was assessed by the Mini Nutritional Assessment (MNA). Determinants of malnutrition were categorized into somatic factors (medicine use, comorbidity, walking aid, falls, urinary incontinence), psychological factors (GDS-15 depression scale, MMSE cognition scale), functional status (Activities of Daily Life (ADL), Instrumental ADL (IADL)), social factors (children, marital status), and life style factors (smoking, alcohol use). Univariate and multivariate logistic regression analyses, adjusted for age and sex and all other risk factors were performed to identify correlates of malnutrition (MNA $<$ 17).
Results: Included were 448 outpatients, mean (SD) age was 80 (7) years and 38% was men. Prevalence of malnutrition and risk for malnutrition were 17% and 58%. Depression, being IADL dependent, and smoking were independently associated with an increased risk of malnutrition with OR's (95%CI) of 2.6 (1.3–5.3), 2.8 (1.3–6.4), 5.5 (1.9–16.4) respectively. Alcohol use was associated with a decreased risk (OR 0.4 (0.2–0.9)).
Conclusion: Malnutrition is highly prevalent among geriatric outpatients and is independently associated with depressive symptoms, poor functional status, and life style factors. Our results emphasize the importance of integrating nutritional assessment within a comprehensive geriatric assessment. Future longitudinal studies should be performed to examine the effects of causal relationships and multifactorial interventions.

1. Introduction

Aging may come with an accumulation of diseases and impairments, including cognitive and physical decline, depressive symptoms and emotional changes, all of which may directly influence the balance between nutritional needs and intake.[1] Dietary behavior of older individuals may change because of health or social reasons, decrease in taste and smell, or a reduced ability to purchase and prepare food. This combination of symptoms or conditions put older individuals at a higher risk of malnutrition.[1,2] Malnutrition is a prognostic factor associated with morbidity, mortality and costs of care.[3,4] It is therefore important to detect those older individuals who are at risk for malnutrition.

The reported prevalence rates of malnutrition in the Netherlands are relatively low in community dwelling older persons (2%–12%), but rise considerably in older individuals receiving home care (18%–35%) or in the hospitalized or institutionalized older patients (30%–60%).[5–9]

Data on the prevalence of malnutrition and clinical correlates of nutritional status of geriatric patients who visit geriatric outpatient departments is not available. These patients are referred to an outpatient clinic with multiple problems in somatic functioning, psychological functioning, and/or with functional or social problems.[10] Multimorbidity is thought to have a direct influence on the balance between nutritional needs and nutritional intake and to contribute to a high prevalence of malnutrition.[11]

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In this study we aimed to investigate the malnutrition prevalence rates among older patients visiting a geriatric outpatient department of a large teaching hospital in the Netherlands. Furthermore, we investigated which somatic, psychological, functional, social or life style characteristics were associated with malnutrition.

2. Methods

2.1. Study design and population

For this cross-sectional study, aiming to investigate the clinical correlates of nutritional status of geriatric patients, we included 448 consecutive patients at their first visit to a geriatric outpatient clinic of a large teaching hospital in the Netherlands between October 2005 and March 2010. All patients were living independently (in their own home or in an assisted care facility). Patients living in a nursing home were excluded. Patients were referred for multiple problems in the somatic, psychological, social or functional domain. Data collection was performed prospectively as part of the routine measurements during the outpatient visits. All patients underwent a comprehensive geriatric assessment including physical examination, laboratory tests and functional screening. Nutritional status, cognitive functioning and depressive symptoms were assessed with questionnaires. Furthermore, patients were asked about demographics, medical history, medication use, and life style.

2.2. Nutritional status

Nutritional status was assessed with the Mini-Nutritional Assessment (MNA), a validated questionnaire for older individuals,[12] recommended by the European Society for Clinical Nutrition and Metabolism (ESPEN).[13] The questionnaire consists of 18 questions clustered in four sections: anthropometric assessment (weight, height, weight loss); general assessment (living situation, medicine use, mobility); dietary assessment (number of meals, food and fluid intake, and autonomy of feeding), and subjective assessment (self-perception of health and nutritional status). A maximum score of 30 can be obtained. A score below 17 indicates malnutrition, a score of 17–23.5 indicates a risk of malnutrition and a score of 24 or higher indicates a satisfactory nutritional status. If the patient was suspected not to be able to give reliable answers, the MNA questionnaire was confirmed by proxy.

2.3. Conditions associated with malnutrition

Possible clinical determinants of malnutrition were classified as somatic, psychological, functional, social, and life style factors.

