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# Nutritional support practices among intensive care units in Turkey: One-day cross-sectional study

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## ABSTRACT

**Objective:** Malnutrition is a significant problem among critically ill patients and is closely associated with poorer patient outcomes. With this study, we aimed to assess nutritional support practices and to evaluate the associated patient outcomes in intensive care units (ICU) in Turkey.

**Methods:** This one-day, cross-sectional study was conducted in November 2015. A total of 1140 patients from 120 ICUs in 46 hospitals across Turkey were included. The general characteristics of the ICUs and patients, clinical data regarding nutritional support, hospitalization courses of the patients, and patient outcomes were recorded. The study questionnaire was prepared by the investigators and was completed by health care professionals from various hospital departments.

**Results:** The mean age of the patients (55.7% were men) was 66.8±18.0 years. The median duration of the ICU stay was 17 days. Enteral tubes were present in 649 patients, of whom 79.4% had nasogastric tubes, 15.3% had percutaneous endoscopic gastrostomy (PEG) tubes, 4% had nasojejunal tubes, and 1.4% had surgical gastrostomy/jejunostomy tubes. 68.1% of ICUs had a nutritional support team. Nutritional support applied included enteral nutrition (44.1%), oral nutrition (25.9%), parenteral nutrition (18.5%), and enteral + parenteral nutrition (11.5%). On the 60$^{th}$ day, the mortality rate was 39.5%. Mortality rates were significantly lower in the oral nutrition group compared with the other groups, and were significantly higher in the parenteral nutrition group compared with the other groups.

**Conclusion:** Our findings confirm the importance of nutritional support teams to provide timely and adequate administration of nutritional support and its association with better patient outcomes. Additionally, better outcomes were obtained with enteral nutrition compared with parenteral nutrition.

**Keywords:** Enteral nutrition, intensive care unit, parenteral nutrition, Turkey

## Introduction

Malnutrition is a generic term used to describe any imbalance in nutrition. Malnutrition is associated with several factors, including reduced food intake, increased metabolic demands, disease conditions, and pathologic features such as poor absorption or excess loss or a combination of these factors (1, 2). The European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines define malnutrition as "a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein, or other nutrients causes measurable, adverse effects on tissues or body form (body shape, size, or composition) and function, and clinical outcome" (3). Timely and appropriate interventions for malnutrition during the hospital stay are a key factor leading to better patient outcomes, given previous studies have reported that malnutrition prevalence in hospitalized critically ill patients can reach up to 50% (4-7).

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Course of intensive care unit (ICU) has many challenges for patients including their nutritional status (8). Advances in nutritional technology and support in recent decades have led to nutritional support becoming an integral part of routine patient care (9). Currently, nutritional support is considered a *sine qua non* in the ICU (10).

Adequate nutritional support to critically ill patients is associated with improved outcomes. Inadequate nutrition can result in complications including decreased and delayed wound healing, an increased risk of infection, poorer cardiac function, increased muscle loss, and impaired renal function (11). Moreover, seriously ill ICU patients, who have a particularly increased risk of malnutrition prior to hospitalization in the ICU, require more attention to existing nutritional deficits (8). If nutritional support is provided according to the guidelines and best practices in the ICU, complications, the need for ventilators, and the excess risk of mortality can be reduced (12, 13).

Therefore, determining the current status of nutritional interventions in ICUs and an evaluation of patient outcomes are critical for making reliable assessments and recommendations. Nevertheless, national data on these issues in Turkey are limited. The only national study to date was conducted by the Turkish Society of Clinical Enteral and Parenteral Nutrition (*Klinik Enteral Parenteral Nütrisyon Derneği* - KEPAN) between June 2005 and January 2006, results of which were published by Korfali et al. in 2009 (14). That study evaluated data from 19 cities, 34 hospitals, and 29,139 patients and reported an overall nutritional risk prevalence of 15% in all patients at first admission and of 52% for patients in ICUs. Ten years later, the present study was conducted with the aims of determining the current status of nutritional assessments, interventions, and methods applied in ICUs in Turkey and evaluating the associated patient outcomes.

## Methods

The present study was a one-day, national cross-sectional study evaluating the nutritional support practices in ICUs in Turkey. It was conducted under the supervision of KEPAN in November 2015. The study questionnaire was prepared by the investigators and was completed by health care professionals (physicians, dietitians, or nurses) within a one-week period. Patients ≥18 years of age were included. Participation in the study was voluntary for both patients and health care professionals. The study protocol was approved by the Çukurova University Hospital Ethics Committee.

