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Original article

Prevalence of undernutrition in Dutch hospital outpatients

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ABSTRACT

Background: The prevalence of undernutrition in hospital inpatients is high. Earlier detection and treatment in the hospital outpatient clinic may help to reduce these numbers. The purpose of this study was to assess the prevalence of undernutrition in hospital outpatients in the Netherlands, to determine high risk departments, and to determine the percentage of patients receiving dietetic treatment.
Methods: This cross-sectional multicenter study was conducted in nine hospitals. Patients who visited the outpatient clinic on one of the screening days in the period March–May 2008 received a short questionnaire and were weighed. Patients were classified as severely undernourished, moderately undernourished or not undernourished.
Results: 2288 patients were included in the study, of which 5% were severely undernourished and 2% were moderately undernourished. The prevalence of severe undernutrition was highest in the outpatient departments of oral maxillofacial surgery (17%), oncology (10%), rehabilitation (8%), gastroenterology (7%) and pulmonology (7%). Only 17% of all severely undernourished and 4% of all moderately undernourished patients reported to receive dietetic treatment.
Conclusion: The prevalence of undernutrition in hospital outpatients is generally low but largely undertreated. Future screening should focus on high risk departments.

1. Introduction

Undernutrition is an extensive problem in health care. The prevalence of disease related undernutrition varies from 25–40% in hospital inpatients to 20–25% in nursing homes and 15–25% in homecare units [1–7]. Undernutrition can be defined as a state of nutrition in which a deficiency or imbalance of energy, protein and other nutrients causes measurable adverse effects on tissue or body form (body shape, size, and composition), function, and clinical outcome [8]. Several studies show that undernutrition is associated with decreased body function [5,6,9–13], higher care complexity [10], increased mortality, length of hospital stay and extra costs in health care [5,6,10,14–17]. Early recognition and treatment is important in order to reduce these consequences.

In the hospital setting, there is growing awareness that undernutrition plays an important role in the course of treatment of patients [3]. However, the prevalence of undernutrition at hospital admission has only slightly decreased over the last few years [7]. This indicates that undernutrition has to be recognized and treated in an earlier stage, such as in general practices or at the outpatient clinic. In these settings generally no structural screening on malnutrition takes place.

To determine how screening and treatment in the outpatient clinic can be optimalized, prevalence rates, high risk departments and bottlenecks need to be identified. However, only limited data is available for this setting. Wilson et al. [18] studied the prevalence of undernutrition in non-cancer hospital outpatients and identified undernutrition in 11% of patients of 65 years and older, and 7% in patients younger than 65 [18]. A study carried out on the preoperative outpatient department [19] and yet unpublished data collected at the general outpatient departments of our hospital revealed prevalence data ranging from 6% to 7%. While these studies provide an indication of the prevalence of outpatient undernutrition, their results cannot be extrapolated to outpatient departments in general.

The aim of this study was to determine the prevalence of undernutrition in outpatient departments of nine different hospitals in the Netherlands, to identify high risk departments, and to determine the percentage of patients receiving dietetic treatment.

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2. Materials and methods

2.1. Patients

This cross-sectional multicenter study was carried out in nine hospitals in The Netherlands, participating in the implementation project "Early recognition and optimal treatment of malnutrition in Dutch hospitals". Participating hospitals were either general (Gelderse Vallei Hospital, Ede ($n=116$); Maasstad Hospital, Rotterdam ($n=508$)), teaching (Amphia Hospital, Breda/Oosterhout ($n=322$); Catharina Hospital, Eindhoven ($n=446$); Canisius Wilhelmina Hospital, Nijmegen ($n=348$); Haga Hospital, The Hague ($n=192$); Martini Hospital, Groningen ($n=124$); Máxima Medical Center, Veldhoven ($n=160$)) or university hospitals (VU University Medical Center, Amsterdam ($n=72$)).

All patients who visited the outpatient clinic of these hospitals on one of the screening days in the period March until May 2008 entered the study. The number of outpatient departments participating in the study varied per hospital (1–18).

