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# Assessment of Malnutrition among Hospitalized Patients in Arak, Iran

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***ABSTRACT***

**Background:** Since most studies evaluating the prevalence of hospital malnutrition in Iran have only been conducted on a specific group of patients, the present study was designed to investigate the prevalence of malnutrition in several different hospital wards. **Methods:** The nutritional status of 284 hospitalized patients was evaluated using the PG-SGA short form and compared according to demographic data and body mass index (BMI). Demographic and SGA domains were compared across BMI categories. Malnutrition degree was also compared. **Results:** Among the participants, 37.0% (n=105) had moderate malnutrition and 51.1% (n=145) had severe malnutrition. Comparing differences within patients according to their BMI status, there were no significant differences according to age, hospitalization duration, and current food intake status. Only sex and cause of hospitalization showed significant differences. Most of male participants had normal weight and were hospitalized for non-GI disorders ($P$=0.001 and 0.031, respectively). As expected, the scores obtained from weight, food intake, and symptoms sections of the questionnaire were higher in underweight patients in comparison to other BMI categories. Comparison of the same characteristics as per malnutrition status showed that people with high risk of malnutrition were older ($P$= 0.023), had oral food intake ($P$=0.007) and normal BMI ($P$=0.001). **Conclusion:** The number of patients at high risk of malnutrition was relatively significant in the study. A high frequency of malnutrition was observed among individuals with normal BMI. Screening tools in addition to BMI should be used to detect patients at risk of malnutrition.

**Keywords:** *Malnutrition; Nutritional status; Hospitalization; Body mass index; Nutrition assessment*

## Introduction

Hospital malnutrition happens during hospital stay as a result of inadequate intake of energy and macro-and micro-nutrients (McKinlay, 2008). It has negative consequences on both patients and the health care system (Barker *et al.*, 2011). The effects of malnutrition on the patient include impaired immune response (Scrimshaw and SanGiovanni, 1997), impaired nutrient absorption, insufficient organs function (Allison, 2000, Holmes, 2007, Kubrak and Jensen, 2007, Naber *et al.*, 1997), reduction of lean and fat mass (Chandra, 1997, Holmes, 2007, Kubrak and

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Jensen, 2007), fatigue, anorexia (Kubrak and Jensen, 2007), increased hospital stay (Kruizenga *et al.*, 2005), and increased disease complications (Braunschweig *et al.*, 2000). On the other hand, malnutrition increases the workload of hospital staff and imposes tremendous costs on the public health system (Ferguson *et al.*, 1997).

The prevalence of hospital malnutrition has been reported to be approximately 20-30% in Europe, 27-39% in Asia, 37-45% in North America, and 23-42% in Australia (Correia *et al.*, 2017). Considerably, the prevalence of malnutrition varies according to age and underlying disease of patients (Ávila *et al.*, 2020). Malnutrition often remains under-recognized due to a lack of attention and awareness of the health care professionals (Adams *et al.*, 2008). Therefore, early detection of malnutrition and making appropriate and timely interventions will prevent its adverse effects (Guyonnet and Rolland, 2015). Nutritional assessment is suggested to evaluate malnutrition in all patients on admission, which is unfortunately often neglected (Schindler *et al.*, 2010). Knowing factors like underlying and current diseases, the patient's preferences, chewing and swallowing abilities, and gastrointestinal tract function is essential for the treatment of malnutrition (Tannen and Lohrmann, 2013).

Several validated tools have been developed to assess patients who are malnourished or at risk of malnutrition. One of these diagnostic tools is the Patient-Generated Subjective Global Assessment Short Form (PG-SGA SF or abridged PG-SGA), which has a subjective nature and helps specialists assess clinical variables changes (Barker *et al.*, 2011). This questionnaire has some patient-reported components including weight history, food intake, nutrition impact symptoms, activity, as well as activities and function (Detsky *et al.*, 1987). Implementation of this screening tool by dieticians is useful for detecting malnutrition and applying the best nutrition care. Some studies have assessed the prevalence of hospital malnutrition in Iran, but most of them have only been conducted on a specific group of patients. Therefore, the present study was designed to investigate the prevalence of malnutrition in several different hospital wards.