For obtaining an overall country-wide inference, 120 ICUs of 46 major hospitals (20 university hospitals, 24 state hospitals, and 2 private hospitals) were identified among 20 provinces in Turkey (Figure 1). For the determination of the participating hospitals, a balance between academic and non-academic centers and those providing services to various patient groups was considered. After determining the participating centers, a full-day training meeting was organised before the initiation of the study. This training was arranged and carried out participation of 2 health care personnel (physicians, dietitians, or nurses) from the study team who organized the procedures in the centers. During this training, all details about the study were explained and all forms were completed.


Figure 1. Geographical distribution of the study centers

| Table 1. Demographic characteristics of the patients | | | |
|---|---|---|---|
| | Total | Females (n=505) | Males (n=635) |
| Age (years) | 66.8±18.0 | 69.0±17.8 | 65.0±18.0 |
| Weight (kg) | 73.2±15.3 | 71.5±16.8 | 74.6±14.0 |
| Height (cm) | 166.9±9.1 | 162.4±8.4 | 170.5±7.9 |
| BMI (kg/m$^2$) | 25.7 (11.7-64.5) | 26.2 (14.2-64.5) | 25.2 (11.7-49.9) |

Data are presented as mean±standard deviation or median (interquartile rage), where appropriate. BMI: body mass index

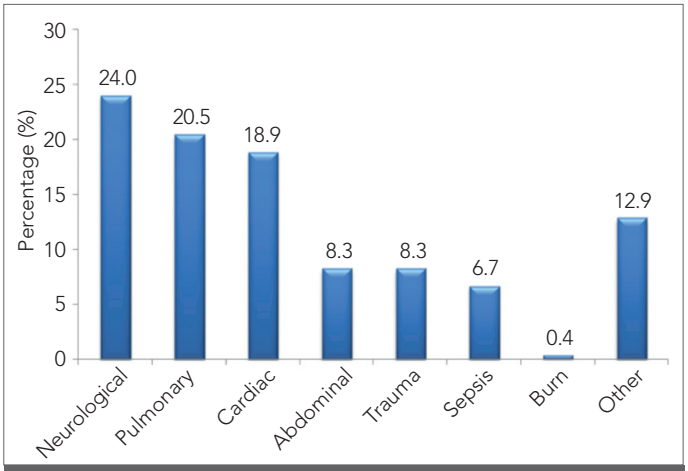


Figure 2. Reasons for hospitalization in intensive care units

A questionnaire was prepared to assess the general characteristics of the ICUs, health care personnel, and patients, as well as to evaluate clinical data regarding nutritional support, hospitalization courses of patients, and patient outcomes including mortality, discharges, and referrals to departments other than the ICU.

### Statistical analysis

Data were analyzed using the IBM Statistical Package for the Social Sciences Statistics for Windows software package, Version 23.0 (IBM SPSS Corp.; Armonk, NY, USA). Descriptive data were expressed as mean and standard deviation, median and interquartile range (IQR), or frequency and percentage. Statistical comparisons between independent groups were conducted using the Mann-Whitney U test for two groups and using the Kruskal-Wallis test for more than two groups. The Bonferroni correction was used for post-hoc pairwise comparisons. A type-I error level of 5% was considered statistically significant.

## Results

We included 1140 patients (55.7% men) with the mean age of 66.8±18.0 years. Demographic features of the patients are shown in Table 1. About 73.1% of the patients had an underlying medical disorder and neurological (24.0%), pulmonary (20.5%), and cardiac (18.9%) diagnoses were the most frequent reasons for hospitalization (Figure 2). The most frequent comorbidities were diabetes (22.9%), congestive heart failure (17.5%), and cancer (13.6%). On the day of data collection in the ICUs, the median duration of hospitalization for all patients was 7 days (IQR: 2-19 days). The mean APACHE-II score was 18.9±8.2 (median, 18, IQR: 13-24). Regarding the types of catheters present during the day of the study, 78.3% were urinary catheters, 60.1% were peripheral venous catheters, 48% were central venous catheters, and 24.6% were arterial catheters. Enteral tubes were present in 649 patients, of whom 79.4% had nasogastric tubes, 15.3% had a percutaneous endoscopic gastrostomy (PEG) tubes, 4% had nasojejunal tubes, and 1.4% had surgical gastrostomy/jejunostomy tubes.

