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RESEARCH ARTICLE

Critical Care Nurses' Perceptions of Enteral Nutrition: A Descriptive Cross-Sectional Study

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Abstract:

Background and Objective:

Nutritional support is an essential component of critical care with a significant effect on the outcomes of critically ill patients. Critical care nurses are in a central position to achieve nutritional goals and preserve the nutritional status of patients at best. This study aimed to investigate the critical care nurses' perceptions of the responsibility, knowledge, and documentation system support regarding enteral nutrition.

Methods:

Data were collected from 292 critical care nurses in different healthcare sectors in Sana'a, the capital of Yemen, using a quantitative, descriptive, cross-sectional design. A self-administered questionnaire containing 50 items was used for data collection. The data were collected between March and June 2021. The Statistical Package for the Social Sciences (SPSS) version 16 was used for the data analysis.

Results:

The study found that most critical care units did not have guidelines, protocols, or a nutritional support team, and the physicians prescribed enteral nutrition. The critical care nurses perceived they had a low responsibility, insufficient knowledge, and moderate documentation support regarding enteral nutrition. The nurses in private hospitals had the highest responsibility, the nurses who received in-service education about enteral nutrition reported the highest level of knowledge, and the nurses in the Neuro critical care units had the best support from a documentation system. Scientific workshops and conferences were the main sources of knowledge regarding enteral nutrition. The nurses' educational needs included the ability to evaluate the outcomes, goal setting, and nutritional assessment.

Conclusions:

The critical care nurses perceived a low responsibility, low level of knowledge, and moderate support from a documentation system regarding enteral nutrition. There is an urgent need to create or adopt enteral nutrition evidence-based guidelines and protocols and establish a multidisciplinary nutritional support team with clear roles and responsibilities. In-service education and training related to enteral nutrition are paramount.

Keywords: Enteral nutrition, Critical care, Critical care nurses, Perceptions, Healthcare sectors, Critically ill patients.

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1. INTRODUCTION

Nutritional support (NS) is a vital part of critical care and significantly affects critically ill patients' outcomes [1]. Enteral nutrition (EN) is the preferred choice for NS for critically ill patients [2, 3] because it is physiologically safe and cost-effective [4]. EN accelerates wound healing, maintains gastrointestinal function [1], preserves the intestinal mucosa integrity and immune function, prevents bacteria translocation, downregulates the systemic inflammatory response [5, 6], reduces infectious complications [7], the length of mechanical ventilation [8], the critical care unit (CCU) stay [4, 7], the hospital stay [4], the mortality rate [6], and hospital costs [7]. However, more than 40% of critically ill patients globally are undernourished during CCU admission [3, 9]. Nutritional practices and nutrition delivery are often suboptimal when EN is administered in CCUs [10]. Delayed initiation [1], under prescribing of the nutritional requirements [3], inappropriate handling of the gastric residual volume [11], and low delivery rates due to repeated and often inappropriate feeding interruptions [1, 3, 11] all contribute to undernutrition.

NS of the critically ill patient is not only the responsibility of the multidisciplinary team but is also fundamental nursing care [9, 12]. Critical care nurses (CCNs) play a crucial role in all aspects of NS. These include conducting a nutritional assessment [7], calculating the nutritional requirements [13], advocating for and initiating early EN [8], delivering EN effectively and safely [14], sustaining NS, following up with patients, and preventing and monitoring EN-related complications [7, 15]. CCNs are pivotal in achieving nutritional goals and preserving the nutritional status of patients at best [14, 15].

Healthcare sciences, including critical care nursing and nutrition, are rapidly advancing and continuously changing. For the effective establishment of EN, CCNs must have adequate current knowledge, specific roles and responsibilities [8, 9], and adequate support from the documentation system. Accurate and correct documentation of the nutritional support activities is crucial to avoid assumptions, misinterpretation and miscommunication of patients' data among healthcare team members [8, 16]. The documentation should cover the entire nursing process from preliminary assessment to outcome evaluation of EN care activities [16]. However, the real situation may differ; the literature reports poor EN knowledge in nurses and healthcare workers [17 - 22], and nurses underutilize scientific journals as a source of new evidence [23, 24]. The nurses' main sources of knowledge regarding EN were consultation with colleagues [7, 22], education, and the Internet [8, 25]. The previous studies report that lack of clarity about the CCNs' responsibilities and lack of knowledge about EN are the main barriers to effective nutritional care [1, 7, 13]. Furthermore, the documentation system provides CCNs with inadequate support to implement NS care [8].

Assessing the CCNs' perceptions of the responsibility, knowledge, and support from documentation systems regarding EN would improve the NS care provided to critically ill patients through reviewing and modifying related policies and practices [5]. The nursing process, with its five components, is a widely accepted framework in nursing education and practice [16]. Limited studies assessed the CCNs' perceptions of their responsibility, knowledge, and support from the documentation systems using the nursing process framework [7, 8, 16, 25]. The literature regarding EN in Yemen is limited, and nothing is known about the knowledge or practices of healthcare workers, including nurses, regarding EN care in critical care settings. This study investigated Yemeni CCNs' perceptions of their responsibilities, knowledge, documentation system support, sources of knowledge, and educational needs regarding EN care for critically ill patients.

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2. MATERIALS AND METHODS

2.1. Design

A quantitative, descriptive cross-sectional design was used to conduct the study.