Patients were not included in the study when they were <18 years of age, pregnant or had been pregnant in the last six months. A total of 2584 patients filled out the questionnaire. Of these, 296 patients (11%) were excluded because nutritional status could not be defined due to missing data on height and/or weight, leaving 2288 patients in the analytic sample.

Multicenter approval was given by the ethical review board of the VU University Medical Center. Because of the low subject burden and the fact that data were collected, handled and stored anonymously, informed consent was not considered necessary by the ethical review board.

2.2. Methods

Administrative personnel of the outpatient departments and research assistants handed out a questionnaire to all patients who registered at the participating outpatient clinic. Research assistants were nurses, dieticians and medical or dietetic students who were instructed by the coordinating dietician of the hospital. The questionnaire consisted of questions about age, gender, height, recent weight loss (one and six months), (reason for) current dietetic treatment, reason for visiting the outpatient clinic and whether patients had cancer, a gastrointestinal disease, a chronic lung disease or were elective for surgery, which are high risk groups in the hospital setting and are thought to be high risk groups for the outpatient clinic as well [1,3,6,19,20]. Because of the confronting character, the last three questions were used by only five of the nine hospitals (gastrointestinal disease $n=1231$; chronic lung disease $n=1226$; and elective for surgery $n=1229$). The question about cancer was used by only four hospitals for the same reason ($n=1065$).

After completing the questionnaire, trained research assistants measured the patients' actual weight on a calibrated scale. Patients were weighed wearing indoor clothing without shoes. An adjustment for clothing was made by deducting 1.77 kg for men and 1.13 kg for women from their weight [21]. An additional correction of 0.40 kg for men and 0.28 kg for women was made when a patient was unable to take off his shoes [21].

Height was asked for and when patients did not know their actual height, research assistants measured the patients' lower leg length (knee height) with a flexible measure tape from the top of the patella with knee flexed at 90 ° while the patient was sitting ($n=92$). Body height was estimated based on patients' lower leg length, adjusted for age and gender [22]. In four of the nine hospitals, patients' actual height was measured with a stadiometer ($n=858$).

2.3. Nutritional status

Nutritional status was defined by involuntary weight loss and body mass index (BMI). BMI was calculated as measured body weight (kg)/height $(m)^2$. Patients were characterized as severely undernourished when one or more of the following conditions were present: a BMI < 18.5 kg/m^2 and/or unintentional weight loss of more than 5% in the last month or more than 10% in the last six months [8,23]. Patients with a BMI ≥ 18.5 kg/m^2, but with 5–10% unintentional weight loss in the last six months were characterized as moderately undernourished [8,23].

2.4. Statistics

The study population was categorized into three groups based on nutritional status (severely undernourished, moderately undernourished, not undernourished) and prevalence was calculated for different outpatient departments and type of disease. Descriptive statistics were used to express means, standard deviations, percentages and frequencies. ANOVA and chi-square tests were used to test the relationship of outpatient characteristics with nutritional status and receiving dietetic treatment. Logistic regression analysis was used to test the relationship of department and disease with nutritional status (undernutrition versus no undernutrition). Results were expressed as odd ratios (OR) and 95% confidence intervals (95% CI). For the relation between type of hospital and nutritional status, the university hospital was left out, since this hospital participated with only one outpatient department. Differences were considered statistically significant at $p<0.05$. Statistical analyses were performed in SPSS 15.0 for Windows (SPSS Inc. Chicago IL., USA).

3. Results

A total of 2288 patients (47.5% male, 52.5% female) were included in the study. Mean age was 56.5 (± 16.3) years and varied from 18 to 94 years. The mean age was not different between patients who were included (age = 56.5) and those excluded because of missing weight and height (age = 57.9; $p=0.19$). There was a tendency that those who were included were more likely to be male (47.5% versus 42.5%; $p=0.07$).

Table 1 shows the characteristics of the patients who participated in the study. Of all patients, 117 patients (5%) were severely undernourished, 46 patients (2%) were moderately undernourished and 2125 patients (93%) were not undernourished. In the group with no undernutrition, 823 patients (39%) were overweight and 435 patients (21%) were obese. Patients were classified as severely undernourished based on either BMI < 18.5 kg/m^2 (38%), unintentional weight loss (57%)

Table 1
Characteristics of outpatients divided by nutritional status ($n=2288$).

