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# Determining the refeeding syndrome awareness levels of nurses working in intensive care units

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## ABSTRACT

**Aim:** This study was conducted to determine the refeeding syndrome (RFS) awareness levels of nurses working in the intensive care unit.

**Methods:** A descriptive research design was employed. The study was conducted with nurses working in adult ICUs at Çukurova University Balcalı Hospital.

**Results:** A total of 73 nurses participated in the study. There was a high-level, statistically significant relationship between participants' education level and giving correct answers to the statement "Only the dietician is responsible for patient nutrition" ($p<0.05$). A statistically significant relationship was found between the level of education and giving correct answers to the questions about "the most common vitamin deficiency" ($p=0.003$) and "the risk of RFS in stroke patients" ($p=0.004$), compared to giving incorrect responses to these items. A statistically significant relationship was detected between the total work experience and giving correct answers to the following questions: "Individuals with low body mass index (BMI) have a risk of developing RFS," "Individuals who develop RFS have normal blood potassium levels," "Only the dietician is responsible for patient nutrition," "The patient's weight is monitored before feeding," and "RFS is an apparent abnormality" ($p<0.05$).

**Conclusion:** It was determined that nurses who worked in intensive care units and had an undergraduate or above education had better knowledge of RFS than those with an associate degree or below education.

**Keywords:** refeeding syndrome, nursing, refeeding, intensive care unit, awareness level

## Introduction

Refeeding syndrome (RFS) is defined as a series of metabolic and electrolyte changes that occur as a result of the reintroduction and/or increase of calories after a period of reduced or no calorie intake.[1] It was first identified during World War II when prisoners of war experienced unexpected disorders and death after they were fed. Fatal cardiac complications occurred after individuals were rapidly refed.[2]

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RFS was observed in 48% of severely malnourished patients, 34% of intensive care unit (ICU) patients, 33% of patients with anorexia nervosa, 25% of inpatients with cancer, and 9.5% of hospitalized patients in a study.[3] Reported incidence rates vary between 0% and 80%, depending on the recognition of the disease and the patient population studied.[4]

The basic principle in the prevention and treatment of RFS is to identify patients at risk of developing the syndrome and have an experienced multidisciplinary team (physician, nurse, and dietitian) monitor nutritional intake and fluid-electrolyte replacement.[5]

RFS is a potentially life-threatening disease; however, it is largely preventable. To prevent it, patients at risk of developing RFS must be identified, and appropriate protocols must be implemented. Nurses play a critical role in the care of patients at risk of developing RFS who are at high risk of malnutrition, have poor oral intake, or cannot tolerate nasogastric feeding.[6] While providing care for patients, nurses use their knowledge, experience, and critical thinking skills to decide which interventions will benefit the patient the most in line with the nursing process.[7] Therefore, it is very valuable for nurses to know the basics of fluid, electrolyte, and nutrient metabolism as well as metabolic complications to identify patients at risk for metabolic complications due to RFS and to report these findings to their team members.[8] In a study in Israel titled "The Role and Knowledge of Intensive Care Nurses in the Assessment and Management of Hypophosphatemia and RFS," it was revealed that intensive care nurses were unclear about their roles and had little knowledge about nutritional management.[9] A study in Yemen titled "The Assessment of the Level of Knowledge of RFS among Physicians and Nurses in ICUs" indicated that the level of nurses' knowledge was low.[10] In another study at Assiut University Hospital in Egypt titled "The perceptions of intensive care nurses and physicians about RFS," nurses' knowledge levels were found inadequate.[11]

**Main Points**

- Early recognition and management of refeeding syndrome is of vital importance in terms of improving clinical outcomes.
- This study was conducted to determine the RFS awareness levels of intensive care nurses
- It was determined that nurses who worked in intensive care units and had an undergraduate or above education had better knowledge of RFS than those with an associate degree or below education.