2.2. Setting and Participants

The data were collected in CCUs at hospitals in Sana'a, the capital city of Yemen. Hospitals in Yemen are categorized as governmental, military/police, teaching, or private. According to this categorization, a convenient sample was obtained from 8 randomly selected hospitals (two hospitals from each category with at least a 10-bed capacity CCU). Based on an estimated population size of 1200 CCNs, a power level of 0.95, a margin of error of 0.05, and a response rate of 50%, a sample size of 292 CCNs were considered sufficient. All the CCNs with at least 6 months experience in the CCU, who provided bedside care and EN to critically ill patients, and who agreed to participate in the study were included regardless of gender or qualification level. Nurses with less than 6 months of clinical experience, not involved in providing EN support, or unwilling to participate were excluded. All the types of CCUs were included. In total, 517 questionnaires were distributed in the eight hospitals; 308 were completed, giving a response rate of 59.6%. Sixteen questionnaires were incomplete, and they were excluded from the analysis.

2.3. Measurements and Data Collection Instrument

The data were collected using a self-administered Nurses' Perceptions of EN questionnaire developed by Persenius *et al.* [16]. After obtaining permission, the authors modified the questionnaire, and the final questionnaire contained two parts with 50 items. The first part contained 19 items about the participants and workplace characteristics. The second part measured the CCNs' perceptions of EN and contained five subscales with 31 items. The first, second, and third subscales contained five questions each that assessed the nurses' perceptions of the responsibility, knowledge, and support from the documentation system regarding EN using the nursing process framework. The fourth subscale assessed the nurses' perceptions of the sources of knowledge regarding EN (7 sources). The fifth subscale assessed the nurses' perceptions of their educational needs regarding EN (5 items) and the format of the required education (4 items). The items in the five subscales used a five-point Likert scale ranging from (1) "very small extent" to (5) "very great extent." The mean score of each item was calculated out of 5; a score < 3 was considered low, 3–3.9 moderate, and 4–5 high [8]. The final questionnaire

was revalidated by three experts in critical care nursing, translated into Arabic, translated back to English, and piloted. The Cronbach's alpha coefficients for the five subscales of the second part (second to sixth) were 0.61, 0.83, 0.86, 0.88, and 0.84, respectively.

2.4. Ethical Considerations

The Research Ethical Review Committee approved the study at Al-Razi University (No. 022/FOMS/2020). After obtaining consent from the hospitals, the researchers met the head/charge nurses of the participating CCUs and explained the objectives and procedures. The head/charge nurses explained the study and distributed the information sheet and questionnaire to the nurses. Participation was voluntary, anonymous, and confidential. Informed consent was obtained from the nurses after they received the information sheet and an adequate explanation. The head/charge nurse in each unit received the completed questionnaires confidentially. The data were collected between March and June 2021.

2.5. Data Analysis

The Statistical Package for the Social Sciences (SPSS) version 16 (IBM, Armonk, NY, USA) was used for the data analysis. Descriptive analysis was performed with the demographic data and the nurses' knowledge of the responsibility for NS. The mean scores of each subscale were obtained by dividing the sum of the raw scores by the number of items in the subscale. An analysis of variance (ANOVA) and an independent t-test was used to compare the mean scores of the perceptions of responsibility, knowledge, documentation system support, sources of knowledge, and educational needs. If the ANOVA test was significant, a post hoc test was used. $P < 0.05$ was considered statistically significant.

3. RESULTS

3.1. Characteristics of the Study Sample and Workplace

Table **1** presents the participants' demographic and workplace characteristics. Most of the respondents were male (60.6%), single (52.1%), aged 30 years or less (65.1%), had an associate degree in nursing (57.5%), and 5 years or less experience in the nursing profession and critical care nursing (64.4% and 73.3%, respectively). About half of the respondents did not receive any in-service education/training about EN.

Table 1. Characteristics of the study sample.

Characteristics	n	%
Total Sample	292	100
Gender	-	-
Male	177	60.6
Female	115	39.4
Age	-	-
≤30	190	65.1
31-40	80	27.4
>40	22	7.5
Marital Status	-	-
Single	152	52.1
Married	115	39.4
Divorce and Widow	25	8.6
Educational Level	-	-
Associate	168	57.5
Bachelor	104	35.6
Postgraduate Diploma or Master	20	6.8
Experience in Nursing (Years)	-	-
≤5	188	64.4
6-10	62	21.2
>10	42	14.4
Experience in CCU (Years)	-	-
≤5	214	73.3
6-10	49	16.8
>10	19	6.5
Missed Data	10	3.4
Job Position	-	-
Staff Nurse	132	45.2
Incharge Nurse	19	6.5
Head Nurse/Nursing Supervisor	24	8.2
Missed Data	175	40.1

(Table 1) contd.....

Characteristics	n	%
Receiving In-service Education and Training about EN		
Yes	149	51
No	143	49

Table **2** describes the characteristics of the workplace. More than a third (38%) of the respondents worked in general CCUs, 22.9% in cardiac CCUs, and 17% in Neuro CCUs. The highest proportion (39%) worked in governmental hospitals, and 24% in military/police hospitals. Only 38% of the nurses reported that their CCU had guidelines or protocols for EN, 34.3% that a nurse or a dietitian was responsible for NS issues in their CCU, 29.4% that they had a nutritional support team (NST) in their units, and 35.6% that there was an NST at their hospital. Most nurses indicated that physicians prescribed the EN amount, type, rate, and probiotics.