	Severely undernourished[a]	Moderately undernourished[b]	Not undernourished[c]	p Value (ANOVA/ chi-square)
n (%)	117 (5.1%)	46 (2.0%)	2125 (92.9%)	–
Female (%)	51.3%	65.2%	52.3%	0.215
Age (y) ± SD	56.5 ± 20.3	58.5 ± 16.0	56.5 ± 16.0	0.707
Age ≥ 60 years (%)	52.1%	54.3%	46.2%	0.263
BMI (kg/m^2) ± SD	21.0 ± 4.2	24.3 ± 3.9	26.8 ± 4.9	<0.001
BMI < 18.5 kg/m^2 n (%)	50 (42.7%)	–	–	
BMI 18.5–25 kg/m2 n (%)	50 (42.7%)	28 (60.9%)	867 (40.8%)	
BMI 25–30 kg/m2 n (%)	11 (9.4%)	13 (28.3%)	823 (38.7%)	
BMI > 30 kg/m^2 n (%)	6 (5.1%)	5 (10.9%)	435 (20.5%)	
Nutritional treatment n (%)	20 (17.1%)	2 (4.3%)	189 (8.9%)[d]	0.006

[a] BMI < 18.5 kg/m^2 and/or (unintentional weight loss of > 5% in the last month or > 10% in the last six months).
[b] BMI ≥ 18.5 kg/m^2 and 5–10% unintentional weight loss in the last six months.
[c] BMI ≥ 18.5 kg/m^2 and <5% unintentional weight loss in the last six months.
[d] $n=2116$.

Table 2
Nutritional status in outpatient departments ($n=2288$).

	No. of hospitals	*n* (%)	Severely undernourished[a]	Moderately undernourished[b]	Not undernourished[c]	OR (95% CI) [d]
			n (%)	*n* (%)	*n* (%)	
Oral maxillofacial surgery	2	30 (1.3%)	5 (16.7%)	–	25 (83.3%)	2.66 (1.00–7.04)
Oncology	5	126 (5.5%)	12 (9.5%)	8 (6.3%)	106 (84.1%)	2.66 (1.60–4.42)
Rehabilitation	3	37 (1.6%)	3 (8.1%)	–	34 (91.9%)	1.15 (0.35–3.80)
Gastroenterology	7	190 (8.3%)	13 (6.8%)	6 (3.2%)	129 (90.0%)	1.51 (0.91–2.49)
Pulmonology	7	133 (5.8%)	9 (6.8%)	1 (0.8%)	123 (92.5%)	1.06 (0.55–2.07)
Urology	5	78 (3.4%)	5 (6.4%)	–	73 (93.6%)	0.89 (0.35–2.23)
Radiotherapy	1	48 (2.1%)	3 (6.3%)	2 (4.2%)	43 (89.6%)	1.53 (0.60–3.92)
Vascular surgery	1	69 (3.0%)	4 (5.8%)	1 (1.4%)	64 (92.8%)	1.02 (0.40–2.59)
Surgery	9	386 (16.9%)	22 (5.7%)	12 (3.1%)	352 (91.2%)	1.33 (0.90–1.97)
Dermatology	4	111 (4.9%)	6 (5.4%)	1 (0.9%)	104 (93.7%)	0.87 (0.40–1.91)
Internal medicine	8	306 (13.4%)	14 (4.6%)	6 (2.0%)	286 (93.5%)	0.90 (0.55–1.46)
Otolaryngology	4	87 (3.8%)	4 (4.6%)	–	83 (95.4%)	0.62 (0.22–1.71)
Cardiology	5	135 (5.9%)	6 (4.4%)	–	129 (95.6%)	0.59 (0.26–1.36)
Ophthalmology	4	51 (2.2%)	2 (3.9%)	2 (3.9%)	47 (92.2%)	1.11 (0.40–3.13)
Nephrology	3	122 (5.3%)	3 (2.5%)	2 (1.6%)	117 (95.9%)	0.54 (0.22–1.35)
Neurology	6	140 (6.1%)	3 (2.1%)	2 (1.4%)	135 (96.4%)	0.47 (0.19 –1.16)
Rheumatology	4	52 (2.3%)	1 (1.9%)	–	51 (98.1%)	0.25 (0.03–1.83)
Orthopedics	5	109 (4.8%)	2 (1.8%)	1 (0.9%)	106 (97.2%)	0.36 (0.11–1.14)
Gynaecology	5	46 (2.0%)	–	1 (2.2%)	45 (97.8%)	0.29 (0.04–2.08)
Others[e]	5	32 (1.4%)	–	1 (3.1%)	31 (96.9%)	0.42 (0.06–3.07)
Total		2288 (100%)	117 (5.1%)	46 (2.0%)	2125 (92.9%)	

