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Short report

An Italian investigation on nutritional risk at hospital admission: The PIMAI (Project: Iatrogenic MAlnutrition in Italy) study

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SUMMARY

Background & aims: Nutritional risk on admission to hospital, which turns out to be high in most countries, was investigated. However, when consulting the "malnutrition-mapping" in Europe, the lack of Italian data raises attention. Accordingly, we designed a multidisciplinary, cross-sectional survey: the PIMAI study (Project: Iatrogenic MAlnutrition in Italy).

Methods: Patients were enrolled from 13 large (>400 beds) multidisciplinary hospitals. Randomly selected adult (>18-year-old) patients were included according to a 4-strata model by gender and age (<65 and ≥65 years). Nutritional risk was assessed by the Nutritional Risk Screening 2002 tool.

Results: A total of 1284 patients were evaluated. Overall prevalence of nutritional risk was 28.6% with similar distribution between sexes and higher rates in medical rather than in surgical departments (33.6% vs 22.8%; $p < 0.0001$). Risk prevalence was markedly heterogeneous among specialties, ranging between 4.8% (ophthalmology) and 62.5% (oncology units). Moreover, in adults aged 18–65 years the prevalence of "risk of malnutrition" was significantly lower than in those ≥65 years (18.3% vs 41.9%; $p < 0.0001$).

Conclusions: The prevalence of nutritional risk on admission to hospital is high also in Italy. However, in patients aged 18–65 years nutritional risk appears a less prevalent comorbidity, thus supporting the role of age as an important determinant.

1. Introduction

The prevalence of "nutritional risk" among hospitalized patients has been frequently investigated.[1] Prevalence data vary significantly and this is above all related to the sensitivity and specificity of the screening tool used. Nevertheless, it is noticeable that nutritional risk varies depending on age, discipline (medical, surgical or intensive care) and the speciality considered.[1–4]

Unfortunately, despite the increasing awareness of the "malnutrition problem" and its consequences on outcome (wound repair, disease recovery, length of hospital stay, morbidity, mortality, treatment costs),[1] recent insights into the current clinical

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practice reveal poor nutritional routines and attitudes among doctors and nurses.[5,6]

All these findings prompted the European Council to first set up a Study Group on the matter and to successively issue a resolution to improve the knowledge of and to enforce the actions towards this problem, focusing the attention on both screening process and treatment through nutritional support and normal hospital diet.[7] In this regard, obtaining information on the actual dimension of the problem and associated factors is the first step to design and apply nutritional policies. Unfortunately, scant and unreliable data of the Italian situation are now available.[8] According to this background the FeSIN (Federation of Nutritional Italian Societies) designed the multicentric "PIMAI study" (Project: Iatrogenic MAlnutrition in Italy) in order to provide prevalence data of nutritional risk among Italian hospital in-patients.

2. Methods

2.1. Study design and Ethical Committee approval

The study protocol, in adherence to the principles established by the declaration of Helsinki, was drafted and firstly approved by the Ethical Committee of the coordinating centre (Regional General Hospital of Bolzano, Italy) and subsequently approved by the local Committees of each participating centre. Written informed consent was obtained for every patient (the patients themselves, relatives or legal guardians). The study started in December 2004 and ended in September 2005. Patients were recruited from 13 large (>400 beds) multidisciplinary regional hospitals with recognized engagement in the field of malnutrition (presence of a clinical nutrition unit and team). To obtain operating methodology standardization all the personnel involved were trained through lectures and practical working sessions in small groups. All the centres received an identical kit of calibrated instruments, which was used for all the measurements. Baseline assessment was planned to take place within 36 h after admission. Random sampling from the daily list of new admissions was managed on a 4-strata model according to gender (male and female) and age (<65 and ≥65 years). All the subjects were considered eligible if they agreed to participate in the survey. Paediatric (age <18 years), pregnant and acute emergency patients were excluded.