In 2017, the American Society for Parenteral and Enteral Nutrition (ASPEN), Parenteral Nutrition (PN) Safety Committee and Clinical Practice Committee established an interprofessional task force consisting of dietitians, nurses, pharmacists, and physicians, who were commissioned to develop consensus recommendations for screening and managing patients who were at risk for or who had developed RF.[1] The multidisciplinary team, consisting of nurses and other healthcare team members, collaborates in ICUs to manage the care and treatment procedures of patients with RFS.[12] As members of the healthcare team, frequently evaluating patients in terms of all daily living activities and constantly monitoring them and observing potential problems at the earliest, nurses play a critical role in the evaluation, monitoring, and follow-up of many complex processes in the ICU.[9] It has been stated that careful patient monitoring and disciplined team management help to recognize early symptoms of RFS and reduce morbidity and mortality.[13] Therefore, nurses need to be aware of early signs, symptoms, or various clinical features of RFS and to recognize the pathophysiology of this syndrome so that they can monitor early symptoms and implement appropriate interventions in patient care.[7]

A review of the literature indicated that there were no studies in Türkiye to measure the level of ICU nurses' awareness of RFS. Early recognition and management of refeeding syndrome is of vital importance in terms of improving clinical outcomes. In this context, this study was conducted to determine the RFS awareness levels of intensive care nurses. In this context, the research questions were determined as follows.

1. Do nurses working in adult ICUs have awareness of RFS?
2. Do nurses working in adult ICUs have enough knowledge about RFS?

## Materials and Methods

### Research type

A descriptive and cross-sectional research design was employed.

### Setting

This research was conducted with nurses working in adult ICUs at Çukurova University Faculty of Medicine, Balcalı Hospital.

### Population and sample

The population of the study consisted of 140 nurses who had been actively working as nurses at Çukurova University Faculty of Medicine, Balcalı Hospital for at least one year. Nurses working in adult ICUs at Balcalı Hospital made up the sample. Inclusion criteria were working as an active nurse in adult ICUs of the Çukurova University Faculty of Medicine, Balcalı Hospital for the past year and volunteering to participate in the study. Considering the inclusion criteria in the study, it was aimed to recruit the entire population without implementing a sampling procedure. Accordingly, all nurses were interviewed, and the study was conducted with those who agreed to participate voluntarily in the study. The participation rate in the study was 52.2% (n=73).

### Ethics of the research

At the outset, the approval of the Çukurova University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee was obtained (Meeting number: 128; Decision Number: 38, 02.12.2022). Participation in the study was voluntary, and individuals who gave consent were informed about the protection of confidentiality and privacy and that they could withdraw from the study at any time.

### Data collection tools

1. Personal Information Form: This form was prepared by the researcher. It consists of questions about participants' socio-demographic characteristics (age, gender, marital status, educational status, etc.).
2. RFS Information Form: This form includes statements about nurses' perceptions of their roles in the management of nutritional care, information on the importance of electrolyte monitoring before starting refeeding, and information on RFS.

### Statistical analyses

Analyses were performed on the SPSS (IBM SPSS Statistics 27) software. Findings were interpreted through descriptive statistics and frequency tables. "Pearson-$X^2$" cross tables were employed to study the correlations between two qualitative variables. The p value of $<0.05$ was considered statistically significant.

## Results

Participants' mean age was 30.17±5.71 (years), and 45 (35.0%) of them were in the <30 age group. Fifty-nine of them (80.8%) were female, 50 (68.5%) had an undergraduate degree, and 39 (53.4%) were married. Fifty-eight of the participants (79.5%) liked their job, Total nursing experience was 8.07±6.36 (years), 25 (34.2%) had been nurses for ≥10 years, 55 (75.3%) had not received nutrition education, and 52 (71.2%) worked voluntarily in the ICU (Table 1).

There was a high and statistically significant relationship between the level of education and the rate of correct responses to the item "Only the dietician is responsible for patient nutrition," compared to the rate of incorrect responses ($p<0.001$) (Table 2).

A statistically significant relationship was found between the level of education and the rate of correct responses to the items about "The most common vitamin deficiency" ($p=0.003$)" and "Risk of RFS in stroke patients" ($p=0.004$)," compared to the rate of incorrect responses (Table 3). There was no statistically significant relationship between the level of education and the rate of correct/incorrect responses to other items in the table ($p>0.05$) (Table 3).

