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Research Article

Impact of Hospitalized Nutritional Formula on Anthropometric, Clinical and Biochemical Indices among Egyptian Adult Cardio-Thoracic Critically Ill Patients: A Single Institutional Study

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Abstract

Background: Malnutrition is a common consequence notably in patients admitted to the intensive care unit.

Aim of the study: was to assess the Impact of hospitalized nutritional formula on anthropometric, clinical and biochemical indices among Egyptian adult cardio-thoracic Critically Ill Patients on admission and discharge days.

Methods: Totally, A convenient sample of 100 cardiothoracic patients was evaluated from admission to discharge in ICUs at Damietta Chest Disease Hospital in Egypt. The patients' anthropometric measurements, clinical data and biochemical indices were assessed As well, hospital diet prescription and intake was also evaluated.

Results: High significant statistical difference patients' clinical data on admission and after one week such as body built (X2 = 52.6; p = 0.0), skin color (X2= 12.9; p = 0.02), skin turgor (X2= 13.19; p = 0.0), and occurrence of bed sore (X2= 27.7; p = 0.0). On the other hand, no significant statistical differences were found in the patients' weight and body mass index on admission and discharge (one week). Moreover, significant statistical differences were found in patients biochemical indices such as albumin (t= 3.03; p=0.003) and lymphocyte counts (3.74; p=0.000). So, the 88 % of patients showed decreased albumin after one week when compared to admission time. While, 10 % of patients showed increased lymphocytic count after one week of admission when compared to admission time.

Conclusion and Recommendations: Clinical assessment, anthropometric, and biochemical indices are essential for evaluation, follow-up and management of cardiothoracic critically ill patients

Key words: Anthropometric; biochemical; clinical; assessment; malnutrition; cardio-thoracic; critically Ill

Introduction

Nutrition is essential in managing patients with chest and cardiac disease, because these groups of patients are at risk for malnutrition as the disease advances **(Evans, 2011).** The principal role of diet in heart disease is apparent since its pathological process that include the development and formation of arterial atheroma , changes s in endothelial lining which may affect blood pressure, and potentiates for thrombosis, and inflammatory processes. Prescribed diet plays a role through the regulation of cholesterol and restrict the underlying inflammation that causes disease progression **(Cox & Rasmussen, 2014)**.

When critically ill patients underwent inadequate diet, they were suffered from many serious consequences like malnutrition, low immunity, severe infections, delayed wound healing and weight loss**.** Malnutrition is an outcome of patients' preexisting nutritional status, degree of metabolism and severity of disease. **(Tappenden et al, 2013).**

Malnutrition is associated with, impaired muscle tone and strength, decreased bone mass, a decreased functional status, compromised immune function, anemia, impaired cognitive function, poor wound healing, higher readmission rate, and increased mortality **(Ahmed &Haboubi, 2015).** Critical illness is physiologically debilitating

and is influenced by the nutritional status of patients. There is a strong relationship between adequate nutritional status and recovery from critical illness **(Huang et al, 2012).**

Critical illness is characterized by increased morbidity that may lead to death. In this condition, patients are prone to multiple organs dysfunction including respiratory, cardiovascular, and digestive systems. As well, critically ill patients usually experience stress, inflammatory reactions and increased metabolic rate (**Wright-Myrie et al, 2013).** The possible reasons for the high spread of malnutrition in critically ill patients include inadequate recognition and monitoring of nutritional status and inadequate intake of nutrients for days. The severity of disease and other pathophysiological factors may restrict such patients' abilities to take an adequate diet **(Thomas, et al, 2013)**.

Nutritional assessment is important to recognize and manage patients at risk **(Ahmed &Haboubi, 2015).** Nutritional status assessment of the critically ill patient is carried out to recognize the possible nutritional risk and to be a base line for monitoring adequate nutrition support **(Prins, 2010).** Nutritional support is standard for critically ill patients and needs a complex calculation of calories, way of delivery, amount and type of nutrients that are administered. All these factors may affect the patient outcomes **(Harveyet al, 2014).** The cost of managing a patient with illness-related malnutrition has been represented 20% and is higher than managing a patient without malnutrition **(Stewart, 2014).**