2.2. Nutritional risk

In agreement with the Guidelines drawn by the European Society of Parenteral and Enteral Nutrition (ESPEN) the presence of nutritional risk was assessed by the Nutritional Risk Screening 2002 (NRS-2002) scoring system.[4,9,10] This screening tool is mainly based on the combination of two factors, undernutrition and increased requirements for nutrients (≈disease-related metabolic stress), that leads to the indication for nutritional therapy. Accordingly, patients were characterized by scoring the components "nutritional status" and "severity of disease". Nutritional status was evaluated by 3 variables (BMI, recent weight loss, recent food intake) and a score of 3 was given in the presence of BMI <18.5 and/or recent weight loss ≥5% in the last month and/or an intake <25% of estimated requirements. A score of 2 was assigned to those with 18.5 < BMI < 20.5 and/or recent weight loss ≥5% in the last 2 months and/or an intake of 25–50% of requirements. A score of 1 was given for recent weight loss ≥5% in the last 3 months and/or an intake of 50–75% of requirements. Requirements were defined as basal metabolic rate by commonly used prediction formula corrected by stress factor. When weight could not be collected, the mid-upper arm circumference (MUAC) was taken as a surrogate. Particularly, BMI was <20.5 kg/m^2 when MUAC was <25 cm.[9]

Therefore, in agreement with ESPEN guidelines,[9,10] patients were categorized according to the severity of disease as follows: none (score 1), slight (score 1), moderate (score 2), or severe (score 3). Finally, an additional point (+1) was assigned to the patient when age >70 years. A total score ≥3 defined the patient being "at-risk".

Finally, the daily number of prescribed drugs (drugs/day) was also taken into account and considered as a surrogate of coexisting comorbidities.

2.3. Data management and analysis

All the data were centrally managed by an analysis unit (National Institute for Research on Food and Nutrition – INRAN) and then analysed (STATA 9 Statistical Software; StataCorp LP, College Station, TX, USA), after being checked for completeness. Results were presented as mean, standard deviation or absolute frequencies. Comparison between groups was performed by unpaired *t*-test (normal distribution) or non-parametric test (not normal distribution) when appropriate. Chi-square (χ^2) was used for proportion comparison. For overall analyses, statistical significance was set to a *p*-value <0.05.

3. Results

In total, 1830 patients were enrolled. After the exclusion of those refusing to participate ($n = 234$; 14.6%), or suffering from terminal illness ($n = 13$; 0.7%) and patients with missing values ($n = 299$; 16.3%) final analysis included a study sample of 1284 subjects. Patients were recruited from all the possible specialties (Table 1) but most of them were from general medicine (19.5%) and general surgery wards (12.9%). In overall population analysis, intensive care patients were arbitrarily grouped as surgical due to the similarities between critical illness and surgical stress and the relative possible effects on nutritional status. Weight was not collected in 86 patients and MUAC was used in the scoring of nutritional status. Prevalence of nutritional risk according to major inclusion criteria (gender and age [<65 and ≥65 years]) is presented in Table 2.

Table 1
Population distribution according to setting, speciality and nutritional risk.

Ward and speciality	Total [*n* (%)]	At-risk (%)
Medical		
General medicine	251 (19.5)	30.7
Cardiology	51 (4.0)	19.6
Endocrinology/metabolism	28 (2.2)	17.8
Gastroenterology	55 (4.3)	32.7
Geriatrics	35 (2.7)	42.9
Haematology/oncology	56 (4.4)	62.5
Immunology/infectivology	35 (2.7)	45.7
Neurology/psychiatry	51 (4.0)	33.3
Nephrology	29 (2.3)	31.0
Pneumology	35 (2.7)	40.0
Rheumatology/dermatology	36 (2.8)	19.4
Others	21 (1.6)	38.1
Surgical		
General/abdominal surgery	166 (12.9)	34.9
Cardio-thoracic surgery	37 (2.9)	32.4
Intensive care	17 (1.3)	23.5
Maxillary/plastic/vascular surgery	33 (2.6)	27.3
Neurosurgery	45 (3.5)	6.7
Gynecologic surgery	31 (2.4)	25.8
Ophthalmology	42 (3.3)	4.8
Orthopaedic/traumatology	68 (5.3)	19.1
Othorhinolaryngology	91 (7.1)	9.9
Urology	71 (5.5)	25.3

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Table 2
Prevalence of nutritional risk according to stratification by gender and age.