The relationship between total work experience groups and the rate of correct responses to the items "Those with low BMI* are at risk for developing RFS" ($p=0.018$), "Those who develop RFS have normal blood potassium levels" ($p=0.048$), "Only the dietician is responsible for patient nutrition" ($p=0.017$) and "The patient's weight is monitored before feeding" was statistically significant ($p=0.002$). There was no statistically significant relationship between total work experience groups and the rate of correct responses to other items in the table ($p>0.05$) (Table 4).

**Table 1.** Distribution of participant characteristics

| Variable (N=73) | n | % |
|---|---|---|
| Age groups | | |
| <30 | 45 | 61.6 |
| ≥30 | 28 | 38.4 |
| Gender | | |
| Female | 59 | 80.8 |
| Male | 14 | 19.2 |
| Level of education | | |
| Vocational high school | 13 | 17.8 |
| Associate degree | 7 | 9.6 |
| Undergraduate degree | 50 | 68.5 |
| Master's degree | 3 | 4.1 |
| Marital status | | |
| Married | 39 | 53.4 |
| Single | 34 | 46.6 |
| Status of liking the profession | | |
| Yes | 58 | 79.5 |
| No | 15 | 20.5 |
| Total nursing experience (years) | | |
| <5 | 24 | 32.9 |
| 5-9 | 24 | 32.9 |
| ≥10 | 25 | 34.2 |
| Having received nutrition education | | |
| Yes | 18 | 24.7 |
| No | 55 | 75.3 |
| *Working voluntarily in the ICU | | |
| Yes | 52 | 71.2 |
| No | 21 | 28.8 |

*ICU:(Intensive Care Unit)

A statistically significant relationship was found between total work experience groups and the rate of correct responses to the item "RFS is an apparent abnormality" (p=0.021). There was no statistically significant relationship between total work experience groups and the rate of correct/incorrect responses to other items in the table (p>0.05) (Table 5).

## Discussion

Nutrition is an interdisciplinary process.[9] A multidisciplinary team approach is vital for the management of RFS. Nurses, who are part of this team, play an important role in the care of patients at risk of developing RFS who have poor oral intake and intolerance to nasogastric intake. They are responsible for the assessment, planning, and implementation of nutrition; therefore, they need to be able to identify the risk factors, pathophysiology, and clinical features of RFS and to report these to appropriate team members.[6] When planning nutritional therapy, experienced clinical nutrition teams should be able to predict the complications that may develop when the patient is refed after a long period of fasting, and they should be able to interpret abnormalities in biochemical findings and the patient's clinical condition and report these to the appropriate team members.[14]

According to the findings of this study, a statistically significant relationship was found between the nurses' education level and the rate of correct/incorrect responses to the statement "Only the dietitian is responsible for patient nutrition." The majority of those who responded to this question accurately had an undergraduate degree or higher education, while all those who answered incorrectly had an associate degree or below education. Contrary to our study, a study in Israel indicated that 91.1% of the nurses participating in the study did not consider nutritional care and follow-up as their responsibility, thinking it only as the responsibility of a dietician.[9] Our study showed that intensive care nurses (with an undergraduate degree or higher education) were aware of their roles and responsibilities among team members in monitoring and managing patients at risk of or with RFS.

In our study, a statistically significant relationship was found between the level of education and the rate of correct/incorrect responses to the statement "The most common vitamin deficiency." It was determined that 49 nurses with an undergraduate degree or higher education (92.5%) had answered the question correctly. The results of the study conducted in Egypt were consistent with our study findings. In the study, 70% of the nurses gave correct answers to the statement "RFS is the most common vitamin deficiency".[11] In another study conducted in Sana, Yemen, the rate of correct responses to the item "RFS is the most common vitamin deficiency" was 26.7%, contrary to our study.[10] Our study revealed that nurses with an undergraduate degree or higher education had better nutrition knowledge.

