

A Multi-Centre Survey on Hospital Malnutrition: Result of PNSI Study

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Research

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Abstract

Background: Disease-related malnutrition is associated with adverse outcomes such as increased rates of morbidity and mortality, prolonged hospital stay, and extra costs of health care. This study was conducted to assess nutritional status among patients and to determine the risk factors for malnutrition in Iran university hospitals.

Methods: Persian Nutritional Survey In Hospitals (PNSI) was a cross-sectional study that conducted in 20 university hospitals across Iran. All the patients with age range of 18 to 65 years, who were admitted or discharged, were assessed by subjective global assessment (SGA).

Results: In total, 2306 patients were evaluated for malnutrition. Mean values of age and body mass index were 44.7 ± 14 years and 25.2 ± 6 kg/m², respectively. Malnutrition (SGA-B & C) was identified in 23.9% of the patients, 26.2% and 21% of whom were among the admitted and discharged patients, respectively. The prevalence of malnutrition was higher in burns (78%) and heart surgery (58%) patients. Malnutrition was not associated with age ($P=0.1$). Multivariate analysis presented male gender ($OR=1.023$, $P<0.001$), malignant disease ($OR=1.409$, $P<0.001$), length of hospital stay ($OR=1.206$, $P<0.001$), and polypharmacy ($OR=1.066$, $P<0.001$) as independent risk factors for malnutrition.

Conclusion: One out of four patients in the studied university hospitals was suffering from malnutrition; thus, appropriate measures should be taken to ameliorate this condition. Male gender, malignant disease, length of hospital stay, and polypharmacy were identified as independent risk factors for malnutrition.

Background

Disease-related malnutrition is associated with adverse outcomes such as increased rates of morbidity and mortality, prolonged hospital stay, impaired wound healing, high readmission rate, and increased costs for health care (1–4).

Malnutrition development is associated with insufficient dietary intake or malabsorption, increased nutritional needs, complications of the underlying disease, or a combination of these factors (5). There is evidence that showed other factors are associated with malnutrition and affect its prevalence such as higher age (6, 7), polypharmacy (8), educational level, health care system, and economic situation of the country where the study was performed. (6, 9).

Studies performed in European countries and the United States indicate that approximately 31% of hospital patients are either malnourished or at nutritional risk (11), they also indicated that 11–45% of patients in England hospitals and home care suffer from malnutrition. (9)

There are different reports of malnutrition prevalence in Iran, Hosseini reported 5.7% of patients on admission and 11% of discharged patients had malnutrition based on $BMI \leq 18.5$ kg/m² (12). The prevalence of malnutrition among the cancer patients was reported as 53.1%, out of which 29.1% had

moderate and 24% had severe malnutrition based on PG-SGA. (13) forty-three percent of hemodialysis patients were moderately malnourished by SGA. (14) Another study reported that 23% of admitted patients had mild to moderate malnutrition and 6% had severe malnutrition based on SGA. (15)

Proper nutritional status can play a notably important role in lowering the incidence of the malnutrition-disease defective cycle. Despite the importance of disease-related malnutrition and the great economic costs of this condition imposes on health systems, there is no comprehensive data on disease-related malnutrition and related risk factors in Iran hospitals. Therefore, this study aimed to assess nutritional status among patients in Iran hospitals and to determine different risk factors for malnutrition in hospitalized patients.

Methods

Persian Nutritional Survey In Hospitals (PNSI) is a multicenter, cross-sectional study conducted in 20 public hospitals in Iran. Informed consent was obtained from all the patients recruited in this study. This study was approved by the Ethics Committee of Mashhad University of Medical Sciences (number 920923). Two educational sessions were held for investigators and a written instruction about data collection was provided.

In each hospital, the investigators referred to included clinical wards and assessed newly admitted or discharged patients on a specified date consecutively. The inclusion criteria comprised of admitted or discharged patients within the age of 18 to 65 years with Iranian nationality, also we excluded duplicated patients. Patients undergoing surgery on the data collection day, outpatients, patients with trauma or eating disorders, and patients admitted to maternity, obstetric, pediatric, orthopedic, and emergency departments or intensive care units (ICUs) were excluded from the study. The study was conducted from 24th to 28th November 2015. STROBE checklist of study is available as supplementary material 1.