68.1% of ICUs had a nutritional support team (NST) at their facilities. Among the ICUs, 30.4% were using national/international nutrition guidelines, 29.5% had individualized nutrition treatment plans, 6.3% had their own nutrition protocol and 33.9% had no written procedures on nutrition. Types of nutritional support provided in the ICUs were enteral nutrition (44.1%), oral nutrition (25.9%), parenteral nutrition (18.5%), and enteral+parenteral nutrition (11.5%). The median duration of enteral and parenteral nutrition was 10 days (IQR: 4-30 days) and 4 days (IQR: 2-9 days), respectively. The most frequent reasons for not starting oral nutrition were intubation (64%), a risk of aspiration (52.7%), and being unable to swallow (42.7%). Nutritional support was interrupted in 248 patients due to surgical reasons (36.7%), intolerance (27%), and transportation (4%). The most commonly used products for enteral nutrition were polymeric standard products (31.5%), hypercaloric products (20.9%), and diabetic products (20.2%).

Parenteral nutrition was delivered through central venous access in 60.7% of the patients and through peripheral access in 39.3% of the patients. 63.5% of the parenteral nutrition solutions were all-in-one products, 35% were prepared as compounder solutions and multiple bottles were used for 1.5% of the patients. The most frequently used all-in-one parenteral nutrition products were soy-based products (37.3%), olive oil based products (34.6%), and soy/olive/fish oil based products (16%). The most frequent adjuncts used were glutamine (n=110), omega-3 fatty acids (n=91), trace elements (n=133), and vitamin-E (n=59), which were administered to 265 patients in various combinations. The ratio of given/planned calorie and protein supplementation was 87.2% and 86.7%, respectively. The products used for oral, enteral, and parenteral nutrition are shown in Figure 3.

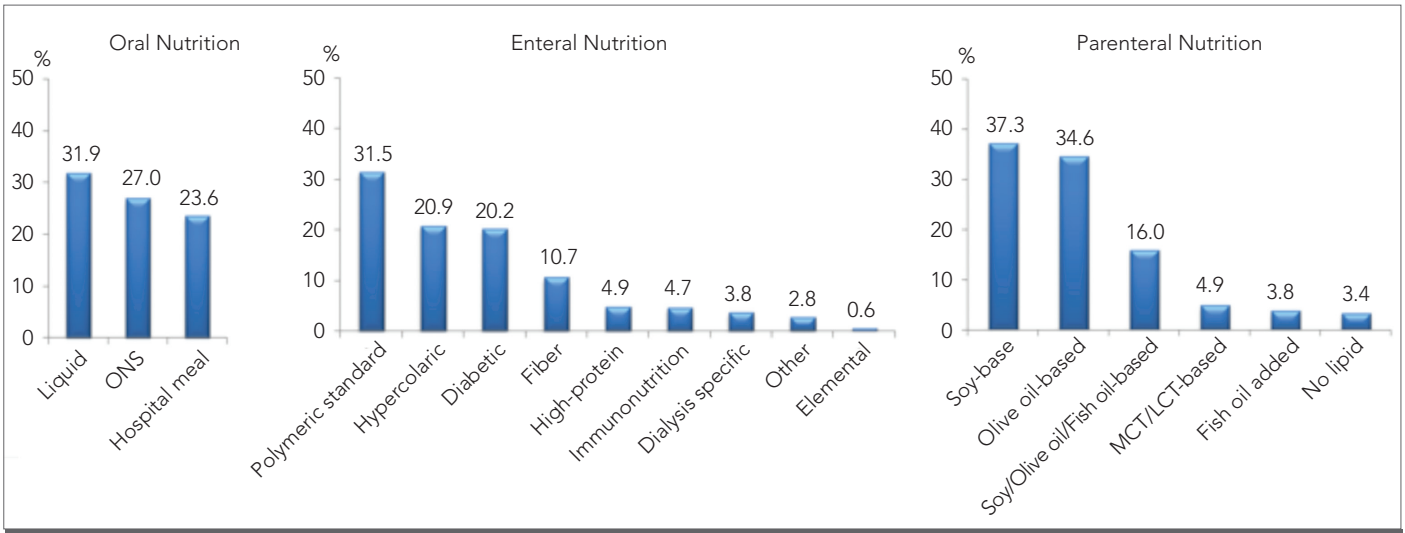


Figure 3. Products used for oral, enteral, and parenteral nutrition
ONS: oral nutritional supplement; MCT: medium-chain triglyceride; LCT: long-chain triglyceride