Table 2. Characteristics of the study workplace (n=292).

Characteristics	n	%
Type of CCU	-	-
General	110	37.7
Cardiac	67	22.9
Surgical	26	8.9
Neuro	50	17.1
Medical	39	13.4
Type of Hospital	-	-
Governmental	114	39
Military/Police	70	24
Teaching	53	18.2
Private	55	18.8
Written Guidelines or Protocols Regarding EN in the Unit		
Yes	111	38.0
No	136	46.6
Don‘t know	45	15.4
Nurse or Dietitian Responsible for Nutrition in the Unit		
Yes	100	34.3
No	128	43.8
Don‘t know	64	21.9
NST in the Unit	-	-
Yes	86	29.4
No	134	45.9
Don‘t know	72	24.7
NST in the Hospital	-	-
Yes	104	35.6
No	114	39.0
Don‘t know	74	25.3
Other Key Persons to Consult in the Hospital	-	-
Yes	105	36.0
No	94	32.2
Don‘t know	93	31.8
Who Prescribe the Amount of EN	-	-
Physician	169	57.9
Nurse	67	22.9
Dietitian	56	19.2
Who Prescribe the Type of EN	-	-
Physician	159	54.5
Nurse	69	23.6
Dietitian	64	21.9
Who Prescribe the Rate of EN	-	-
Physician	183	62.7

(Table 2) contd.....

Characteristics	n	%
Nurse	42	14.4
Dietitian	67	22.9
Who Prescribe the Probiotics	-	-
Physician	147	50.3
Nurse	105	36.0
Dietitian	40	13.7

Abbreviation: CCU: critical care unit, NST: nutritional support team (NST), EN: enteral nutrition

3.2. Nurses' Perceptions of the Responsibility, Knowledge, and Documentation System Support Regarding Enteral Nutrition

In general, the nurses perceived that they had a low level of responsibility, a low level of knowledge, and a moderate level of support from the documentation system regarding EN care. The nurses' perception of their knowledge had the lowest mean score (2.76 ± 0.89), and the perceptions related to documentation support the highest (3.15 ± 1.06). Of the items related to the level of knowledge, the highest mean score was for "planning and implementing interventions." Knowledge regarding "prevention of complications" was second, and the lowest mean score was for "evaluating the outcome." The nurses reported the highest mean score for responsibility and documentation support for the "prevention of complications" and "planning and implementing interventions" were second. The lowest responsibility and documentation support was "evaluating outcome" (Table **3**).

3.3. The Effects of the Nurses' and Workplace Characteristics on Nurses' Perceptions

The nurses in the teaching hospitals perceived a significantly lower responsibility for EN than those in the private hospitals; however, the nurses in all types of hospitals experienced a low level of responsibility. The nurses who received in-service education about EN and working in CCUs with policy or NST perceived having a significantly higher level of knowledge regarding EN than those who did not receive in-service education and nurses working in CCUs without policy or NST, though all had a low level of knowledge. The nurses working in the Neuro CCU felt they had significantly higher support from documentation than those in the general CCU. Similarly, the nurses with associate degrees felt they had significantly higher support from documentation regarding EN compared to those with bachelor's degrees (Table **4**).

Table 3. Nurses' perceptions of their responsibility, knowledge, and support from the documentation system.

Item	Response					Score
	Very Small Extent n(%)	Small Extent n(%)	Neither Small Nor Great Extent n(%)	Great Extent n(%)	Very Great Extent n(%)	Mean (SD)*
Responsibility[a]	-	-	-	-	-	**2.77 (0.89)**
Assessment	35(12)	130 (44.5)	49(16.8)	48(16.4)	30(10.3)	2.68 (1.18)
Goals	27(9.2)	88(30.1)	104(35.6)	49(16.8)	24(8.2)	2.84 (1.07)
Planning and Implementation of Interventions	41(14)	43(14.7)	120(41.1)	59(20.2)	29(9.9)	2.97 (1.14)
Prevention of Complications	26(8.9)	58(19.9)	94(32.2)	72(24.7)	42(14.4)	3.16 (1.16)
Evaluation of outcome	125(42.8)	47(16.1)	67(22.9)	41(14)	12(4.1)	2.20 (1.24)
Knowledge[b]	-	-	-	-	-	**2.76 (0.98)**
Assessment	44(15.1)	73(25.0)	111(38.0)	28(9.6)	38(12.3)	2.79 (1.18)
Goals	24(8.2)	110(37.7)	87(29.8)	37(12.7)	34(11.6)	2.82 (1.14)
Planning and Implementation of Interventions	23(7.9)	94(32.2)	91(31.2)	47(16.1)	37(12.7)	2.94 (1.24)
Prevention of complications	45(15.4)	54(18.5)	119(40.8)	25(8.6)	49(16.8)	2.92 (1.24)
Evaluation of outcome	121(41.4)	38(13.0)	78(26.7)	23(7.9)	32(10.8)	2.33 (1.36)
Documentation[c]	-	-	-	-	-	**3.15 (1.07)**
Assessment	44(15.1)	33(11.3)	86(29.5)	67(22.9)	62(21.2)	3.24 (1.32)
Goals	39(13.4)	42(14.4)	77(26.4)	85(29.1)	49(16.8)	3.21 (1.26)
Planning and Implementation of Interventions	45(15.4)	21(7.2)	76(26.0)	95(32.5)	55(18.8)	3.32 (1.29)
Prevention of Complications	43(14.7)	30(10.3)	63(21.6)	66(22.6)	90(30.8)	3.47 (1.46)
Evaluation of Outcome	65(22.3)	59(20.2)	128(43.8)	26(8.9)	14(4.8)	2.53 (1.07)

Note: *Mean score ranged from 1 to 5.

a The extent of nurses' responsibility regarding EN.

b The extent of knowledge regarding EN.

c The extent of support from documentation regarding EN.