Data collection

Patient characteristics, i.e., gender, date of birth (age), underlying disease, the main affected organ, comorbidity, the number of different prescriptions per day, and history of ICU stay and surgery were recorded. The length of hospital stay was calculated for discharged patients from the date of admission and date of the survey. Body weight was measured by standard Seca scale (Seca 620, Germany) in light clothes to the nearest 1 kilogram. Body height was assessed by Seca portable stadiometer (Seca 213, Germany) to the nearest 1 centimeter. Mid-arm circumference (MAC) was measured in mid-acromion and olecranon process interval at the non-dominant relaxed arm with a non-stretchable tape measure to the nearest 0.1 centimeter.

Nutritional status

The nutritional status of patients was assessed by subjective global assessment (SGA) and anthropometric measures (BMI and MAC) for all the admitted and discharged patients included in the

study (16).

SGA is a valid and reliable tool for assessing nutritional status in hospitalized patients (17,18). Among the recommended screening tools, SGA enjoys the highest diagnostic accuracy for acute care patients. Baker et al (17) and Detsky et al. (18) demonstrated that the use of SGA for evaluating patients yields reliable results with inter-observer reliability of 80%. SGA is comprised of two components: medical history and physical sign. In the medical history part, the severity and pattern of weight loss, dietary intake, gastrointestinal symptoms, and functional capacity are evaluated. In the physical signs part, loss of subcutaneous fat, muscle mass, and presence of edema and ascites were assessed. According to this tool, patients are classified as well-nourished (SGA-A), moderately malnourished (SGA-B), and severely malnourished (SGA-C) (15).

Body mass index (BMI; weight/height²) is most commonly used for assessing nutritional status. BMI was calculated as weight (kg) divided by squared height (m²) (19). If BMI was less than 18.5, between 18.5 and 25, and higher than 25, the patient was considered as malnourished, normal, and overweight or obese, respectively.

Statistical analysis

Quantitative variables with normal distribution were expressed as mean, standard deviation, and range. Quantitative variables with non-normal distribution were reported as median and range. Stratified variables were reported as frequency and percentage. Analysis of nominal qualitative data was performed by non-parametric tests such as the Chi-squared test. Mann-Whitney test was used for ordinal qualitative variables; for quantitative variables with normal distribution, t-test was run. Odds ratios (OR) were reported with 95% confidence interval. To identify independent risk factors logistic regression was used. A P-value less than 0.05 was considered statistically significant

Results

Patient characteristics

Overall, 2324 patients were eligible for inclusion in the study, of whom 2306 provided consent. In general, 18 cases refused consent, six were too ill and refused consent or were deemed too ill by hospital staff, and three were bedridden and could not be weighed. (Table 1)

Patients from 100 medical wards of 20 hospitals were assessed in this study. The mean age of the participants was 44.7±14 years of whom 50% (n=1055) were male and 50% (n=1054) were female. Demographics of the study population are shown in Table 2. Moreover, the mean values for weight, height, and BMI were 68.1±16 kg, 164.4 ± 10 cm, and 25.2 ± 6 kg/m², respectively. In 8.7% (n=183) of the patients, BMI was less than 18.5 kg/m².

Nutritional status

The clinical data of the patients are presented in Table 3. The overall prevalence of malnutrition was 23.9% (n=479 cases), which is determined by combining the SGA-B (moderate malnutrition, 17.3%) and C (severe malnutrition, 6.6%) also 76.1% (n=1523) of patients were identified as SGA-A (with normal nutritional status).

Weight loss in the last three months was reported by 37.3% (n=799) of the respondents, of whom 217 subjects were well-nourished and 36 subjects were malnourished.

Approximately 3% and 0.50% of the patients had severe to moderate edema and ascites, respectively. A significant statistical association was found between BMI and SGA categories ($P < 0.05$). The highest prevalence of malnutrition was observed in burns department (77.7%), followed by cardiac Surgery (57.8%), and hematology departments (50%). The lowest number of patients with malnutrition was in the ophthalmology department (2.5%) (Table 4).