Somatic characteristics included medication use, co-morbidity, fall-events, use of a walking aid, and urinary incontinence. The number of drugs was derived from the patients' medical records and was checked by asking the patient or the caregiver. Both prescription drugs and over-the counter-drugs were included. Polypharmacy was classified as using <6 drugs vs. ≥ 6 drugs (6 being the median number of drugs taken). Comorbidity was assessed by summing the numbers of underlying chronic diseases of a patient. Multimorbidity was classified as having <4 vs. ≥ 4 chronic diseases (divided by median number of comorbidities). Information about underlying diseases was obtained from the patients' medical records. The following chronic diseases were classified: hypertension, diabetes mellitus, cardiovascular disease, cerebrovascular disease, renal impairment, osteoporosis, chronic obstructive pulmonary disease (COPD), and malignancy. The use of a walking aid was classified as none vs. use of a walking stick/trolley walker/wheelchair. Falls were classified as never vs. ever. Urinary incontinence was classified as absent vs. present.

Psychological characteristics included depressive symptoms and cognitive functioning. Depressive symptoms were assessed by the Geriatric Depression Scale with 15 items (GDS-15). A higher score indicates more depressive symptoms.[14] A cut-off value of ≥ 5 was used to indicate clinically important depressive symptoms. Global cognitive functioning was assessed with the Mini Mental State Examination (MMSE). Cognitive dysfunction was defined as an MMSE score <24.[15]

Functional characteristics included activities of daily life (ADL) and instrumental ADL (IADL). ADL was assessed by asking if the patient was able to dress or wash himself independently, partly independent, or with help only. IADL was assessed by asking the patient if he/she was able to do the shopping, finances and cleaning the household independently, partly independent, or with help only. Both ADL and IADL were classified as independent or partly independent vs. dependent.

Social characteristics included education, marital status, and whether the patient had children. Education was classified as low (no education/primary school), middle (lower vocational education/intermediate vocational education), or higher education (pre-university education/higher vocational education/university). Marital status was classified as married/living together or unmarried/divorced vs. widow (-er). Presence of children was classified as zero vs. ≥ 1 child(ren).

Finally, it was inquired whether a patient was a current smoker (vs. former smoker or never smoker) or a current alcohol user (vs. former or never alcohol user).

2.4. Other variables

Height was measured with a stadiometer to the nearest centimetre (cm) and weight was assessed by a non-electronically scale (Seca, model 761) to the nearest kilogram (kg). Patients were weighed with their clothes on and the measured body weight was corrected for clothing (-2 kg). BMI was calculated as weight in kg divided by the square of height in meters (kg/m^2). Waist circumference was measured to the nearest cm with a flexible tape measured while the patient was in standing position. The tape was placed approximately 3 cm below the belly button of the patient.

2.5. Statistical analyses

Patient characteristics were calculated for the nutritional status categories (MNA <17.0, 17.0–23.5, and >23.5). Differences across categories were tested with ANOVA for normally distributed variables, Kruskall–Wallis tests for not normally distributed variables, and with χ^2 tests for categorical variables.

Logistic regression analyses were performed to assess the independent association of the clinical covariates with presence of malnutrition (MNA < 17). Somatic, psychological, functional, social and life style characteristics were separately included as covariates in the model. Regression analyses were adjusted for age and sex. To assess the independent association of the clinical characteristics with presence of malnutrition, all covariates for malnutrition (somatic, psychological, functional, social, and life style) were included in one logistic regression model using backward elimination.

Finally, all somatic, psychological, functional, and social correlates were summed and mean adjusted MNA scores were calculated for categories of number of clinical problems (≤ 2, 3–4, 5–6, ≥ 7) using analysis of covariance (ANCOVA).

Statistical analyses were performed with Statistical Package for the Social Sciences (SPSS Inc, Chicago, IL) version 20.0 for Windows.

3. Results

Mean (SD) age of the total population ($n = 448$) was 80 (7) years and 38% was male. In this population of geriatric outpatients, 17% was malnourished (MNA < 17.0), and 58% were at risk for malnutrition (MNA 17.0–23.5).

Table 1 presents the patient characteristics across categories of MNA. Patients with malnutrition had a lower weight, BMI and smaller waist circumference, and less frequently drank alcohol than patients with better nutritional status. Also, patients with malnutrition used more medication, were dependent on walking aid more frequently, and more often had urinary incontinence than patients with better nutritional status. Finally, patients with malnutrition had more depressive symptoms, had a higher prevalence of poor functional status, and were lower educated.