## Materials and Methods

*Study design and population:* The present cross-sectional study was carried out during six months, from March 18 to September 20, 2018. The study included 262 hospitalized patients in endocrine, renal, cardiology, and gastroenterology wards. Assuming a hospital malnutrition prevalence of 43%, the sample size was calculated using type 1 error 0.05. The study was done in Arak, Iran, including five leading educational hospitals. A list of the number of patients admitted to selected wards of each hospital was prepared. Study participants were selected by simple random sampling. Then, each hospitalized patient who met the inclusion criteria entered the study. Patients were included in the study if they were ≥18-year-old and excluded if they had following criteria: discharge within the next 24-h, being pregnant or lactating, having dementia or eating disorders, and terminally-ill patients.

*Measurements*: Demographic and clinical data including age, sex, body weight, height, hospitalization duration, cause of hospitalization, and current food intake status were extracted from patients' medical records. Body mass index (BMI) was determined using the following formula: weight (kg)/[height (m)]$^2$. Patients were classified into four groups including underweight (BMI <18.5 kg/m$^2$), normal (BMI 18.5-24.99 kg/m$^2$), overweight (BMI 25-29.99 kg/m$^2$), and obese (BMI >30 kg/m$^2$). Nursing students gathered the data. Each student was trained by one of the project managers to ensure careful data collection and nutrition assessment. Nutritional assessment was performed using the validated Persian version of the scored PG-SGA SF (Shahabbasi *et al.*, 2018). The PG-SGA SF total score was obtained from summing up the scores of four domains. Domain 1 described weight changes history (scores 0–5), domain 2 described food intake changes (scores 0–4), domain 3 reported symptoms affecting nutritional status (scores 0–23), and domain 4 showed any changes to activities and


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functions (scores 0–4). Based on the total score obtained from the questionnaire, malnutrition was defined as either: 0-1 wellnourished; 2-3 mildly malnourished; 4-8 moderately malnourished; and ≥9 severely malnourished. Given that malnutrition is also defined as BMI < 18.5 kg/m$^2$, the relationship between BMI and SGA domains was also investigated.

*Ethical considerations:* The study was approved by the Ethics Committees of the Arak University of Medical Sciences (IR.ARAKMU.REC.1398.231) and conducted in line with the Helsinki declaration. The study protocol was explained for all participants and informed consent forms were obtained before participating in the study.

*Data analysis:* For descriptive analysis, mean and standard deviation (SD) were used for quantitative variables and frequency and percent for qualitative variables. One-sample Kolmogorov Smirnov analysis was applied for parametric tests. All quantitative variables in this study had non-parametric distribution. Therefore, Kruskal-Wallis test was used to analyse differences between either degree of malnutrition or BMI categories and study quantitative variables. Furthermore, Chi-square test was used to determine independence of degree of malnutrition and the qualitative variables. The significance level was considered lower than 0.05. All analyses were conduct in SPSS 24.0 software.

## Results

In this analysis, 284 patients were included. The mean age of participants was 57.74±18.83) years. Males were 58.8% (n=167) of the participant. The mean score of BMI of the participants was 25.20 ±5.25 kg/m$^2$. The mean score of days of hospitalization were 9.34±11.63 days. The most important cause of hospitalization was non-GI disorders (64.3%). Most of patients (65.2%) had food intake by mouth. Losing weight during the past year, past 6 months, and past 2 weeks were observed in 48.6%, 40.9%, and 30.4% of the participants, respectively. Among the participants, 37.0% (n=105) had moderate malnutrition and 51.1% (n=145) had severe malnutrition (**Table 1**).

**Table 1.** Characteristics of the patients.

| | |
|---|---|
| Age (year) | 57.74±18.83[a] |
| Body mass index (kg/m$^2$) | 25.20±5.25 |
| Hospitalization duration (days) | 9.34±11.63 |
| Sex | |
| Female | 117 (41.2)[b] |
| Male | 167 (58.8) |
| Cause of hospitalization | |
| GI disorders | 100 (35.7) |
| Non- GI disorders | 180 (64.3) |
| Current food intake status | |
| Oral intake | 144 (65.2) |
| Nutrition support | 77 (34.8) |
| Losing weight in the past year | |
| Decreased | 136 (48.6) |
| No change | 99 (35.4) |
| Increased | 45 (16.1) |
| Losing weight in the past 6 months | |
| Decreased | 112 (40.9) |
| No change | 131 (47.8) |
| Increased | 31 (11.3) |
| Losing weight in past 2 weeks | |
| Decreased | 84 (30.4) |
| No change | 181 (65.6) |
| Increased | 11 (4.0) |
| Malnutrition risk | |
| Normal | 6 (2.1) |
| Mild | 20 (7.0) |
| Moderate | 105 (37.0) |
| Severe | 145 (51.1) |

[a]: Mean±SD; [b]: N(%)

Comparing differences within patients according to their BMI status showed that there were no significant differences according to age, hospitalization duration, and current food intake status. Only sex and cause of hospitalization showed significant differences. Most of male participants had normal weight and were hospitalized for non-GI disorders (*P*=0.001 and 0.031, respectively, **Table 2**). The scores obtained from weight, food intake, and symptoms sections of the questionnaire were higher in underweight patients in comparison to other BMI categories (**Table 2**).