Analysis of factors which may have been associated with malnutrition shows male gender (OR= 1.023, 1.015-1.031 $P < 0.001$), malignant disease (OR=1.409, 1.080-1.830 $P < 0.001$), number of medications (OR=1.066, 1.030-1.104 $P < 0.001$) and length of hospital stay (OR=1.206, 1.170-1.304 $P < 0.001$) were independent risk factors for malnutrition. Age and disease type were not associated with malnutrition ($P > 0.05$)

Discussion

This was the first multicenter study to determine the prevalence of malnutrition in patients of general hospitals in Iran. This study indicated that 23.9% of patients suffered from malnutrition. Independent factors associated with malnutrition were as follows: male gender, malignant disease, polypharmacy, and length of hospital stay.

The results of this study are comparable with reports on the prevalence of malnutrition in Europe and the USA, which shows the importance of identifying malnutrition in hospitals throughout the world. In the United States, Tucker and Stanley found that 94.4% of 2485 patients had one or more risk factors for malnutrition. In Europe, Naber et al. (8) found malnutrition in 45% of internal-medicine and gastrointestinal patients, and McWhirter and Pennington (20) identified malnutrition in 40% of patients (21).

The results of the present study are in line with those of a national study conducted in Germany using SGA that reported 27.4% of patients suffered from malnutrition. A study in European hospitals showed that the prevalence of malnutrition ranged between 10 and 50% depending on the studied region (12). A study using SGA in Latin America reported a 50.2% prevalence for hospital patients (22). Evaluation of nutrition risks in Turkish hospitals demonstrated that 15% of patients were at nutrition risk on admission (21). The prevalence of malnutrition diagnosed as determined by SGA in Australian hospitals was found to be 30% in patients (16).

There are various reports on the prevalence of malnutrition around the world globe, which might be due to features of the studied samples, the tool used to identify malnutrition, and the type of assessed centers. Moreover, it should be noted that the mean age of patients in this study (44.7 years) was less than other studies (63.9 years) performed in Australia and (52.2 years) Latin America, while age was shown to be an independent risk factor for malnutrition. Additionally, most patients in the present study did not have malignant diseases that could affect the prevalence of malnutrition.

The mean age of the discharged patients was 2.6 years less than the admitted ones, which could account for the higher prevalence of malnutrition in admitted patients (admitted: 26.2% and discharged: 21%).

the present study did not demonstrate any association between age and malnutrition that could be pertinent to the low mean age of the samples (44.7 years) (23). In the study performed in Germany, which divided patients into two groups of aged under 65 and equal to or more than 65 years, malnutrition was not found to be associated with age in the group aged less than 65 years, while in those aged more than 65 years, age was identified as an independent risk factor for malnutrition (8). In the present study, the prevalence of malnutrition in males was 5.2% higher than in females. This finding is in line with the findings of a study conducted in Argentina (21) and inconsistent with the results of a study by Aliabadi et. al., while no difference was observed in the frequency between the two genders in another study (6) The present findings suggest an association between malnutrition and malignant diseases. Lack of energy protein intake in cancer patients might be due to anorexia and other complications of chemotherapy, e.g., nausea, vomiting, changes in the sense of taste, xerostomia, and early satiety (14, 22). The multivariate analysis reflected that malnutrition patients at discharge compared to those without malnutrition had a longer duration of hospital stay. Studies using various assessment tools have also shown length of hospitalization as an important risk factor for malnutrition (12, 19). In this study, the number of administered medications was considered as an independent risk factor for malnutrition. This association was considered in several other studies (24). The number of medications was closely related to malnutrition, which similar to benign and malignant diseases, however, it can be concluded that polypharmacy itself acts as a major contributing factor to malnutrition, especially given that a large number of drugs are known to decrease appetite or cause vomiting.

The current study was the first national survey of hospital malnutrition and associated factors in Iran public hospitals which used a valid and reliable tool for nutritional assessment, however, there were some limitations such as didn't assess of malnutrition trend during hospitalization because of the cross-sectional design of the study, assessment by different investigators in hospitals.

Conclusion

This study revealed that almost 24% of patients in public hospitals suffer from malnutrition. Male gender, malignancy, polypharmacy, and length of hospital stay were identified as independent risk factors for malnutrition. While the present study cannot determine to what extent and how malnutrition affects the

outcomes, there is evidence showing effects on outcome and health costs, in this regard screening and nutrition interventions can improve the results.