Table 4. Effect of the nurses' and workplace characteristics on the nurses' perception of responsibility, knowledge, and support from documentation system.

Characteristics	Responsibility[a]	Knowledge[b]	Documentation[c]
	Mean (SD)	**Mean (SD)**	**Mean (SD)**
Total	2.77(0.89)	2.76(0.98)	3.15(1.07)
Age	-	-	-
≤30	2.79(0.86)	2.83(0.99)	3.16(1.05)
31-40	2.71(0.97)	2.66(1.00)	3.21(1.02)
>40	2.86(0.96)	2.51(0.79)	2.92(1.34)
P value	**0.450**	**0.394**	**0.256**
Gender	-	-	-
Male	2.78(0.92)	2.73(0.96)	3.07(1.08)
Female	2.76(0.85)	2.79(1.01)	3.27(1.03)
P value	**0.860**	**0.604**	**0.115**
Educational Level	-	-	-
Associate	2.76(0)	2.78(1.05)	3.28(1.00)
Bachelor	2.79(0.92)	2.73(0.89)	2.92(1.13)
High Diploma or Master	2.75(0.94)	2.77(0.87)	3.34(1.07)
P value	**0.956**	**0.925**	**0.015**
Experience in Nursing (years)		-	-
≤5	2.76(0.86)	2.79(1.01)	3.14(0.99)
6-10	2.82(0.97)	2.76(0.98)	3.31(1.15)
>10	2.77(0.97)	2.62(0.85)	3.00(1.24)
P value	**0.899**	**0.613**	**0.331**
Experience in CCU (years)	-	-	-
≤5	2.75(0.89)	2.73(0.99)	3.19(1.02)
6-10	2.99(0.95)	2.96(0.98)	3.09(1.18)
>10	2.55(0.84)	2.63(0.95)	3.15(1.25)
P value	**0.126**	**0.204**	**0.849**
Job Position	-	-	-
Staff Nurse	2.82(0.85)	2.90(0.94)	3.07(0.99)
Incharge Nurse	2.78(0.97)	2.60(0.82)	2.90(1.35)
Head nurse/Nursing Supervisor	2.96(1.02)	2.87(1.02)	3.08(1.17)
P value	**0.747**	**0.434**	**0.948**
Type of CCU	-	-	-
General	2.83(0.89)	2.83(0.96)	2.87(1.10)
Cardiac	2.79(0.95)	2.63(0.88)	3.25(1.02)
Surgical	3.14(0.77)	2.91(1.21)	3.22(1.08)
Neuro	2.56(0.75)	2.68(1.10)	3.43(0.93)
Medical	2.61(0.98)	2.78(0.91)	3.40(1.06)
P value	**0.064**	**0.600**	**0.008**
Type of Hospital	-	-	-
Governmental	2.80(0.95)	2.74(0.99)	3.11(1.10)
Military/Police	2.84(0.85)	2.86(1.06)	3.14(1.05)
Teaching	2.46(0.69)	2.64(0.95)	3.15(1.04)
Private	2.92(0.97)	2.78(0.91)	3.27(1.04)
P value	**0.036**	**0.654**	**0.833**
Receiving In-service Education and Training about EN			
Yes	279(0.89)	2.88(1.01)	3.25(1.05)
No	2.76(0.90)	2.64(0.94)	3.05(1.07)
P value	**0.739**	**0.045**	**0.108**
Written Guidelines or Protocols Regarding EN in the Unit			
Yes	2.72(0.91)	3.01(1.18)	3.26(0.98)
No	2.83(0.88)	2.58(0.81)	3.07(1.07)

(Table 4) contd.....

Characteristics	Responsibility[a]	Knowledge[b]	Documentation[c]
	Mean (SD)	Mean (SD)	Mean (SD)
Don't know	2.75(0.93)	2.66(0.77)	3.12(1.22)
P value	**0.649**	**0.00**	**0.386**
NST in the Unit		-	-
Yes	2.56(0.83)	3.09(1.18)	3.24(1.00)
No	2.84(0.92)	2.72(0.80)	3.18(1.03)
Don't know	2.90(0.89)	2.43(0.91)	3.01(1.19)
P value	**0.053**	**<0.001**	**0.363**

a : The extent of nurses' responsibility regarding EN, b : The extent of knowledge regarding EN, c : The extent of support from documentation regarding EN, CCU: critical care unit, NST: nutritional support team (NST), EN: enteral nutrition.

Table 5. Comparing nurses' perceptions of their sources of and needs for knowledge regarding enteral nutrition in the four healthcare sectors.