In our study, a statistically significant relationship was found between the level of education and the rate of correct/incorrect responses to the statement "Risk of RFS in stroke patients." It was determined that 44 people

**Table 2.** Examination of the relationship between the level of education and knowledge levels about RFS

| Level of education / Variable | Associate degree/ below (n=20) | | Undergraduate degree/above (n=53) | | Statistical analysis* |
|---|---|---|---|---|---|
| | n | % | n | % | Probability |
| "Only the nurse is responsible for diet care monitoring." | | | | | |
| True | 20 | 100.0 | 51 | 96.2 | $X^2$=0.776 |
| False | - | - | 2 | 3.8 | p=0.378 |
| "Only the nurse is responsible for electrolyte monitoring." | | | | | |
| True | 20 | 100.0 | 53 | 100.0 | # |
| "The nurse reports electrolyte abnormalities to the physician." | | | | | |
| True | 6 | 30.0 | 27 | 50.9 | $X^2$=2.571 |
| False | 14 | 70.0 | 26 | 49.1 | p=0.109 |
| "Nutrition should be provided according to RMR* measurement." | | | | | |
| True | 5 | 25.0 | 11 | 20.8 | $X^2$=0.153 |
| False | 15 | 75.0 | 42 | 79.2 | p=0.696 |
| "Those with low BMI* are at risk for developing RFS." | | | | | |
| True | 14 | 70.0 | 38 | 71.7 | $X^2$=0.020 |
| False | 6 | 30.0 | 15 | 28.3 | p=0.886 |
| "Those who develop RFS have normal blood potassium levels." | | | | | |
| True | 11 | 55.0 | 27 | 50.9 | $X^2$=0.096 |
| False | 9 | 45.0 | 26 | 49.1 | p=0.757 |
| "The nurse regularly monitors nutritional status." | | | | | |
| True | 17 | 85.0 | 50 | 94.3 | $X^2$=1.679 |
| False | 3 | 15.0 | 3 | 5.7 | p=0.195 |
| "Only the dietitian is responsible for the patient's nutrition." | | | | | |
| True | 16 | 80.0 | 53 | 100.0 | $X^2$=11.214 |
| False | 4 | 20.0 | - | - | **p<0.001** |
| "The nurse monitors blood sugar regularly." | | | | | |
| True | 18 | 90.0 | 51 | 96.2 | $X^2$=1.087 |
| False | 2 | 10.0 | 2 | 3.8 | p=0.297 |
| "Blood electrolytes are checked daily before feeding." | | | | | |
| True | 13 | 65.0 | 40 | 75.5 | $X^2$=0.800 |
| False | 7 | 35.0 | 13 | 24.5 | p=0.371 |
| "The patient's weight is monitored before feeding." | | | | | |
| True | 16 | 80.0 | 47 | 88.7 | $X^2$=0.925 |
| False | 4 | 20.0 | 6 | 11.3 | p=0.336 |
| "Nurses are always aware of RFS*." | | | | | |
| True | 11 | 55.0 | 39 | 63.6 | $X^2$=2.324 |
| False | 9 | 45.0 | 14 | 26.4 | p=0.127 |
| "Updated information and education on nutritional status is provided." | | | | | |
| True | 8 | 40.0 | 22 | 41.5 | $X^2$=0.014 |
| False | 12 | 60.0 | 31 | 58.5 | p=0.907 |

*RMR (Resting metabolic rate), BMI (Body mass index), RFS (Refeeding syndrome)
*"Pearson-$X^2$" cross tables were used to examine the relationships between two qualitative variables.