Feeding of critically ill patients in ICU is accomplished by two feeding strategies that are currently being advocated, Enteral Nutrition (EN) and Parenteral Nutrition (PN) **(Casaer&Berghe, 2016).** The enteral feeding route is divided to tube feeding and oral feeding which were preferred for critically ill patients because of its reduced costs and risk of infective complications. Parenteral nutrition, however, has an important role because many intensive care patients have gastrointestinal dysfunction and not able to obtain required amounted intake. Parenteral Nutrition (PN) delivered through a central or peripheral venous line **(Andrews et al, 2011).**

The nurses play a significant role in managing and maintaining of an optimal nutritional status in acutely ill patients. Critical illness is life threatening that may be caused by, surgery, sepsis, disease and shock usually needs intensive care units (**Wright-Myrie et al, 2013).** Nutritional assessment of critically ill patients is very important. It is verified that malnourished patients who are greatly ill have poor outcomes than well-nourished patients. Therefore, examining patients' nutritional condition may be essential in determining which patients may experience increased morbidity and mortality (**Fontes, 2014**).

A number of parameters and indices such as anthropometric measurements such as height , body weight, body mass index, mid-arm circumference , triceps skin-fold circumference , and calf circumference, as well as biochemical indices such as total protein, albumin, and pre-albumin, and immune composition markers (e.g., lymphocyte count) combined with nutrition assessment tools can be utilized to identify the nutritional condition of critically ill patients. **(Kubrak C, Jensen L, 2007).**

Significance of the study

It was observed in clinical practice that cardiac and thoracic critically ill patients suffering from loss of weight delay of wound healing and some abnormalities in biochemical analysis. As well, the medical records do not have data related to malnourishment status of cardiac and thoracic critically ill patients in ICU setting. Therefore, a rapid nutritional status assessment in critically ill patients is necessary to prevent and decrease nutritional disturbances and to monitor nutritional management . Furthermore, early nutritional assessment is a principal factor in providing suitable and adequate nutritional therapy that may minimize the length of ventilator connection, ICU stay, and mortality.

Therefore, implementation of this research could provide health care providers sound knowledge about the impact of administered hospitalized nutritional formula on the nutritional parameters of cardiac and thoracic critically ill patients. Also, the study could support the role of nurse in ICU settings. It is hoped that findings of this study help in improve quality of patient's care and establish evidence based data that can promote nursing practice and research in nutrition of critically ill patients.

Aim of the Study

The aim of this study was to assess the impact of hospitalized nutritional formula on anthropometric, clinical and biochemical indices among Egyptian adult cardio-thoracic Critically Ill Patients on admission and discharge days.

Design

Descriptive exploratory research design was utilized to describe the characteristics of various aspects, descriptive attempts to explore and explain while providing additional information about the study.

Setting

The study was carried out at ICU of Damietta Chest Disease Hospital.

Subjects

A convenience sample of 100 cardiac/thoracic critically ill patients was used in the study. The patients were classified randomly into two groups; 44 cardiac patients and 56 chest patients. Calculation of sample size required for the study was performed using G*Power program (version 3.1.9.2). The total number of 98 patients is required based on large effect size of (0.25) p value of (0.05) statistical power of (0.80) and repeated two measurements.

Study instruments

Instrument I: patients' characteristics and clinical data assessment

This part covered basic information about critically ill patients that included patient's age, gender, level of education. The clinical data assessment included current diagnosis, date of admission, length of stay, level of consciousness, feeding pattern in ICU, hospitalized nutritional formula elements (protein, fats, carbohydrate and vitamins) and diet, general appearance, skin and nail assessment, gastrointestinal problems such as vomiting and nausea, and delayed gastric empting

Instrument II: Anthropometrics Measurements

This part was measured at the first (24) hours of admission after stabilized of patients and repeated after one week, it was included three items:

1. **Height:**
   Knee height was measured according to following equation:
   - Male height (cm) = 64.19 - (0.04 X age) + (2.02 X knee Height cm).
   - Female height (cm) = 84.88-(0.24 X age) + (1.83 X knee Height cm).
2. **Weight:**
   It was calculated according to following equation:
   - Female weight = (0.98 X AC in cm)+(1.27 X CC in cm) + (0.4 X SSF in cm) + (0.87 X KH in cm) - 62.35.

- Male weight = (1.73 X AC in cm) + (0.98 X CC in cm) + (0.37 X SSF in cm) + (1.16 X KH in cm) - 81.69.
- AC (Arm Circumferences), CC (Calf Circumferences), SSF (Subscapular Skin fold Thickness), KH (Knee Height).