Table 2 shows the prevalence of comorbidities across categories of nutritional status. Patients with malnutrition more often had osteoporosis; a trend was observed for cardiovascular and cerebrovascular diseases.

Univariate logistic regression analyses, adjusted for age and sex showed that patients who smoked, patient who used a walking aid, patients with depressive symptoms, and patients being ADL or IADL dependent were at increased risk for malnutrition (Table 3). Patient currently using alcohol were at decreased risk of being malnourished. Polypharmacy, multimorbidity, falls, urine incontinence, level of education, cognitive functioning, level of education, marital status, or 'having children' were not significantly associated with an increased risk of malnutrition (Table 3).

In the multivariate model depression, being IADL dependent, and smoking remained independently associated with an increased risk of malnutrition with OR's (95%CI) of 2.6 (1.3–5.3), 2.8 (1.3–6.4), 5.5 (1.9–16.4) respectively. Alcohol use was associated with a decreased risk (OR 0.4 (0.2–0.9)).

Furthermore, increasing numbers of correlates were associated with lower mean MNA scores; the p-value for trend was <0.001 (Fig. 1).

Table 1
Characteristics of the study population ($N = 448$) according to categories of nutritional status.

	MNA < 17	MNA 17–23.5	MNA > 23.5	p-Value**
	$N = 76$	$N = 261$	$N = 111$	
General characteristics				
Sex, % male	33%	38%	40%	0.63
Age (yr)[a]	82 ± 7	80 ± 7	80 ± 7	0.11
Weight (kg)[a]	62 ± 13	72 ± 14	76 ± 13	<0.01
BMI (kg/m^2)[a]	22 ± 4	25 ± 4	27 ± 3	<0.01
Waist circumference (cm)[a]	94 ± 12	101 ± 12	102 ± 9	<0.01
Life-style characteristics				
Smoking, % current	20%	12%	8%	0.12
Alcohol use, % current	30%	43%	57%	0.01
Somatic characteristics				
Medication use, % ≥6	40%	42%	25%	0.02
Comorbidities, % ≥4	53%	52%	46%	0.29
Using walking aid, %	65%	46%	35%	<0.01
Falls, % ever	63%	61%	55%	0.53
Urinary incontinence, %	59%	66%	52%	0.04
Psychological characteristics				
GDS, % ≥5	46%	32%	8%	<0.01
Cognition, % MMSE <24	61%	53%	45%	0.09
Functional characteristics				
ADL, % dependent	33%	11%	5%	<0.01
IADL, % dependent	50%	28%	17%	<0.01
Social characteristics				
Education, % low	41%	33%	21%	0.01
Marital status, % widow (-er)	41%	36%	32%	0.52
Children, % no children	17%	13%	12%	0.57

ADL: activities of daily living; BMI: body mass index; GDS: geriatric depression scale; IADL: instrumental activities of daily living; MMSE: mini mental state examination; MNA: mini nutritional assessment.
**P-value derived from either ANOVA, Kruskall–Wallis, or χ^2 test.
[a] Mean ± SD.

Table 2
Prevalence of comorbidity across categories of nutritional status.

	MNA <17	MNA 17–23.5	MNA > 23.5	p-Value*
	$N = 76$	$N = 261$	$N = 111$	
Hypertension	55%	55%	56%	0.98
Diabetes	24%	31%	25%	0.27
Cardiovascular disease	51%	48%	37%	0.09
Cerebrovascular disease	17%	15%	7%	0.09
Renal impairment	15%	17%	15%	0.78
COPD	15%	11%	9%	0.52
Osteoporosis	20%	9%	11%	0.03
Malignancy	28%	23%	27%	0.59

COPD: chronic obstructive pulmonary disease; MNA: mini nutritional assessment.
*p-Value derived from χ^2 test.

4. Discussion

The present study among 448 independently living geriatric outpatients indicates a high prevalence of malnutrition and risk of malnutrition (17% and 58%). Multimorbidity, poor functional status, depressive symptoms and smoking were independently associated with an increased risk of malnutrition. Also, the more somatic, psychological, social, or functional problems a patient experienced, the higher the risk of being malnourished. Alcohol use was associated with a decreased risk of malnutrition.

This is one of the first studies describing malnutrition prevalence rates among older persons visiting an outpatient clinic. We are aware of two other European studies including older patients, both showing lower prevalence rates than the present study. However in these studies the patients included were much younger than ours.[11,16] In the 'middle old' (75–84 y) and 'oldest old' (≥85 y) subpopulations in Saka's study[11] he found data very much in accordance with ours. Our study population consisted of relatively unhealthy older patients (with many patients having functional limitations, being incontinent, having depressive symptoms or cognitive decline). The sample is thought to be representative for older patients attending Dutch geriatric outpatient clinics, but may not be representable across Europe. The poor medical condition of

Table 3
Somatic, psychological, functional, and social characteristics and risk of malnutrition (MNA <17).