**Table 3.** Examination of the relationship between the level of education and knowledge levels about RFS

| **Level of education** / **Variable** | **Associate degree/ below (n=20)** | | **Undergraduate degree/ above (n=53)** | | **Statistical analysis*** **Probability** |
|---|---|---|---|---|---|
| | **n** | **%** | **n** | **%** | |
| "RFS is the route of feeding." | | | | | |
| True | 15 | 75,0 | 46 | 86,8 | $X^2$=1,470 |
| False | 5 | 25,0 | 7 | 13,2 | p=0,225 |
| "RFS is an apparent abnormality." | | | | | |
| True | 12 | 60,0 | 31 | 58,5 | $X^2$=0,014 |
| False | 8 | 40,0 | 22 | 41,5 | p=0,907 |
| "RFS is the source of electrolyte disturbance." | | | | | |
| True | 4 | 20,0 | 10 | 18,9 | $X^2$=0,012 |
| False | 16 | 80,0 | 43 | 81,1 | p=0,913 |
| "RFS is the most common vitamin deficiency." | | | | | |
| True | 13 | 65,0 | 49 | 92,5 | $X^2$=8,551 |
| False | 7 | 35,0 | 4 | 7,5 | **p=0,003** |
| "RFS is not a risk factor." | | | | | |
| True | 3 | 15,0 | 21 | 39,6 | $X^2$=2,951 |
| False | 17 | 85,0 | 32 | 60,4 | p=0,086 |
| "Operations increase the risk of RFS." | | | | | |
| True | 18 | 90,0 | 50 | 94,3 | $X^2$=0,429 |
| False | 2 | 10,0 | 3 | 5,7 | p=0,513 |
| "RFS is risky weight loss." | | | | | |
| True | 16 | 80,0 | 43 | 81,1 | $X^2$=0,012 |
| False | 4 | 20,0 | 10 | 18,9 | p=0,913 |
| "Risks in patients receiving CT*" | | | | | |
| True | 12 | 60,0 | 42 | 79,2 | $X^2$=1,883 |
| False | 8 | 40,0 | 11 | 20,8 | p=0,170 |
| "Risk of RFS in stroke patients" | | | | | |
| True | 10 | 50,0 | 44 | 83,0 | $X^2$=8,223 |
| False | 10 | 50,0 | 9 | 17,0 | **p=0,004** |
| "Ocular disease develops in those with RFS." | | | | | |
| True | 4 | 20,0 | 13 | 24,5 | $X^2$=0,167 |
| False | 16 | 80,0 | 40 | 75,5 | p=0,683 |
| "Distinguishing inaccurate information about RFS" | | | | | |
| True | 8 | 40,0 | 29 | 54,7 | $X^2$=1,258 |
| False | 12 | 60,0 | 24 | 45,3 | p=0,262 |
| "The most important application for RFS" | | | | | |
| True | 19 | 95,0 | 48 | 90,6 | $X^2$=0,378 |
| False | 1 | 5,0 | 5 | 9,4 | p=0,538 |

*CT(chemotherapy)
*"Pearson-$X^2$" cross tables were used to examine the relationships between two qualitative variables.