Item	Total n(292)	Governmental n(114)	Military n(70)	Teaching n(53)	Private n(55)	F test
	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	P value
Sources of their Present Knowledge	-	-	-	-	-	-
Educational Courses in Nursing College (Undergraduate Education)	2.83(1.21)	2.89(1.16)	2.50(1.20)	2.85(1.09)	3.09(1.35)	**0.045**
Specialized Post-graduate Education Course	2.88(1.00)	2.81(1.01)	2.86(1.04)	2.74(1.00)	3.18(0.90)	0.086
In-service Education and Training	2.84(1.06)	2.86(1.09)	2.86(0.91)	2.79(1.18)	2.83(1.13)	0.984
Scientific Workshops and Conferences	3.01(1.15)	3.04(1.15)	3.20(1.01)	2.62(1.11)	3.09(1.26)	**0.039**
Consulting Colleagues and other Healthcare Workers	2.87(1.25)	2.84(1.30)	2.87(1.20)	2.56(1.21)	3.20(1.19)	0.071
Guidelines and Protocols	2.84(1.135)	2.79(1.18)	1.77(0.99)	2.73(1.02)	3.14(1.28)	0.184
Textbooks, Scientific Journals Articles, and other Literature	2.83(1.24)	2.63(1.19)	2.94(1.28)	2.83(1.25)	3.12(1.26)	0.087
Knowledge/Educational Needs	-	-	-	-	-	-
Assessment	3.26(1.11)	3.24(1.11)	3.20(0.94)	3.23(1.24)	3.40(1.19)	0.836
Goals	3.37(1.24)	3.29(1.21)	3.22(1.38)	3.25(1.20)	3.76(1.12)	0.144
Planning and Implementation of Interventions	2.86(1.12)	2.75(0.99)	2.70(1.09)	3.07(1.13)	3.05(1.32)	0.235
Prevention of Complications	2.69(1.21)	2.62(1.10)	2.60(1.25)	2.82(1.21)	2.81(1.38)	0.723
Evaluation of Outcome	3.51(1.20)	3.31(1.18)	3.65(1.14)	3.41(1.27)	3.83(1.18)	0116
Formats of the Required Education	-	-	-	-	-	-
Ward Rounds	3.31(1.36)	3.341(1.36)	3.15(1.41)	3.15(1.38)	3.54(1.29)	0.499
Lectures	3.30(1.67)	3.19(1.17)	3.13(1.11)	3.31(1.02)	3.69(1.25)	0.96
Presentations in Team Meetings	3.30(1.24)	3.18(1.18)	3.25(1.21)	3.43(1.14)	3.47(1.47)	0.548
Full-day Workshop /Study days	3.07(1.25)	3.03(1.22)	3.00(1.26)	3.15(1.26)	3.11(1.3)	0.938

3.4. The Nurses' Sources of and Needs for Knowledge

Scientific workshops and conferences scored highest as the source of knowledge related to EN. All other sources had similar scores. The nurses from the private hospitals scored higher in educational courses in the nursing school than those from the military/police hospitals ($p = 0.045$). Scientific workshops and conferences received higher scores from the nurses of the military/police hospitals than those from the teaching hospitals ($p = 0.039$). In terms of their educational needs, the outcome evaluation scored the highest, followed by goal setting and nutritional assessment. The nurses reported that their educational needs could be met mostly through ward rounds, lectures, and presentations at team meetings. There were no significant differences between the nurses in the four types of the hospital regarding their educational needs and the format (Table **5**).

4. DISCUSSION

The current study investigated CCNs' perceptions of the responsibility, knowledge, and documentation system support regarding EN for critically ill patients in different types of hospitals in Sana'a, the capital city of Yemen. This was the first national study in Yemen related to EN, and the results will support understanding the perceptions of CCNs regarding EN and provide a baseline for in-service education and future studies. In general, results revealed a lack of guidelines/protocols or NST in most CCUs. The nurses perceived a low level of responsibility and knowledge and moderate support from documentation systems regarding EN.

4.1. Characteristics of the Study Workplace

Most nurses reported that there were no guidelines in place or were unaware of the availability of guidelines in their units. The internal conflict in Yemen affected the dissemination and implementation of EN guidelines in CCUs. In contrast to our results, Fulbrook *et al.* [26] and Roynette *et al.* [27] found that 75.7% (280/370 units) of CCUs in 20 European countries had guidelines or protocols for EN. However, the results of the current study are consistent with the findings of Darawad *et al.*

[8], who reported that most Jordanian nurses reported no guidelines. The hospital administration must adopt and implement current evidence-based guidelines for EN in CCUs. The orientation of new nursing staff and periodical in-service education are essential for providing EN care consistently [8].

The lack of staff or team responsible for NS at the unit and hospital levels is consistent with the literature [16, 26, 27]. Establishing such a team will positively affect patient outcomes, nurses' knowledge, and institutional costs [8, 16]. In the current study, physicians were primarily responsible for prescribing the EN type, rate, amount, and probiotics, similar to the literature [8, 11, 16]. CCNs administer the prescribed type, amount, rate, and probiotics of EN, but they need to understand the reasons for and effects of the prescribed EN to achieve the desired outcomes.

4.2. Nurses' Perceptions of the Responsibility, Knowledge, and Documentation System Support Regarding Enteral Nutrition

The CCNs perceived having a low responsibility and low knowledge regarding EN care, and their responsibility score was lower than that reported in Sweden [16] and Jordan [8], congruent with the studies that reported a lack of knowledge in nurses and healthcare workers [4, 7 - 9, 17 - 22]. Interestingly, the Yemeni CCNs perceived receiving reasonable support from documentation systems. This finding is comparable with the results of the Jordanian nurses [8] and inconsistent with the findings of the Swedish nurses [16].