[a] BMI < 18.5 kg/m^2 and/or unintentional weight loss of >5% in the last month or >10% in the last six months.
[b] BMI ≥ 18.5 kg/m^2 and 5–10% unintentional weight loss in the last six months.
[c] BMI ≥ 18.5 kg/m^2 and <5% unintentional weight loss in the last six months.
[d] ORs present the odds of being undernourished in a certain department compared to all other departments, and are based on the combination of severely and moderately undernourished patients versus not undernourished patients.
[e] Others: psychiatry ($n=17$), radiology ($n=8$), geriatrics ($n=5$), physiotherapy ($n=2$).

(>5% in the last month (20%), >10% in the last six months (21%), or both (16%)), or a combination of low BMI and unintentional weight loss (5%).

There was no difference in the prevalence of undernutrition between men (6.7%) and women (7.5%; $p=0.48$), patients of 60 years and older (8.1%) and patients younger than 60 years (6.3%; $p=0.11$), and between general (7.9%) and teaching hospitals (6.5%; $p=0.25$).

3.1. Dietetic treatment

Seventeen percent of the severely undernourished patients and 4% of the moderately undernourished patients reported to receive dietetic treatment. In the group with no undernutrition, 6% ($n=49$) of the normal weight, 9% ($n=75$) of the overweight and 15% ($n=65$) of the obese patients received dietetic treatment. In undernourished patients, having cancer (48.2% versus 10.9% in persons with no cancer; $p=0.03$) and being treated at the department of radiotherapy (66.7% versus 15.8%; $p=0.02$) were positively associated with treatment by a dietician. Being treated at the department of surgery (0.0% versus 21.1%; $p=0.02$) was negatively associated with receiving dietetic treatment.

Reasons for receiving dietetic treatment in patients with severe undernutrition were: (risk for) undernutrition (60%), diabetes (10%), gastrointestinal disease (5%), or not reported (25%). Reasons for receiving dietetic treatment in patients with no undernutrition were: diabetes (44%), overweight/obesity (21%), other diseases (25%), non-classifiable (3%), or not reported (7%).

3.2. Outpatient departments

Table 2 presents the number of patients at each outpatient department by nutritional status. The prevalence of severe undernutrition was highest in the department of oral maxillofacial surgery (17%), followed by the departments of oncology (10%), rehabilitation (8%), gastroenterology (7%) and pulmonology (7%). The prevalence of undernutrition in general (both severe and moderate undernutrition) was high in the departments of radiotherapy and general surgery as

Table 3
Nutritional status for different types of diseases[a].

	n (%)	Severely undernourished[b]	Moderately undernourished[c]	Not undernourished[d]	OR (95% CI) [e]
		n (%)	*n* (%)	*n* (%)	
Gastrointestinal disease (response = 1231)	129 (10.5%)	11 (8.5%)	2 (1.6%)	116 (89.9%)	1.95 (1.04–3.65)
Cancer (response = 1065)	99 (9.3%)	7 (7.1%)	3 (3.0%)	89 (89.9%)	1.86 (0.92–3.78)
Chronic lung disease (response = 1226)	180 (14.7%)	10 (5.6%)	1 (0.6%)	169 (93.9%)	1.03 (0.53–2.00)
Elective for surgery (response = 1229)	108 (8.8%)	4 (3.7%)	–	104 (96.3%)	0.58 (0.21–1.61)