	Overall ($n = 1284$)		Women ($n = 650$)		Men ($n = 634$)	
	n	At-risk	n	At-risk	n	At-risk
<65 years	723	18.3%	365	17.5%	358	19.0%
(age, mean ± SD)	46.4 ± 13.1	47.3 ± 12.9	45.7 ± 12.9	46.6 ± 12.6	47.1 ± 13.3	47.9 ± 13.3
≥65 years	561	41.9%	285	41.1%	276	42.7%
(age, mean ± SD)	74.8 ± 6.7	76.9 ± 6.4	75.3 ± 7.1	77.7 ± 7.2	74.3 ± 6.1	76.1 ± 5.4

In every group prevalence was significantly higher in patients ≥65 year-old (χ^2; $p < 0.0001$).

Overall prevalence of nutritional risk was 28.6% ($n = 367$) with similar distribution between genders (27.8% [F] vs 29.3% [M]; $\chi^2 = 0.35$, $p = 0.554$). According to speciality, risk prevalence was markedly heterogeneous, ranging between 4.8% (ophthalmology) and 62.5% (oncology units) and with consistently higher rates in other medical patients, particularly in geriatrics (42.9%) and in those affected by infective (45.7%) and respiratory (40.0%) diseases. Higher rates of "at-risk" patients were observed in medical vs surgical settings (33.6% vs 22.8% respectively; $\chi^2 = 18.10$, $p < 0.0001$) and, as expected, in patients aged ≥65 years (41.9% vs 18.3%; $\chi^2 = 86.43$, $p < 0.0001$).

In both medical and surgical wards, patients "at-risk" were older ($p < 0.0001$), had lower BMI ($p < 0.0001$), were more likely to suffer from malignancies ($p < 0.0001$) and received multiple medications ($p < 0.02$) (Table 3). Moreover, drug prescription was higher for medical patients in both risk groups.

According to the distribution of the main components of NRS-2002 in our population, we report that only 9.2% and 2.2% of patients were diagnosed being "at-risk" because of impaired nutritional status ("nutritional score" = 3) and disease severity ("severity of disease score" = 3), respectively. In the other cases, being classified "at-risk" was mainly due to "nutritional score" = 2 in combination with "severity of disease" (33.5%) or age (16.9%) (Table 3). Finally, a weight loss ≥5% in the previous 3 months was the most frequent sign reported (35.7%).

4. Discussion

The present study aimed to investigate the prevalence of nutritional risk on admission to hospital in Italy. This study adds to the consistent number of those already performed in other countries.[1–4,11,12] Given the lack of Italian data in the current literature, our survey clearly improves the "malnutrition-mapping" of Europe.

Our results are in agreement with those of other multicentre and multidisciplinary studies.[1–4,10,11] In Italy, overall hospital prevalence of risk of undernutrition was 28.6%, with higher rates in medical wards (33.6%) rather than in surgical ones (22.8%). Thus, the prevalence seems to be lower when compared to that of the largest study (EuroOOPS) available in the literature (32.6%; $p < 0.01$).[4] However, despite the similarity in the mean age between the population investigated, it should be recognized that our study was designed to include a larger proportion of adults aged 18–65 years. In this segment of the population, the risk of undernutrition appeared significantly lower (18.3%). Thus, our survey might not be considered a prevalence survey in a broad sense and we also recognize that there has been no attempt to determine if the selected cohort were representative of the hospital populations in terms of gender and age. However, our results allowed us to better quantify, for the first time, the importance of age in contributing to overall risk by the NRS-2002 tool. In regard to study limitations, we recognize that about 30% of patients eligible for study inclusion were not fully assessed (due to refusal to participate) or did not have data analysed (due to missing values) with possible consequences on prevalence of nutritional risk. We also highlight the exclusion of emergency patients. These patients are more likely to be "at-risk". This relates not only to the higher severity of disease but also to the fact that critically ill patients are usually unable to meet their energy requirements by full oral diet. In the EuroOOPS study about 5–6% of the patients were critically ill and this result seems to explain the difference in prevalence of our

Table 3
Major features of study sample according to setting and nutritional risk (NRS-2002 score ≥3).