Inadequate knowledge remains a barrier to implementing guidelines and providing adequate EN [4, 7]. Not using research regarding EN may be one factor contributing to the nurses' perceptions of having a low level of knowledge [7, 8]. The main general knowledge sources were in-service education, guidelines and protocols, scientific journal articles, and the Internet [7, 8, 25]. Unfortunately, these sources are unavailable in most Yemeni hospitals due to the unstable situation. The high level of knowledge found by Morphet *et al.* [13] in CCNs could be attributed to the qualifications of the respondents, who were all members of the Australian College of Critical Care Nurses with postgraduate critical care qualifications. In the current study, most nurses have newly graduated with associate degrees.

In relation to the nursing processes, the CCNs indicated higher levels of responsibility, knowledge, and documentation support for the middle stage of the nursing process, compared with the earlier stages of assessment and the last stage of outcome evaluation. The CCNs' autonomy and knowledge were prominent in performing actions rather than assessment and decision-making regarding EN. This finding is in accordance with Kim and Chang [7], Persenius *et al.* [16], Al Kalaldeh *et al.* [25], and Fletcher and Carey [12]. Globally, nursing roles in CCUs have changed and expanded in terms of increasing autonomy with greater responsibility [16], but the physician's traditional dominant role over the other healthcare team members' roles still exists in CCUs in Yemen. This situation may prevent nurses from adequately assessing, managing, and evaluating their patients' nutritional status [13, 8].

4.3. The Effects of the Nurses' and Workplace Characteristics on Nurses' Perceptions

The nurses in all types of hospitals indicated experiencing a low level of responsibility, low level of knowledge, and moderate documentation support regarding EN. However, the nurses in the private hospitals had the highest scores for responsibility and documentation support, and their self-perceived responsibility was significantly higher than those in teaching hospitals. This result supports the finding of Darawad *et al.* [8] that nurses in a private hospital had significantly higher responsibilities and support from the documentation system. In the CCUs in Yemen, EN policies are unavailable, updated, or followed, or the nurses may be unaware. However, policy availability with a clear description of the responsibilities and well-defined monitored and controlled systems in the private sector with specific functions for each healthcare member would ensure that nurses know their roles and responsibilities [8, 25].

The nurses who received EN-related in-service education and those working in CCUs with policy or NST reported significantly higher levels of knowledge than those without in-service education, policy, and NST groups. This finding is logical and supports the positive effect of in-service education on the EN level of knowledge, as also reported by Kim and Chang [7]. The presence of NST and policy/protocol regarding EN in the unit positively affects the nurses' knowledge [8, 16]. Previous studies reported that NST and colleagues were the main sources of information regarding the EN [7, 16, 22, 25]. Similarly, the procedure manual and policy/guidelines/protocol regarding EN were among the main resources of EN information [6, 13, 22, 25].

The nurses with associate degrees or who worked in the Neuro CCU had significantly higher perceptions of support from the documentation system than those with a bachelor's degree or nurses working in a general CCU. It appears that the nurses with bachelor's degrees misunderstood the concept of support from documentation and that the documentation systems in specialized CCUs, including a Neuro CCU, were clear and provided moderate support for the nurses in their NS activities. Other possible reasons could be related to the heavier workload in general CCUs and the greater availability of clear policy documentation and procedure manuals in the specialized CCUs compared with the general CCUs [8].

In the current study, age, gender, nursing career experience, CCU experience, and job position had no significant effect on the nurses' perceptions of responsibility, knowledge, or documentation support. This finding concurs with Morphet *et al.* [13], reporting that the level of qualification or the job classification had no significant effect on the self-rated EN level of knowledge.

4.4. The Nurses' Sources of and Needs for Knowledge

Surprisingly, the perceived main sources of the nurses' knowledge were scientific workshops and conferences, followed by postgraduate specialized education courses. Persenius *et al.* [16], Kim and Chang *et al.* [7], and Metin and Pars [22] found that consulting colleagues was the main source of knowledge for Swedish, Korean, and Turkish nurses. However, Darawad *et al.* [8] and Al-Ghabeesh *et al.* [28]

reported the main sources of knowledge as education and the Internet. Morphet *et al.* [13] found that dietitians and protocols were the main sources of Australian CCNs information about EN. The low scores for undergraduate education could be because, in many countries, including Yemen, nutrition courses in nursing schools are provided by other schools or programs, such as medical or agriculture schools [8]. In-service educational programs in most Yemeni hospitals have been suspended or terminated, and the nurses worked with the knowledge they acquired during their undergraduate education. Surprisingly, Morphet *et al.* [13] found that even postgraduate studies in critical care nursing provided limited education related to nutrition, which was inadequate for informing EN decisions. In addition, the in-service education provided by Australian hospitals was limited.

The nurses' perceptions of their educational needs confirmed their perceptions of their level of EN knowledge. The educational needs regarding the outcome evaluation scored the highest, followed by goal setting and nutritional assessment. The nurses reported that their educational needs could be met through ward rounds, lectures and presentations at team meetings. In-service education and liaising with colleagues were reported as the preferred format for meeting their educational needs regarding EN [8, 29].