Characteristics		MNA < 17
		OR (95% CI)
Lifestyle	Smoking (current)	4.3 (1.9– 9.9)
	Alcohol (current)	0.4 (0.2– 0.8)
Somatic	Medication use (≥6)	1.0 (0.6– 1.7)
	Comorbidities (≥4)	1.1 (0.6– 1.8)
	Use of walking aid (yes)	2.1 (1.2– 3.6)
	Fall incident (ever)	1.0 (0.6– 1.8)
	Urinary incontinence (yes)	0.8 (0.5– 1.4)
Psychological	GDS-15 (≥5)	2.8 (1.6– 4.9)
	MMSE (<24)	1.5 (0.8– 2.5)
Functional	ADL (dependent)	4.9 (2.6– 9.3)
	IADL (dependent)	3.1 (1.8– 5.3)
Social	Education (low)	1.6 (0.9– 2.8)
	Marital status (widow)	1.0 (0.6– 1.8)
	Children (no)	1.3 (0.7– 2.6)

Adjusted for age, sex.

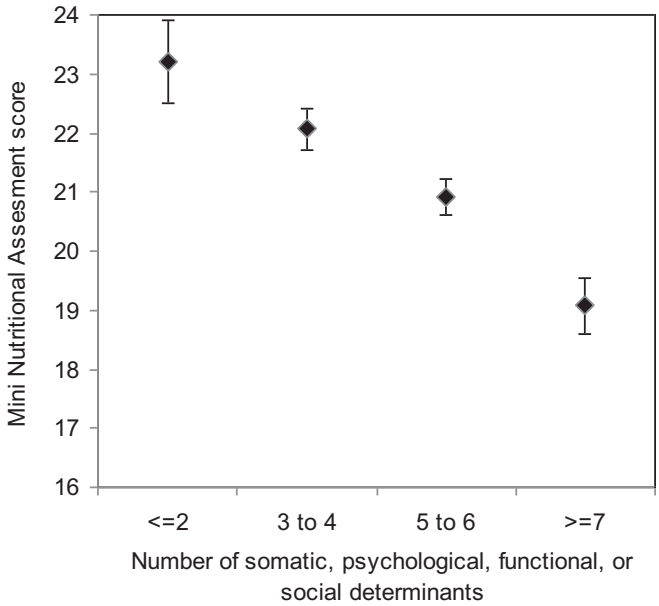

Fig. 1. Mean (SE) mini nutritional assessment scores for categories of number of clinical determinants.

our patient cohort may in part explain the higher prevalence rates of malnutrition.

The two earlier studies describe a correlation between malnutrition and other comorbidities, among others: depression, fecal incontinence, bone mineral density, several biochemical parameters, decreased cognitive functioning and functional dependency.[11,16] These results as well as ours underline the importance of multimorbidity as a risk factor for malnutrition and vice versa.

More studies have described the nutritional status of community dwelling older individuals.[5–9,17] These studies observed prevalence rates of malnutrition ranging from 0 to 35%. However, these studies used different definitions for malnutrition and different settings such as private households, general practice, communities, and institutions. Because of these differences, the prevalences found are difficult to compare.

Our finding that the MNA score was lower in patients with multiple burden of somatic, psychological, functional, or social characteristics provides further evidence that malnutrition could be regarded as a geriatric syndrome, next to already established geriatric syndromes such as falls, incontinence, pressure sores, and delirium. A geriatric syndrome refers to one symptom or a complex of symptoms with high prevalence in geriatric populations, resulting from multiple diseases and multiple risk factors and leading to decreased functioning.[18] From literature study it has been shown that the chance of having a geriatric syndrome is higher when more risk factors – especially: older age, cognitive impairment, functional impairment, and impaired mobility – are present.[19,20] This etiological principle has recently also been shown for malnutrition. In Saka's study, involving 413 geriatric inpatients and outpatients, nutritional status of patients was found to correlate with the number of established geriatric syndromes. The higher the number of geriatric syndromes, the higher the chance of being malnourished.[11] Only recently, a consensus group of Dutch geriatricians has defined that they would like to approach malnutrition as a geriatric syndrome as well, having multiple underlying causes and needing a multifactorial approach.[21]