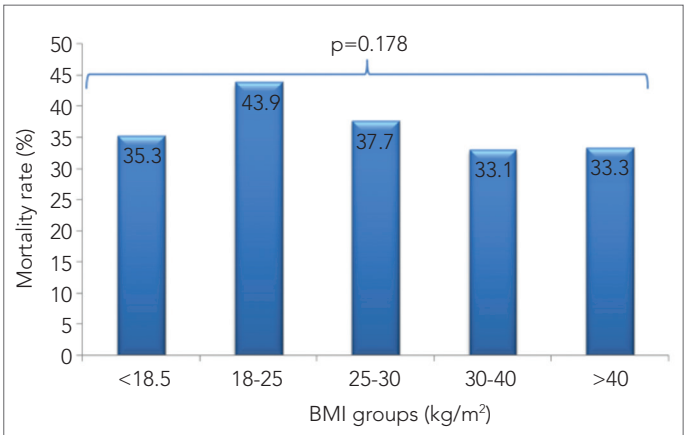


Figure 4. Mortality rates according to body mass index groups

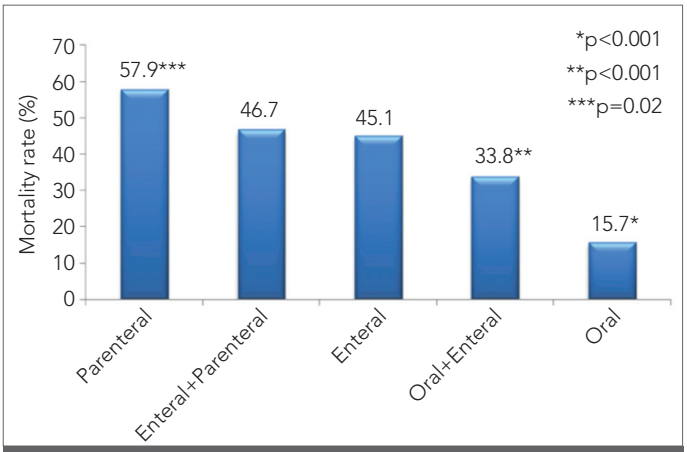


Figure 5. Mortality rates according to modes of nutritional support
(Mortality rate: * significantly lower in the oral nutrition group compared to those in other groups; ** significantly lower in the oral + enteral group than in the parenteral and enteral + parenteral groups; and *** significantly higher in the parenteral nutrition group than in the parenteral and enteral + parenteral groups)

The median duration of the ICU stay was 17 days (IQR: 6-42 days) and the median duration of the total hospital stay was 23.5 days (IQR: 11-48 days). On the 60th day, the mortality rate was 39.5%, the discharge rate was 44.1%, and the hospitalization rate was 16.4%. When the mortality rates were evaluated with regard to body mass index (BMI), no statistically significant differences were found among the BMI groups (p=0.178, Figure 4). In terms of mortality and the modes of nutritional support, mortality rates were significantly lower in the oral nutrition group than in the other groups (p<0.001). When oral and enteral nutrition were considered together, the mortality rate was again significantly lower in the oral+enteral group than the rates in the parenteral and enteral+parenteral groups (p<0.001). On the other hand, the mortality rate in the parenteral nutrition group was significantly higher than those in the enteral and enteral+parenteral groups (p=0.02) (Figure 5).