IMPLICATIONS AND RECOMMENDATIONS

These findings highlight that CCUs in Yemen urgently need to create or adopt EN evidence-based guidelines, protocols, and policies and establish multidisciplinary NST with clear roles and responsibilities for each member. Healthcare facilities should provide newly hired nurses with in-service education and training related to EN guidelines, policies, and practices. Similarly, nursing schools and faculty members should include nutritional courses, update the curricula, and integrate evidence-based guidelines into their courses. Increasing the availability of knowledge sources, such as textbooks, scientific journal articles, and international evidence-based guidelines, with periodical refresher in-service programs, is highly recommended. Documentation systems need to be examined and modified to provide better support for nurses. Further studies are recommended to examine the nurses' practices and compliance with guidelines in relation to EN.

LIMITATIONS

This study's limitation was using a convenience sample that offered a low-bias control. Inclusion and exclusion criteria were formulated to decrease possible bias associated with the sampling technique, and the nurses in all the hospitals were approached during the three working shifts of the day.

CONCLUSION

Most CCUs did not have guidelines/protocols or NST, and physicians continued to play a leading role in all aspects of EN care. In general, the nurses perceived a low level of responsibility and knowledge and moderate support from documentation systems regarding EN. The nurses in the private hospitals had significantly higher responsibilities than those in the teaching hospitals. The nurses who received in-service education about EN and those working in CCUs with policy or NST reported significantly higher knowledge of EN. The nurses working in the Neuro CCU felt they had significantly higher support from the documentation system than those in the general CCU. Scientific workshops and conferences were the main sources of the nurses' EN-related knowledge. The educational needs of CCNs regarding the evaluation of outcomes, goal setting, and nutritional assessment scored the highest.

LIST OF ABBREVIATIONS

SPSS	=	Statistical Package for the Social Sciences
NS	=	Nutritional Support
EN	=	Enteral Nutrition
CCU	=	Critical Care Unit
CCNs	=	Critical Care Nurses
SPSS	=	Statistical Package for the Social Sciences
NST	=	Nutritional Support Team

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The Research Ethical Review Committee approved the study at Al-Razi University (No. 022/FOMS/2020).

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were per the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from all participants.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The authors confirm that the data supporting the findings of this study are available within the manuscript.

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None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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REFERENCES

[1] Bloomer MJ, Clarke AB, Morphet J. Nurses' prioritization of enteral nutrition in intensive care units: a national survey. Nurs Crit Care

2018; 23(3): 152-8.
[http://dx.doi.org/10.1111/nicc.12284] [PMID: 28133862]

[2] Bayrak Kahraman B, Kirca K, Sozeri Ozturk E, Kutluturkan S, Turkoglu M, Aygencel G. Complications developing in intensive care patients receiving enteral feeding and nursing interventions. Journal of Critical and Intensive Care 2020; 11: 60-5.
[http://dx.doi.org/10.37678/dcybd.2020.2498]

[3] Kim H, Choi-Kwon S. Changes in nutritional status in ICU patients receiving enteral tube feeding: A prospective descriptive study. Intensive Crit Care Nurs 2011; 27(4): 194-201.
[http://dx.doi.org/10.1016/j.iccn.2011.05.002] [PMID: 21680184]

[4] Mooi NM, Ncama BP. Enteral nutritional therapy practices for adults in a district hospital and primary healthcare centers in KwaZulu-Natal province of South Africa: Knowledge and attitude of health care professionals. Int J Afr Nurs Sci 2020; 12: 100202.
[http://dx.doi.org/10.1016/j.ijans.2020.100202]

[5] Agrawal P, Gupta B, Soni K, *et al.* Enteral nutrition practices in the intensive care unit: Understanding of nursing practices and perspectives. J Anaesthesiol Clin Pharmacol 2012; 28(1): 41-4.
[http://dx.doi.org/10.4103/0970-9185.92433] [PMID: 22345944]

[6] Friesecke S, Schwabe A, Stecher SS, Abel P. Improvement of enteral nutrition in intensive care unit patients by a nurse-driven feeding protocol. Nurs Crit Care 2014; 19(4): 204-10.
[http://dx.doi.org/10.1111/nicc.12067] [PMID: 24602046]

[7] Kim H, Chang SJ. Implementing an educational program to improve critical care nurses' enteral nutritional support. Aust Crit Care 2019; 32(3): 218-22.
[http://dx.doi.org/10.1016/j.aucc.2018.04.001] [PMID: 29759596]

[8] Darawad MW, Hammad S, Al-Hussami M, Haourani E, Aboshaiqah AE, Hamdan-Mansour AM. Investigating critical care nurses' perception regarding enteral nutrition. Nurse Educ Today 2015; 35(2): 414-9.
[http://dx.doi.org/10.1016/j.nedt.2014.11.023] [PMID: 25497040]

[9] Kim H, Choue R. Nurses' positive attitudes to nutritional management but limited knowledge of nutritional assessment in Korea. Int Nurs Rev 2009; 56(3): 333-9.
[http://dx.doi.org/10.1111/j.1466-7657.2009.00717.x] [PMID: 19702807]

[10] VanBlarcom A, McCoy MA. New nutrition guidelines: Promoting enteral nutrition *via* a nutrition bundle. Crit Care Nurse 2018; 38(3): 46-52.
[http://dx.doi.org/10.4037/ccn2018617] [PMID: 29858195]

[11] Marshall AP, West SH. Enteral feeding in the critically ill: Are nursing practices contributing to hypocaloric feeding? Intensive Crit Care Nurs 2006; 22(2): 95-105.
[http://dx.doi.org/10.1016/j.iccn.2005.09.004] [PMID: 16289652]