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee of Mashhad University of Medical Sciences. Informed consent was obtained from each participant.

Consent for publication

As our manuscript does not include any individual data or sensitive personal information, therefore consent for publication is “Not Applicable” in this case.

Availability of data and materials

All data generated or analyzed during this study are included in this published article. There is no public access to the databases.

Competing interests

The authors declare that they have no competing interests

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Authorship contribution

All authors contributed to study design, SP, FSH, JK, A-AH, PT, YP, MA-N, MS, MH, and AN contributed to data collection, SP, FSH, AN, SE-H, OP analyzed data, SP and FSH provided manuscript. The manuscript has been revised and approved by all authors. There is no conflict of interest of authors.

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Tables

Table 1. Demographic characteristics of the patients

Variable	Results			P-value
	All patients	Admitted	Discharged	
Gender ^a	1054 (50%)	534 (50%)	494 (50%)	0.76
	1055 (50%)	526 (50%)	500 (50%)	
Age (year) ^b	44.7 (± 14)	45.4 (±14.96)	43.8 (±14)	0.012
Height (cm) ^b	164.4 (±10)	164.1 (±10)	164.5 (± 10)	0.3
Weight (kg) ^b	68.1 (±16)	67.7 (±17)	68.6 (±16)	0.2
Body mass index (W/H ²) ^b	25.2 (±6)	25.1 (±6)	25.34 (±6)	0.2
Mid Arm Circumference (cm) ^b	31 (±6)	30.0 (±10)	32.0 (±9)	0
Length of hospital stay ^c	Mean: 6.7 Median: 5 Mode: 3		Mean: 6.7 Median: 5 Mode: 3	
Kind of drug ^b	3(±3.2)	2/6 (±3.37)	3/3 (±3.1)	<0.001
Number of drugs ^a				
- No drug	492(22.3%)	285(25.8%)	178 (17.2%)	<0.001
- 1 to 2	617 (27.9%)	293(26.5%)	307(29.8%)	
- 3 to 5	539(24.4%)	264(23.9%)	260(25.2%)	
- More than 5	402(18.2%)	164(14.8%)	231(22.4%)	
- I don't know	156(7.0%)	96(8.7%)	54(5.2%)	
mobility ^a				
Yes	1770(82.2%)	825(78.6%)	877(86.3%)	
only with help	263(12.2%)	146(13.9%)	101(9.9%)	
bed ridden	90(4.2%)	63(6.0%)	25(2.5%)	
Comorbidity ^a	1038(48.7%)	530(49.3%)	482(48.3%)	0.647
- High blood pressure ^a	473(22.2%)	246(22.9%)	220(22%)	0.674
-Type 1 diabetes ^a	50(2.3%)	17(1.6%)	32(3.2%)	0.015
-Type 2 diabetes ^a	331(15.5%)	166(15.4%)	158(15.8%)	0.807

-Chronic respiratory disease^a	87(41%)	47(4.4%)	39(3.9%)	0.596
-Myocardial infarction^a	28(1.3%)	15(1.4%)	12(1.2%)	0.699
-Chronic heart failure^a	126(5.9%)	60(5.6%)	65(6.5%)	0.373

^acategorical variables represented as n (%).

^bcontinuous variables represented as mean±standard deviation for normally distributed data

^ccontinuous variable presented as mean, median, and mode for not normally distributed data

Table 2 . Patients' nutritional status

Variable	Result (n, %)
SGA* rating	
SGA-A	1523 (76.1%)
SGA-B	347 (17.3%)
SGA-C	132 (6.6%)
All Patients	2002 (100%)
Nutritional status	
Well-nourished	1523 (76.1%)
Malnourished	479 (23.9%)
Body mass index (kg/m²)	
<18.5	183 (8.7%)
18.5–25	954 (45.1%)
25–29.9	603 (28.5%)
>30	374 (17.7%)
Mid arm circumference	
Normal	2020 (95.5%)
Mild malnutrition	56 (2.6%)
Moderate malnutrition	39 (1.8%)
Severe malnutrition	0 (0%)