Depressive symptoms and poor functional status were identified as independent determinants for malnutrition. Lack of appetite, loss of interest in self-care, apathy and physical weakness can explain the association between malnutrition and depression.[16] Malnutrition has been associated with progressive loss of muscle mass and muscle strength, which could be explained by decreased activity pattern or inadequate nutritional intake.[22]

Life style factors were found to be associated with malnutrition as well, whereby smoking increased the risk of being malnourished and alcohol use decreased this risk. Being a current smoker has been associated with a poorer nutritional status in COPD patients in earlier studies, after adjustment for age, social deprivation and disease severity.[23,24] The authors of these manuscripts hypothesized that the association between smoking and malnutrition may be linked to how taste and appetite are affected in smokers, or to the pro-inflammatory effect of smoking. Our finding that alcohol use was associated with a decreased risk of malnutrition is in line with a recent cross-sectional study in community dwelling elderly.[6] The beneficial effect of alcohol consumption may be found in the high energy content of alcohol consumptions, thus preventing involuntary weight loss, or in the context of the alcohol drinking (often in companionship).

Malnutrition is associated with adverse clinical outcomes, as has been shown in a large number of studies.[25–27] Since malnutrition is mostly thought to be modifiable, it is important to develop and implement adequate interventions to prevent, diagnose and treat malnutrition. Early identification of malnutrition is a first step. The MNA fulfils many criteria for both screening and diagnostic measures. However, critics may argue that it is a too time-consuming method to use in daily clinical practice. In this study, we have shown that its implementation is feasible in the outpatient setting. Moreover, most questions of the MNA are already covered by the Comprehensive Geriatric Assessment, which has been adapted as the basis for diagnosis and treatment in Dutch geriatric medicine. The MNA has the advantage over easier screening instruments that it identifies not only (the degree of) malnutrition, but also the possible underlying causes. For these reasons, a Dutch geriatric consensus group has defined the MNA as the preferred instrument for diagnosis and screening in the Netherlands.[21]

As a follow-up to diagnosis of malnutrition, adequate interventions are required. Recent studies indicate that protein and energy supplementation to malnourished older subjects not only leads to increase body weight,[28] but also to improved function and decreased number of falls.[29,30] Following the idea that malnutrition is a multifactorial problem, the intervention should preferably target not only the nutritional status, but also the underlying problems in the somatic, social, functional, or psychological domain. These studies are, so far, lacking for malnourished older patients.

One of the strengths of this study was the availability of a complete and extensive dataset, including data on nutritional status. This data was prospectively collected by one clinical geriatrician, so data collection was performed consistently. Another strength of this study was the use of validated questionnaires like MNA, GDS-15, and MMSE. ADL and IADL were, at the time of the study, assessed by interview, not using a formal instrument. This must be considered as a weakness. Presently, also ADL and IADL are assessed using validated questionnaires.

Our interpretation of the results may be limited by a few factors. The first limitation of our study is its cross-sectional design, which limits conclusions regarding within-person change or direction of causality. Second, our data was derived from a clinical database, not specifically designed with the purpose to investigate the prevalence and risk factors of malnutrition. Data collection was dependent on the reporting of individual patients of their medical history and medication use. This could have led to both under and over reporting of comorbidities and drug use. If we assume that misclassification was non-differential, this might have led to an

underestimation of our findings and could explain the absent relation between somatic characteristics and malnutrition. Third, we used a quantitative, rather than a qualitative evaluation of medication use. This may have introduced bias, as some medication is known to influence appetite and weight. Finally, our study population mainly consisted of native older patients. Thus we doubt generalisability of results to foreign geriatric outpatients in the Netherlands, especially in multicultural regions, since these patients may have different eating habits, cultural beliefs and a different system of care receiving when it comes to diseases.

From the present study we can conclude that malnutrition among geriatric outpatients is a multifactorial condition associated with, among others, functional status, depressive symptoms, and several life style factors. We thus consider malnutrition to be a geriatric syndrome, which should be integrated within the comprehensive geriatric assessment. In our opinion, the treatment of malnutrition should be multifactorial and the treatment team should be multidisciplinary. Further research is needed to develop appropriate and concrete guidelines for nutrition among geriatric outpatients and intervention programs. Longitudinal studies should be performed to examine integral interventions and causal relationships.

Statement of authorship

MAEvB, SLM and MM designed the study. SLM collected the data. MAEvB and MM performed the data analyses. MAEvB drafted the manuscript. All authors contributed to the writing of the manuscript. All authors approved the final version of the manuscript.

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Conflict of interest statements

None of the authors declared a conflict of interest.

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