Comparison of the same characteristics in each malnutrition status indicated that those with high risk of malnutrition were older (*P*= 0.023), had oral food intake (*P*= 0.007) and normal BMI (*P*= 0.001, **Table 3**).


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**Table 2.** Characteristics of patients based on their weight status.

| Variables | Weight status | | | | P-value[c] |
|---|---|---|---|---|---|
| | Underweight | Normal | Overweight | Obese | |
| Age (year) | 61.94 ± 18.00[a] | 58.66 ± 20.38 | 57.68 ± 18.47 | 54.63 ± 13.60 | 0.374 |
| Hospitalization duration (days) | 12.66 ± 17.71 | 10.30 ± 13.33 | 7.72 ± 7.93 | 9.73 ± 10.61 | 0.835 |
| Weight score | 0.77 ± 0.42 | 0.66 ± 0.47 | 0.54 ± 0.50 | 0.39 ± 0.49 | 0.008 |
| Food intake | 2.88 ± 1.60 | 2.22 ± 1.19 | 1.95 ± 1.17 | 2.07 ± 1.42 | 0.041 |
| Symptoms score | 5.55 ± 3.32 | 4.12 ± 2.88 | 3.79 ± 3.34 | 3.42 ± 4.25 | 0.023 |
| Activities and function score | 2.27 ± 1.17 | 2.04 ± 1.16 | 1.91 ± 1.20 | 2.26 ± 1.17 | 0.276 |
| Sex | | | | | 0.001 |
| Female | 4 (1.5)[b] | 43 (15.6) | 40 (14.5) | 26 (9.5) | |
| Male | 14 (5.1) | 82 (29.8) | 54 (19.6) | 12 (4.4) | |
| Cause of hospitalization | | | | | 0.031 |
| GI disorders | 8 (3.0) | 53 (19.6) | 30 (11.1) | 7 (2.6) | |
| Non- GI disorders | 9 (3.3) | 71 (26.2) | 62 (22.9) | 31 (11.4) | |
| Current food intake status | | | | | 0.314 |
| Oral intake | 6 (2.8) | 62 (28.6) | 53 (24.4) | 20 (9.2) | |
| Nutrition support | 8 (3.7) | 29 (13.4) | 27 (12.4) | 12 (5.5) | |

[a]: Mean±SD; [b]: N(c%), [c]: Obtained from Kruskal-Wallis test for quantitate and Chi-square test for categorical variables.

**Table 3.** Characteristics of patients based on their malnutrition risk

| | Malnutrition risk | | | P-value[c] |
|---|---|---|---|---|
| | Mild | Moderate | High | |
| Age (year) | 52.55 ± 15.33[a] | 55.72 ± 19.67 | 60.73 ± 18.39 | 0.023 |
| Hospitalization duration (days) | 5.95 ± 6.31 | 8.15 ± 8.67 | 10.45 ± 12.28 | 0.246 |
| Sex | | | | 0.560 |
| Female | 10 (3.7)[b] | 38 (14.1) | 62 (23.0) | |
| Male | 10 (3.7) | 67 (24.8) | 83 (30.7) | |
| Cause of hospitalization | | | | 0.278 |
| GI disorders | 6 (2.3) | 31 (11.7) | 58 (21.8) | |
| Non- GI disorders | 13 (4.9) | 71 (26.7) | 87 (32.7) | |
| Current food intake status | | | | 0.007 |
| Oral intake | 13 (22.2) | 60 (22.2) | 65 (22.2) | |
| Nutrition support | 3 (22.2) | 20 (22.2) | 52 (22.2) | |
| Weight status | | | | < 0.001 |
| Underweight | 0 (0.0) | 3 (1.1) | 15 (5.7) | |
| Normal | 5 (1.9) | 39 (14.9) | 74 (28.4) | |
| Overweight | 6 (2.3) | 43 (16.5) | 39 (14.9) | |
| Obese | 8 (3.1) | 14 (5.4) | 15 (5.7) | |

[a]: Mean±SD; [b]: N(c%), [c]: Obtained from Kruskal-Wallis test for quantitate and Chi-square test for categorical variables.