Table 3. Prevalence of malnutrition as ward type*

Ward type	Malnutrition (n, %)	Ward type	Malnutrition (n,%)
General internal	131 (36.3%)	Renal	25 (20%)
Ophthalmology	1 (2.5%)	Nerves	47 (25.2%)
Otorhinolaryngology	9 (13.8%)	Poisoning	1 (14.2%)
Heart	28 (19.5%)	Infectious	19 (26.3%)
Glands	9 (10.2%)	Skin	2 (33.3%)
Hematology	12 (50%)	Lung	18 (33.9%)
Neurosurgery	19 (28.3%)	Rheumatology	5 (26.3%)
Heart Surgery	22 (57.8%)	Cancer	5 (35.7)
General Surgery	78 (16.4%)	Burns	7 (77.7%)
Vascular surgery	3 (4.7%)	Gynecology	6 (10.3%)
Liver and Digestive	34 (38.2%)		

*Percentage of malnutrition in each ward calculated based on number of malnourished patients divided on all assessed patients in each ward

Figures

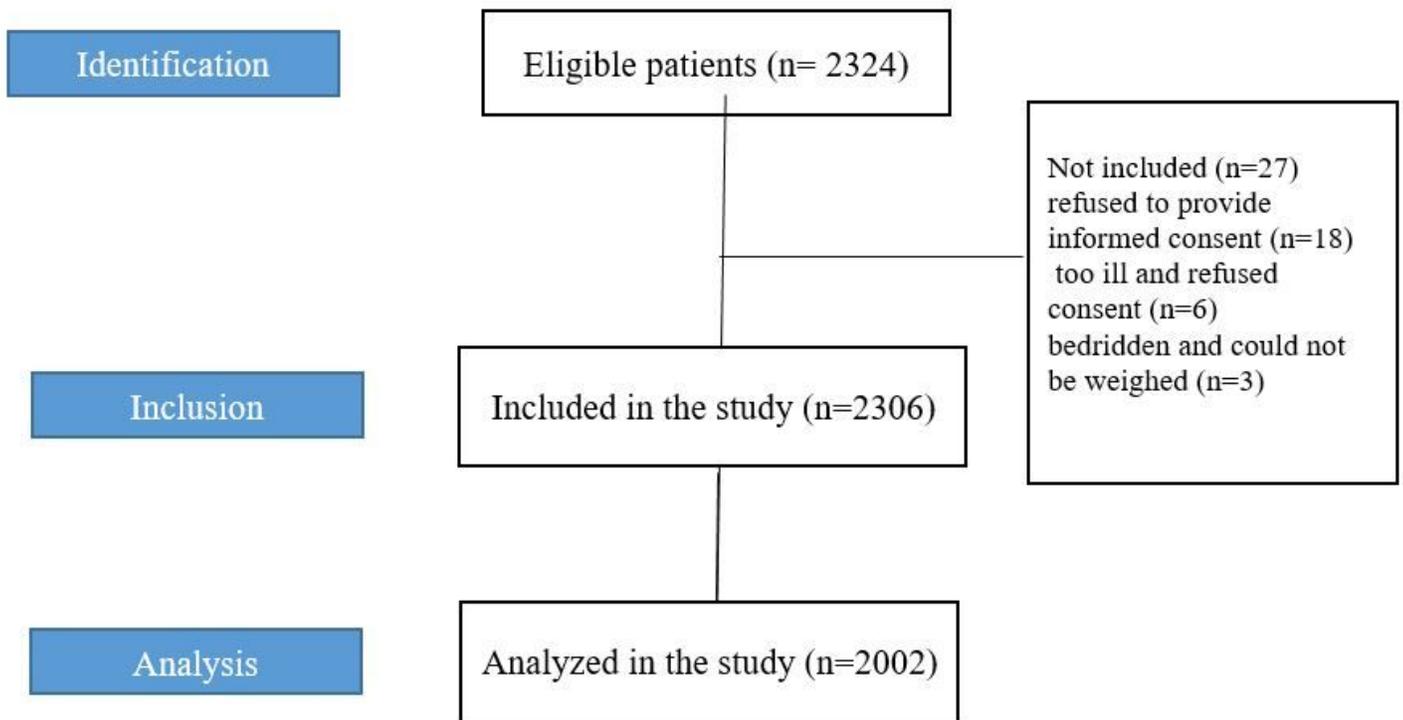


Figure 1

Participant flow chart

Supplementary Files

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