	Overall ($n = 1284$)	Medical setting ($n = 688$)		Surgical setting ($n = 596$)	
		At-risk ($n = 231$)	Not at-risk ($n = 457$)	At-risk ($n = 136$)	Not at-risk ($n = 460$)
Age (years)	58.8 ± 17.7	67.4 ± 16.7	59.7 ± 17.0†#	64.3 ± 17.3	51.9 ± 16.4†
Body mass index (Kg/m^2)[a]	26.4 ± 5.3	23.8 ± 4.9	27.6 ± 5.0†§	24.4 ± 5.1	26.9 ± 5.1†
Malignancies	212	62	37†	69	44†
Drugs/day (n)	2.4 ± 2.5	3.3 ± 2.5#	2.8 ± 2.7*#	2.2 ± 2.5	1.7 ± 2.1*
NRS-2002 components					
Nutritional score = 3	118 (9.2%)	82	–	36	–
BMI <18.5 Kg/m^2	41	28	–	13	–
BMI <20.5 Kg/m^2	138	27	13	35	35
1-Month previous WL ≥5%	91	65	–	26	–
3-Month previous WL ≥5%	458	187	93	92	86
Food intake <25%	14	12	–	2	–
Food intake <75%	264	117	39	63	45
Disease severity score = 3	8 (2.2%)	7	–	1	–
Age score = 1	413 (32.2%)	135	137	74	67

Data are presented as mean ± standard deviation (age, body mass index [BMI] and drugs/day) or frequencies.
BMI, body mass index; and WL, weight loss.
*$p < 0.02$; †$p < 0.0001$: compared to "at-risk" group within the same ward (by unpaired t or non-parametric or chi-square tests).
§$p < 0.03$; #$p < 0.0001$: compared to correspondent risk group in surgical ward (by unpaired t or non-parametric tests).
[a] $n = 1198$.

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study. This is supported by the low number of patients presenting with a "severity of disease" score = 3. We included only large (>400 beds) multidisciplinary urban hospitals (approximately 25% of Italian hospitals). However, it is worth mentioning that the prevalence of malnutrition has been previously reported remarkably higher in non-university hospital than in university ones.[3] Thus, further studies are required to provide more precise prevalence data.

Our study confirms that prevalence in single departments is markedly heterogeneous, thus reflecting the different features (e.g. age, nutritional status, disease severity, presence of comorbidities) of the patients admitted in the various specialties. This is one of the main purposes on which the NRS-2002 was structured.[9,10] Along with this, nutritional risk was found associated with the number of comorbities (number of drugs). This observation is in agreement with that of the Geman malnutrition study.[3]

Similar to the large EuroOOPS study, in which the NRS-2002 was used as screening tool, in our investigation most patients have been diagnosed "at-risk" mainly on the basis of "nutritional score" (~65%), with weight loss ≥5% and reduced oral intake being the major determinants.[4] However, in a good proportion, the combination of different sub-scores was also necessary. These data support the use and the applicability of the NRS-2002 as screening procedure. Unfortunately, the lack of outcome data (e.g. length of stay, infections, mortality) is a major limitation, meaning that we are not able to further investigate and demonstrate the independent role of nutrition screening components as was recently done by Sorensen et al.[4]

In conclusion, our study confirms that the overall prevalence of nutritional risk in patients on admission to hospital is high also in Italy. However, in adults aged 18–65 years patients nutritional risk appears a less prevalent comorbidity, thus supporting the role of age as an important determinant.

Conflict of interest

All Authors certify that there are no affiliations with or involvement in any organization or entity with a direct financial interest in the subject matter or materials discussed in the manuscript.

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Statement of authorship

All the authors significantly contributed to the work, read and approved the final manuscript. L.L., A.D., M.G.G., N.C.B. and M.A.F. designed the study. A.D and E.C. analysed data. E.C. wrote the manuscript. All the authors contributed to data interpretation and critical revision of the article.

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