**Table 4.** Examination of the relationship between total work experience and knowledge levels about RFS

| Total work experience / Variable | <5 years (n=24) | | 5-9 years (n=24) | | ≥10 years (n=25) | | Statistical analysis* |
|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | Probability |
| "Only the nurse is responsible for diet care monitoring." | | | | | | | |
| True | 22 | 91.7 | 24 | 100.0 | 25 | 100.0 | $X^2$=4.198 |
| False | 2 | 8.3 | - | - | - | - | p=0.123 |
| "Only the nurse is responsible for electrolyte monitoring." | | | | | | | |
| True | 24 | 100.0 | 24 | 100.0 | 25 | 100.0 | # |
| "The nurse reports electrolyte abnormalities to the physician." | | | | | | | |
| True | 11 | 45.8 | 10 | 41.7 | 12 | 48.0 | $X^2$=0.204 |
| False | 13 | 54.2 | 14 | 58.3 | 13 | 52.0 | p=0.903 |
| "Nutrition should be provided according to RMR* measurement." | | | | | | | |
| True | 3 | 12.5 | 7 | 29.2 | 6 | 24.0 | $X^2$=2.044 |
| False | 21 | 87.5 | 17 | 70.8 | 19 | 76.0 | p=0.360 |
| "Those with low BMI* are at risk for developing RFS." | | | | | | | |
| True | 12 | 50.0 | 19 | 79.2 | 21 | 84.0 | $X^2$=8.006 |
| False | 12 | 50.0 | 5 | 20.8 | 4 | 16.0 | **p=0.018** |
| "Those who develop RFS have normal blood potassium levels." | | | | | | | |
| True | 8 | 33.3 | 13 | 54.2 | 17 | 68.0 | $X^2$=6.076 |
| False | 16 | 66.7 | 11 | 45.8 | 8 | 32.0 | **p=0.048** |
| "The nurse regularly monitors nutritional status." | | | | | | | |
| True | 23 | 95.8 | 22 | 91.7 | 22 | 88.0 | $X^2$=0.997 |
| False | 1 | 4.2 | 2 | 8.3 | 3 | 12.0 | p=0.608 |
| "Only the dietitian is responsible for the patient's nutrition." | | | | | | | |
| True | 24 | 100.0 | 24 | 100.0 | 21 | 84.0 | $X^2$=8.125 |
| False | - | - | - | - | 4 | 16.0 | **p=0.017** |
| "The nurse monitors blood sugar regularly." | | | | | | | |
| True | 23 | 95.8 | 21 | 87.5 | 25 | 100.0 | $X^2$=3.813 |
| False | 1 | 4.2 | 3 | 12.5 | - | - | p=0.149 |
| "Blood electrolytes are checked daily before feeding." | | | | | | | |
| True | 15 | 62.5 | 17 | 70.8 | 21 | 84.0 | $X^2$=2.902 |
| False | 9 | 37.5 | 7 | 29.2 | 4 | 16.0 | p=0.234 |
| "The patient's weight is monitored before feeding." | | | | | | | |
| True | 22 | 91.7 | 16 | 66.7 | 25 | 100.0 | $X^2$=12.379 |
| False | 2 | 8.3 | 8 | 33.3 | - | - | **p=0.002** |
| "Nurses are always aware of RFS*." | | | | | | | |
| True | 19 | 79.2 | 14 | 58.3 | 17 | 68.0 | $X^2$=2.418 |
| False | 5 | 20.8 | 10 | 41.7 | 8 | 32.0 | p=0.299 |
| "Updated information and education on nutritional status is provided." | | | | | | | |
| True | 8 | 33.3 | 8 | 33.3 | 14 | 56.0 | $X^2$=3.489 |
| False | 16 | 66.7 | 16 | 66.7 | 11 | 44.0 | p=0.175 |

*RMR (Resting metabolic rate), BMI (Body mass index), RFS (Refeeding syndrome)

*"Pearson-$X^2$" cross tables were used to examine the relationships between two qualitative variables.

**Table 5.** Examination of the relationship between total work experience and knowledge levels about RFS

| **Total work experience** / **Variable** | **<5 years (n=24)** | | **5-9 years (n=24)** | | **≥10 years (n=25)** | | **Statistical analysis*** **Probability** |
|---|---|---|---|---|---|---|---|
| | **n** | **%** | **n** | **%** | **n** | **%** | |
| "RFS is the route of feeding." | | | | | | | |
| True | 19 | 79.2 | 21 | 87.5 | 21 | 84.0 | $X^2$=0.612 |
| False | 5 | 20.8 | 3 | 12.5 | 4 | 16.0 | p=0.736 |
| "RFS is an apparent abnormality." | | | | | | | |
| True | 10 | 41.7 | 13 | 54.2 | 20 | 80.0 | $X^2$=7.765 |
| False | 14 | 58.3 | 11 | 45.8 | 5 | 20.0 | **p=0.021** |
| "RFS is the source of electrolyte disturbance." | | | | | | | |
| True | 6 | 25.0 | 3 | 12.5 | 5 | 20.0 | $X^2$=1.226 |
| False | 18 | 75.0 | 21 | 87.5 | 20 | 80.0 | p=0.542 |
| "RFS is the most common vitamin deficiency." | | | | | | | |
| True | 22 | 91.7 | 20 | 83.3 | 20 | 80.0 | $X^2$=1.375 |
| False | 2 | 8.3 | 4 | 16.7 | 5 | 20.0 | p=0.503 |
| "RFS is not a risk factor." | | | | | | | |
| True | 5 | 20.8 | 9 | 37.5 | 10 | 40.0 | $X^2$=2.385 |
| False | 19 | 79.2 | 15 | 62.5 | 15 | 60.0 | p=0.304 |
| "Operations increase the risk of RFS." | | | | | | | |
| True | 21 | 87.5 | 22 | 91.7 | 25 | 100.0 | $X^2$=3.122 |
| False | 3 | 12.5 | 2 | 8.3 | - | - | p=0.210 |
| "RFS is risky weight loss." | | | | | | | |
| True | 20 | 83.3 | 19 | 79.2 | 20 | 80.0 | $X^2$=0.151 |
| False | 4 | 16.7 | 5 | 20.8 | 5 | 20.0 | p=0.927 |
| "Risks in patients receiving CT*" | | | | | | | |
| True | 20 | 83.3 | 15 | 62.5 | 19 | 76.0 | $X^2$=2.786 |
| False | 4 | 16.7 | 9 | 37.5 | 6 | 24.0 | p=0.248 |
| "Risk of RFS in stroke patients" | | | | | | | |
| True | 19 | 79.2 | 16 | 66.7 | 19 | 76.0 | $X^2$=1.055 |
| False | 5 | 20.8 | 8 | 33.3 | 6 | 24.0 | p=0.590 |
| "Ocular disease develops in those with RFS." | | | | | | | |
| True | 6 | 25.0 | 7 | 29.2 | 4 | 16.0 | $X^2$=1.247 |
| False | 18 | 75.0 | 17 | 70.8 | 21 | 84.0 | p=0.536 |
| "Distinguishing inaccurate information about RFS" | | | | | | | |
| True | 12 | 50.0 | 12 | 50.0 | 13 | 52.0 | $X^2$=0.026 |
| False | 12 | 50.0 | 12 | 50.0 | 12 | 48.0 | p=0.987 |
| "The most important application for RFS" | | | | | | | |
| True | 21 | 87.5 | 22 | 91.7 | 24 | 96.0 | $X^2$=1.173 |
| False | 3 | 12.5 | 2 | 8.3 | 1 | 4.0 | p=0.556 |