## Discussion

The study results indicated that in underweight participants, the prevalence of weight loss, poor food intake, and symptoms affecting eating enough was significantly higher in comparison to other BMI categories. However, normal BMI patients were more likely to be malnourished.

Poor socioeconomic resources, health conditions (the disease per se), lack of timely diagnosis, and prescriptions for supplying nutritional needs of patients, can lead to hospital malnutrition (Waitzberg *et al.*, 2001). The prevalence of poorly nourished patients in the present study was 88.1%. This is somehow congruent with the results of Alzahrani and Alamri's study, in which 76.6% of the hospitalized patients had poor nutritional status


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(Alzahrani and Alamri, 2017). Martín-Palmero *et al.* reported that 56% of hospitalized patients were malnourished (Martín-Palmero *et al.*, 2017). However, this result was higher than the results of a multicenter cross-sectional study, in which the prevalence of malnutrition was 22.0% in hospitalized patients (Kang *et al.*, 2018). This high prevalence could be attributed to the inclusion of hospitalized patients in the study. In addition, patients' demographics and health status were different.

Despite the longer length of hospitalization in those with high risk of malnutrition, there was no difference between groups with varying degrees of malnutrition. Gonçalves de Ávila *et al*. evaluated 130 cardiac patients and reported that malnutrition was positively associated with hospitalization longer than 7 days (Ávila *et al.*, 2020). Kang *et al*. demonstrated a higher length of hospital stay in malnourished patients with different diseases (Kang *et al.*, 2018). However, the current study finding is in agreement with the study by Thomas et al. conducted on 64 patients, in which they found no significant association between nutritional status and hospital length of stay according to SGA (Thomas *et al.*, 2007).

Age was related to the risk of malnutrition. The mean age of patients at high risk of malnutrition was 60.73±18.39 years. In a study on 886 German patients in 13 hospitals, the prevalence of malnutrition was more among ⩾70-year old patients (Pirlich *et al.*, 2006). Kellett *et al*. found a significant positive relationship between malnutrition risk and age (Kellett *et al.*, 2016). This might be related to factors such as polypharmacy, declined senses of taste and/or smell, and cognition decline that can decrease food intake (Doty *et al.*, 1984, Shum *et al.*, 2005).

People with lower BMI are often expected to be at higher risk of malnutrition (Luma *et al.*, 2017) and high BMI may be a protective factor; however, overweight and/or obese patients may also be malnourished (Allard *et al.*, 2016). Malnourished participants of the study conducted by Feldblum *et al.* had a lower BMI in comparison to those at risk of malnutrition (Feldblum *et al.*, 2007). In the present study, it was demonstrated that patients at higher risk of malnutrition had normal BMI. This is in line with the results of Celik *et al*., reporting that those who suffered from malnutrition (57.5%) were in the normal range of BMI (Celik *et al.*, 2021). This indicates that malnutrition screening should be performed in all hospitalized patients, regardless of their BMI. Only 6.3% of the patients included in the present study were underweight and most of them were normal or overweight.

This study has some limitations including small sample size, the heterogeneity of sample, and lack of access to laboratory data, which potentially could affect the generalizability of the findings. One of the strengths of this survey is applying a validated and reliable screening tool used in clinical setting. Further studies should be conducted particularly to determine problems affecting screening, assessment, and treatment of malnutrition.

## Conclusion

Malnutrition was highly prevalent among hospitalized patients, especially those who were older, had oral food intake, and normal BMI. Specific attention should be paid to nutritional status by efforts to identify concerns for malnutrition in health services planning. Moreover, training of the therapeutic team to provide proper nutritional support is also suggested as a solution to reduce problems caused by malnutrition.

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## Conflict of interest

The authors declare that there is no conflict of interest.

## Authors' contributions

Azizi-Soleiman F and Moradzadeh R designed the research; Vahid F conducted the research; Moradzadeh R analyzed the data; and Azizi-Soleiman F and Vahid F wrote the paper. Azizi-



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Soleiman F had primary responsibility for final content. All authors read and approved the final manuscript.

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