[a] Patients could have had more than one disease (284 patients had one disease, 61 patients had two diseases, 6 patients had three diseases and 3 patients had all four diseases).
[b] BMI < 18.5 kg/m^2 and/or unintentional weight loss of >5% in the last month or >10% in the last six months.
[c] BMI ≥ 18.5 kg/m^2 and 5–10% unintentional weight loss in the last six months.
[d] BMI ≥ 18.5 kg/m^2 and <5% unintentional weight loss in the last six months.
[e] ORs present the odds of being undernourished when having a certain disease state compared to not having this disease state, and are based on the combination of severely and moderately undernourished patients versus not undernourished patients.

well. Undernutrition in general was significantly higher in the department of oral maxillofacial surgery and the department of oncology compared to the other departments.

3.3. Type of diseases

Table 3 shows the distribution of nutritional status in patients with gastrointestinal diseases, oncological diseases, chronic lung diseases and patients elective for surgery. Nine percent of the patients with a gastrointestinal disease were severely undernourished, which was a statistically higher prevalence compared to that in patients without this disease. For patients with oncological diseases, chronic lung diseases and patients elective for surgery the prevalence was 7%, 6% and 4% respectively.

There was no difference in terms of age ($p=0.88$), gender ($p=0.31$) or BMI ($p=0.61$) between hospitals who asked patients whether they had these diseases and hospitals who left out these questions. However, in the hospitals who left out these questions, the prevalence of undernutrition was 5.5% ($n=57$) compared with 4.8% ($n=60$) in the rest of the population ($p=0.03$).

4. Discussion

In this first, large, cross-sectional multicenter study on undernutrition in the outpatient departments of nine Dutch hospitals, 5% of all outpatients were severely undernourished and 2% were moderately undernourished. There were no significant differences in the prevalence of undernutrition according to age, sex or type of hospital. However, clear differences were observed between outpatient departments. Only 17% of the severely undernourished patients and 4% of the moderately undernourished patients received some form of dietetic treatment.

To the best of our knowledge, this is the first multicenter study on the prevalence of undernutrition in hospital outpatients. Since the results are based on data of 2288 patients from either university, teaching and general hospitals, individual hospitals showed only small differences in prevalence. These results about the prevalence of undernutrition in outpatients are in line with the results of Neelemaat et al [19] and with yet unpublished data from our hospital where 6–7% of the patients were undernourished. Moreover, the observed prevalence of undernourished patients receiving dietetic treatment of 15% is also in line with our earlier (unpublished) work. As data seem comparable to these previous studies, we suggest that our current results can be extrapolated to the hospital outpatient population in general in the Netherlands. Because there are only two non-Dutch studies to compare with, and these studies used different definitions of undernutrition [18,24], we cannot state that results can be generalized to all Western countries. However, there is no reason to assume large differences between countries.

The absence of a golden standard for disease-related undernutrition is an important point of discussion. In order to be able to compare studies on the prevalence of undernutrition, it is crucial for all studies to use the same universal definition. In this study, we used a definition of undernutrition based on percentage unintentional weight loss and BMI, which is a commonly used and accepted definition [8,23].

Similar to a previous study [19] and to yet unpublished data from our hospital, severe undernutrition was most prevalent in the outpatient departments of oral maxillofacial surgery (17%), oncology (10%), rehabilitation (8%), gastroenterology (7%) and pulmonology (7%). Overall undernutrition was also high in the departments of radiotherapy and general surgery. However, the prevalence of undernutrition was only significantly higher in the department of oral maxillofacial surgery and the department of oncology when compared with the other departments. Since the results for the department of oral maxillofacial surgery were mainly based on a single hospital and 30 patients only, and taking into consideration the broad confidence interval, the relatively higher prevalence of undernutrition in this department has to be interpreted with caution. On the other hand, no oncological (e.g. head and neck cancer) patients were present in this department during the measurements, while these patients are especially known to have a high risk for undernutrition [25]. Therefore, the prevalence of undernutrition is expected to be even higher in this department.