3. **Body Mass Index** (BMI) = weight (kg)/height (m)^2

Instrument III: Biochemical Assessment

It was evaluated at the first (24) hours of admission after stabilized of patients and repeated after one week, It was included three parameters as serum albumin, White blood cells (WBCs), also called leukocytes and total cholesterol.

Protection of Human Rights

An official permission to conduct the study was obtained from the responsible authorities of hospital. The research was submitted for the approval the ethical committee of research in Faculty of Nursing El-Mansoura University. Ethical considerations were included explaining the nature of the study to the subjects and obtaining informed consent from them in addition to ensuring confidentiality and privacy. Informed consent was obtained from critically ill patients (CIPs) before the beginning of the study and explains the aim of this study.

Procedure

The current study was conducted through two phases: preparation phase and implementation phase

A. Preparation Phase

This phase started from September till December 2015. This phase involved review of literatures related to the study subjects, preparation of data collection based on reviewing current, past and international related literature. Later, the tool was reviewed and modified by the researcher and experts. Next, the tool was tested for validity and reliability.

B. Implementation Phases

Data was started from December to the end of May 2016. A written consent was obtained from them before data collection, then explained the aim and nature of study was discussed with patients and their relatives. Nutritional assessment sheet was collected from patients and lasted almost one hour and collected during morning, afternoon and night shift.

Description of hospitalized nutritional formula:

It was prepared by hospital nutrition department and have been approved by the Ministry of Health. The formula was given into two forms:

a) Oral Formula

1. Formula of **cardiac**patients contained:

Daily (100) gram protein, (70) gram fats, (370) gram carbohydrates and (30) gram vitamins, this formula divided to three meals:

i. Breakfast:

Bread (110) gram, half cream white cheese (65) gram, egg (50) gram, one tomato and full cream milk (200) ml.

ii. Lunch:

Bread (55) gram, rice or pasta (100) gram, meat (150) gram or chicken (275) gram, vegetable (200) gram and fruit (200) gram.

iii. Dinner:

Bread (110) gram, half cream white cheese (65) gram, honey or jam (30) gram, yogurt (110) gram and one tomato.

2. Formula of **chest** patients contained:

Daily 105 gram protein, (86) gram fats, (340) gram carbohydrates and (30) gram vitamins, this formula divided to three meals:

i. Breakfast:

Bread (110) gram, full cream white cheese (65) gram, egg (50) gram, one tomato and full cream milk (200) ml.

ii. lunch:

Bread (55) gram, rice or pasta (100) gram, meat (150) gram or chicken (275) gram, vegetable (200) gram and fruit (200) gram.

iii. Dinner:

Bread (110) gram, full cream white cheese (65) gram, yogurt (110) gram and one tomato.

b) Nasogastric Formula

1. Formula of **comatose** patients contained:

Daily 80 gram protein, (70) gram fats, (255) gram carbohydrates and (30) gram vitamins.And divided into three meals which made mixed to pass easily through tube feeding:

i. Breakfast:

Full cream milk (400) ml, honey (60) gram, one potato, fresh juice (150) ml, wheat and lentils (10) gram.

ii. Lunch:

Soup (400) gram, chicken (138) gram, lentils (10) gram, fresh juice (150) ml, rice (20) gram, carrot (100) gram and zucchini (100) gram.

iii. Dinner:

Yogurt (220) gram, full cream milk (200) ml, honey (60) gram, one potato, fresh juice (150) ml, and lentils (10) gram.

.The study instruments were used two times; the first time on admission and the second time on discharge after one week of admission.

Statistical Analysis Data

The collected data were tabulated analyzed utilizing descriptive statistics such as mean ± standardDeviation), frequencies (number of cases), percentages. The comparison of means was carried out using T test. The comparison of qualitative variables was carried out using Chi-square statistics. All statistical

Calculations were done using computer program SPSS (Statistical Package for the Social Science; SPSS version 22. The *P* - value of < 0.05 indicates a significant finding.

Results

Table (1) apparent that almost half of patient's age range between (50–59) with the mean age (43.1±8.25) Concerning gender, more than half of patients were female. Regarding educational level, 42% and 36% respectively were illiterate and low educated.