## Discussion

Assessing nutritional status and performing appropriate nutritional interventions for patients in ICUs is critical for enhanced treatment responses, better recovery, and improved patient outcomes. Based on these facts and the high prevalence of malnutrition in ICUs, the present study was designed to evaluate the current status of nutritional approaches used in ICUs and to investigate associated patient outcomes in Turkey. Our results revealed that about 2/3 of the ICUs in Turkey had an NST in their facilities. The importance of an NST for patients hospitalized in ICUs has been emphasized in previous studies, including a recent

study by Jo et al. (15) who reported that the involvement of a multidisciplinary nutrition team significantly improved the proportion of enteral nutrition provision and nutritional goal achievement. These authors also reported that the presence of a multidisciplinary nutrition team in ICUs was associated with better patient outcomes during discharge from the units. These findings have been supported by other studies, such as a recent study from Turkey by Yilmaz et al. (16), which reported that the presence of a nutrition team directly affected the clinical outcomes of the patients undergoing treatment in ICUs. Another study by Mo et al. (17) reported that the activities of an NST comprised of doctors, pharmacists, and nutritionists decreased medical costs as well as improved the outcomes of the patients in ICUs. Similar results have also been reported in other studies (18, 19). In addition, in our study, about 2/3 of ICUs had national/international nutrition guidelines, individualized nutrition treatment plans or their own nutrition protocol, and this percentage reflected the ICUs with an NST. All of this evidence suggests that the contribution of an NST is important and effective in improving outcomes.

Another finding of the present study was that oral and enteral nutritional support were administered to a majority of the patients and that nasogastric and PEG were the most frequently used routes for enteral nutrition. Additionally, all-in-one solutions were the most frequently used products for parenteral nutrition and trace elements were not adequately used for supplementation. Currently available data suggest that enteral nutrition is preferable to parenteral nutrition for several reasons. First, enteral nutrition has been suggested to be associated with immune-enhancing properties as well as with a reduced incidence of infections (20, 21). Immunological changes associated with nutritional status include impairment of the gut-associated lymphatic system in cases of decreased oral and enteral nutrition. Patients who are shifted from an oral/enteral regimen to parenteral feeding despite the presence of a functional intestinal system encounter increased activated cells and proinflammatory stimulants during gut starvation (22). The secondary mechanisms include permeability changes and bacterial translocation (8). Nevertheless, there is an ongoing debate on these topics in the literature (23, 24). A meta-analysis of 27 nutrition studies conducted on 1828 patients concluded that enteral nutrition was associated with a lower risk of infections (relative risk: 0.66; 95% Confidence Interval [CI] 0.56-0.79) but had no advantage regarding mortality (RR: 0.96; 95% CI 0.55-1.65) (25). Our study revealed that enteral nutrition and oral nutrition were administered to the majority of patients, showing that NSTs and health professionals in the ICUs in Turkey followed the updated guidelines in accordance with recent research on nutrition. Moreover, our results regarding the comparisons between subgroups revealed that the duration of hospitalization in ICUs or other departments were not correlated with BMI or mortality rates. However, the mortality rates were significantly lower in the patients in the oral nutrition group and significantly higher in the patients in the parenteral nutrition group as compared with the patients in the enteral nutrition and enteral +parenteral nutrition groups. These findings are also in accordance with the literature data that favor enteral nutrition over parenteral nutrition.

In the present study, about 87% and 86% of the planned calories and protein were delivered to the patients. The median duration of hospitalization in the ICUs was 7 days, whereas the median duration of enteral nutrition was 10 days, suggesting that some patients were taking enteral nutrition during hospitalization in other non-ICU departments. According to the current guidelines of the American Society for Parenteral and Enteral Nutrition and the Society of Critical Care Medicine, and ESPEN guidelines on clinical nutrition in the intensive care unit, initiation of enteral nutrition during the first 48 hours of an ICU stay is recommended for critically ill patients to deliver 80% to 100% of their estimated calorie and protein needs (20, 26). Achieving these estimated calorie and protein goals has been demonstrated to be associated with significantly decreased mortality and hospital stays in critical care patients (27). Our results in terms of calorie and protein delivery are in accordance with those recommended in the guidelines; this suggested favorable outcomes in our study population.

In conclusion, the present study determined the current status of nutritional support in ICUs in Turkey. Our findings confirm the importance of NSTs in providing adequate nutritional support via the optimal route and confirm the favorable outcomes that have been associated with enteral nutrition over parenteral nutrition.

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**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept - S.K.; Design - S.K., K.Demirağ., D.H.B.; Supervision - O.A.; Data Collection and/or Processing - H.S., M.G., Ö.C., Z.Ü.; Analysis and/or Interpretation - K.Demirağ., D.H.B.; Literature Search - T.E., K.D.; Writing Manuscript - K. Demirağ.; Critical Review - S.K.

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**Conflict of Interest:** The authors have no conflicts of interest to declare.

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