The prevalence of undernutrition in the department of rehabilitation was 8% and similar to that of the oncology and gastroenterology departments. Since this is the first study to include a rehabilitation department and since results are based on data of 37 patients only, more research is required to confirm these results.

The questions about type of diseases revealed that the prevalence of undernutrition was higher in patients with a gastrointestinal disease (9%) compared to patients without this disease. Patients from hospitals who left out these questions had a slightly yet statistically higher prevalence of undernutrition. However, since it were the hospitals who choose to leave out these questions and not the patients who decided not to respond to these questions, we cannot explain this difference.

Seventeen percent of severely undernourished patients reported to receive dietetic treatment. This was significantly higher compared to the moderately undernourished (4% dietetic treatment) and not undernourished patients (9%) ($p=0.01$), but still largely insufficient. These data are comparable to clinical studies [26], that showed that malnourished patients are indeed more often referred to a dietician, but that the number of referrals is still very low.

Despite the low prevalence of undernutrition in the outpatient departments, the prevalence of another malnutrition problem, overweight and obesity, was considerable in the not undernourished population (39% and 21% respectively). This was in line with the prevalence of overweight and obesity in an earlier study at our hospital (unpublished data). Moreover, only 9% of the patients with overweight and 15% of the patients with obesity received dietetic treatment, which indicates that dietetic treatment of these patients is also far from optimal. It implies that not only undernourished patients, but also overweight patients, should be referred to a dietician more frequently.

Since all hospitals participating in the study were already active in screening for undernutrition in hospitalized patients, data can be slightly biased. Given the low prevalence of dietetic treatment, however, this is not expected.

A methodological point of discussion is the difference in height measurement. In five of the nine hospitals, patients' height was based on self-report height or based on measured lower leg length, because it was not feasible to use a stadiometer on each department. In the other four hospitals, a stadiometer was present at each outpatient department, so patients' height was measured. There were however no statistical differences in either height ($p=0.18$) or nutritional status ($p=0.73$) between the two hospital groups.

On or near every department, one or more research assistants and local staff were present and every patient received a questionnaire at admission. We therefore expect the number of non-participants to be insignificant. We cannot exclude that the few patients who did not want to participate had a different health status and nutritional status compared to those who were included in the study. Furthermore, even though research assistants were well-instructed, 11% of the patients who filled out a questionnaire were excluded because missing data on height and/or weight. The reported reasons for missing data were: lack of time, patient refusal and patients who were wheelchair dependent and could not be weighed. Although the patients included and excluded in our study were of similar age and gender, this selection bias may have led to an underestimation of the prevalence of undernutrition. To further examine this, we performed a post-hoc analysis using data from 47 excluded patients who could not be weighed (60% female, mean age 65 ± 16.7 years) but did provide a self-reported body weight. The prevalence of moderate and severe undernutrition in this population was 2% and 11% respectively, supporting a potential underestimation of undernutrition in our study. However, these

data should also be carefully interpreted since there was a significant difference of −1.5 kg between self reported and measured weight ($p<0.001$), suggesting that patients generally underestimated their weight. By using self-reported weight for the total population, the prevalence of severe undernutrition indeed increased to 6%.

In conclusion, our findings indicate that the prevalence of undernutrition in hospital outpatients is generally low but can be as high as 17% in specific departments. Furthermore, the results suggest that both undernutrition and obesity are severely undertreated. Because both undernutrition and overweight are known to influence the course of medical treatment, nutritional status should ideally be assessed in every patient. Screening systematically for undernutrition at high risk outpatient departments should be considered.

5. Learning points

- In this large mulitcenter study, 5% of hospital outpatients were severely undernourished and 2% were moderately undernourished.
- Prevalence of severe undernutrition was highest in the outpatient departments of oral maxillofacial surgery (17%), oncology (10%), rehabilitation (8%), gastroenterology (7%) and pulmonology (7%).
- Undernutrition is largely undertreated in hospital outpatients.

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EL was responsible for the study design, data collection and analysis, and writing the manuscript. AME and HWMvZ participated in the development of the study design. FN, PJMW, MAEvB and MV participated in writing the manuscript. HMK participated in the development of the study design and writing the manuscript. There was no conflict of interest.

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