*CT(chemotherapy), RFS (Refeeding syndrome)
*"Pearson-$X^2$" cross tables were used to examine the relationships between two qualitative variables.

with an undergraduate degree or higher education (83.0%) gave correct responses to the item. The majority of those who responded to the item correctly had an undergraduate degree or higher education, while most of those who answered incorrectly had an associate degree or lower education. In contrast to our study, in a study in Egypt, 23.3% of the nurses identified the reason for the increased risk of RFS in stroke patients as dysphagia correctly.[11] In the study conducted in Sana, Yemen, 51.1% of the nurses identified the reason for the increased risk of RFS in stroke patients as dysphagia correctly, while 48.9% gave incorrect answers.[10] According to our study and the literature, nurses with undergraduate and higher education are aware of refeeding syndrome and have more knowledge on this subject.

There was a statistically significant relationship between the total work experience and the rate of correct/incorrect responses to the items "Those with low BMI have a risk of developing RFS," "Those who develop RFS have normal blood potassium levels," and "The patient's weight is monitored before feeding." It was determined that the majority of those who answered the questions correctly had been working for ≥10 years, while most of those who answered them incorrectly had been working for <5 years. The results of a systematic review of the Use of Approved Tools to Determine the Nutrition Knowledge of Physicians and Nurses were consistent with our study. It was stated that the nutritional knowledge of nurses who were specialized in the profession and had more practice experience was higher than the level of those who were not specialized and had less practice experience.[15]

## Conclusions and Recommendations

It was determined that intensive care nurses with undergraduate or higher education had better levels of knowledge about refeeding syndrome than those who had associate or below education. It may be recommended that in-service training programs be organized to increase the knowledge of nurses, who are an integral part of a multidisciplinary team in nutritional care, regarding the identification and management of RFS, and that a protocol based on current nutritional guidelines be created to increase awareness of RFS.

## Ethical approval

This study has been approved by the Çukurova University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee (approval date 02.12.2022, number 38). Written informed consent was obtained from the participants.

## Author contribution

The authors declare contribution to the paper as follows: Study conception and design: KM, ZE, KA, PYD; data collection: KM; analysis and interpretation of results: KM, ZE, KA, PYD; draft manuscript preparation: KM, ZE, KA, PYD. All authors reviewed the results and approved the final version of the article.

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## Conflict of interest

The authors declare that there is no conflict of interest.

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