[12] Fletcher A, Carey E. Knowledge, attitudes and practices in the provision of nutritional care. Br J Nurs 2011; 20(10): 615-620, 618-620.
[http://dx.doi.org/10.12968/bjon.2011.20.10.615] [PMID: 21646993]

[13] Morphet J, Clarke AB, Bloomer MJ. Intensive care nurses' knowledge of enteral nutrition: A descriptive questionnaire. Intensive Crit Care Nurs 2016; 37: 68-74.
[http://dx.doi.org/10.1016/j.iccn.2016.07.001] [PMID: 27554608]

[14] Al Kalaldeh M, Shahein M. Nurses' knowledge and responsibility toward nutritional assessment for patients in intensive care units. J Health Sci (Sarajevo) 2014; 4(2): 90-6.
[http://dx.doi.org/10.17532/jhsci.2014.168]

[15] Marshall AP, Cahill NE, Gramlich L, MacDonald G, Alberda C, Heyland DK. Optimizing nutrition in intensive care units: empowering critical care nurses to be effective agents of change. Am J Crit Care 2012; 21(3): 186-94.
[http://dx.doi.org/10.4037/ajcc2012697] [PMID: 22549575]

[16] Wentzel Persenius M, Larsson BW, Hall-Lord ML. Enteral nutrition in intensive care. Intensive Crit Care Nurs 2006; 22(2): 82-94.
[http://dx.doi.org/10.1016/j.iccn.2005.09.001] [PMID: 16289849]

[17] Kim H, Soun E. Critical care nurses' perception, knowledge, and practices of enteral nutrition. J Korean Acad Fundam Nurs 2016; 23(4): 383-92.
[http://dx.doi.org/10.7739/jkafn.2016.23.4.383]

[18] Yun SH, Kim SJ, Oh EG. Healthcare professional's knowledge, perception and performance on early enteral nutrition for critically ill patients. Korean J Crit Care Med 2012; 27(1): 36-44.
[http://dx.doi.org/10.4266/kjccm.2012.27.1.36]

[19] Lane C, Wedlake LJ, Dougherty L, Shaw C. Attitudes towards and knowledge of nutrition support amongst health care professionals on London intensive care units. J Hum Nutr Diet 2014; 27(Suppl. 2): 339-51.
[http://dx.doi.org/10.1111/jhn.12152] [PMID: 24033658]

[20] Awad S, Herrod PJJ, Forbes E, Lobo DN. Knowledge and attitudes of surgical trainees towards nutritional support: Food for thought. Clin Nutr 2010; 29(2): 243-8.
[http://dx.doi.org/10.1016/j.clnu.2009.08.016] [PMID: 19766361]

[21] Mowe M, Bosaeus I, Rasmussen HH, *et al.* Insufficient nutritional knowledge among health care workers? Clin Nutr 2008; 27(2): 196-202.
[http://dx.doi.org/10.1016/j.clnu.2007.10.014] [PMID: 18295936]

[22] Gok Metin Z, Pars H. Knowledge and clinical competence of nurses regarding enteral nutrition. Topics Clin Nutr 2020; 35(2): 104-15.
[http://dx.doi.org/10.1097/TIN.0000000000000217]

[23] Moreno-Casbas T, Fuentelsaz-Gallego C, de Miguel ÁG, González-María E, Clarke SP. Spanish nurses' attitudes towards research and perceived barriers and facilitators of research utilisation: a comparative survey of nurses with and without experience as principal investigators. J Clin Nurs 2011; 20(13-14): 1936-47.
[http://dx.doi.org/10.1111/j.1365-2702.2010.03656.x] [PMID: 21539627]

[24] Timmins F, McCABE CATHERINE, McSHERRY ROBERT. Research awareness: managerial challenges for nurses in the Republic of Ireland. J Nurs Manag 2012; 20(2): 224-35.
[http://dx.doi.org/10.1111/j.1365-2834.2012.01333.x] [PMID: 22380417]

[25] Al Kalaldeh M, Watson R, Hayter M. Jordanian nurses' knowledge and responsibility for enteral nutrition in the critically ill. Nurs Crit Care 2015; 20(5): 229-41.
[http://dx.doi.org/10.1111/nicc.12065] [PMID: 24279734]

[26] Fulbrook P, Bongers A, Albarran JW. A European survey of enteral nutrition practices and procedures in adult intensive care units. J Clin Nurs 2007; 16(11): 2132-41.
[http://dx.doi.org/10.1111/j.1365-2702.2006.01841.x] [PMID: 17331100]

[27] Roynette CE, Bongers A, Fulbrook P, Albarran JW, Hofman Z. Enteral feeding practices in european ICUs: A survey from the european federation of critical care nursing associations (EfCCNa). e-SPEN, the European e-Journal of Clinical Nutrition and Metabolism 2008.
[http://dx.doi.org/10.1016/j.eclnm.2007.10.004]

[28] Al-Ghabeesh SH, Abu-Moghli F, Salsali M, Saleh M. Exploring sources of knowledge utilized in practice among Jordanian registered nurses. J Eval Clin Pract 2012; 19(5): no.
[http://dx.doi.org/10.1111/j.1365-2753.2012.01869.x] [PMID: 22640258]

[29] Marshall AP, West SH, Aitken LM. Preferred information sources for clinical decision making: critical care nurses' perceptions of information accessibility and usefulness. Worldviews Evid Based Nurs 2011; 8(4): 224-35.
[http://dx.doi.org/10.1111/j.1741-6787.2011.00221.x] [PMID: 21649854]