Demographic data	No.	%
Age/ years		
20- 29	5	5.0
30- 39	8	8.0
40- 49	38	38.0
50- 59	49	49.0
Mean ± SD 43.1±8.25		
Gender		
Male	48	48.0
Female	52	52.0
Education Level		
Illiterate	42	42.0
Low Educated	36	36.0
Moderated Educated	18	18.0
Highly Educated	4	4.0

Table 1: *Frequency Distribution of Patients' Demographic Characteristics*

It is apparent from table (2) that almost two-third of patients (61%) suffered from chest diseases. The most frequencies were respiratory failure (16%), acute bronchitis (16%). Moreover, more than one-third (39%) suffered from cardiac diseases such as pulmonary edema (7%), IHD (9%) and heart failure (7%).

Health Relevant Data	No.	%
Diagnosis		
Chest	61	61.0
Cardiac	39	39.0
Chest		
Pneumonia	5	5.0
Chronic Bronchitis	3	3.0
Respiratory Failure	16	16.0
Acute Sever Asthma	5	5.0
Bronchial Asthma	6	6.0
Lung Fibrosis	3	3.0
Pleural Effusion	5	5.0
Acute Bronchitis	2	2.0
COPD	16	16.0
Cardiac		
IHD	9	9.0
Sinus Tachycardia	2	2.0
Heart Failure	7	7.0
AF	3	3.0
Unstable Angina	4	4.0
LVH	1	1.0
LBBB	1	1.0
Pulmonary Edema	7	7.0
MI	5	5.0
History		
DM	17	17.0
HTN	22	22.0
Renal	2	2.0
Liver	5	5.0
CVS	51	51.0
Chest	63	63.0
Cancer	5	5.0
Surgery	3	3.0

Table 2: Frequency Distribution of Patients' Health Relevant Data (No=100)

It is apparent from table (3) that most of patients were on oral feeding on admission (92%) and that ratio decreased to be 80 % after one week of admission. Regarding tube feeding placement, 8% of patients were on nasal feeding and increased to be 16% after one week of admission. Concerning GIT problems , 17 % of patients complained of dysphagia such are diarrhea (7%), constipation (5%) on admission as well as dysphagia (17%) and 6 % vomiting respectively after one week of

admission when compared 4% dysphagia and 2% vomiting on admission.

Nutritional data	On admission		A week after admission		X^2 / fisher	*P* – value
	No.	%	No.	%		
Feeding Pattern						
Oral	92	92.0	80	80.0	5.980	.01*
Tube feeding	8	8.0	20	20.0		
Tube Feeding Placement						
Oral	0	.0	4	4.0	1.867	.172
Nasal	8	8	16	16.0		
GIT Problems						
No problems	77	77.0	66	66.0	13.926	.02*
Vomiting	4	4.0	6	6.0		
Nausea	1	1.0	0	.0		
Delay Gastric Emptying	0	.0	3	3.0		
Anorexia	2	2.0	3	3.0		
Dysphagia	4	4.0	17	17.0		
Diarrhea	7	7.0	3	3.0		
Constipation	5	5.0	2	2.0		

Table 3: Frequency Distribution of Patient's Clinical Assessment Pertinent to Feeding Pattern and Gastrointestinal Problems on Admission and after One Week (No=100)

It is apparent from table (4) that high significant statistical difference in patients on admission and after one week regarding body built ($X^2 = 52.6$; $p = 0.0$), skin color ($X^2 = 12.9$; $p = 0.02$), skin turgor ($X^2 = 13.19$; $p = 0.0$), bed sore ($X^2 = 27.7$; $p = 0.0$). So more than two-third of patient (64%) had normal body built when compared to one week after admission (17%). Moreover, more than one third of patients had pink and smooth nails (40%) when compared to one week after admission (9%). egarding skin color (45%) of patient had normal color when compared to one week after admission (32%). Regarding skin turgor, almost three fourth (74%) of patients had normal skin turgor and this ratio decreased to (47%) after one week of admission. Regarding the incidence of bed sore almost all patients (97%) hadn't bed sore and this ratio decreased to (69%) after one week of admission

General Appearance & Skin Assessment	On admission		A week after admission		X^2 / fisher	*P* – value
	No.	%	No.	%		
Body Built						
Normal	64	64.0	17	17.0	52.662	.000
Thin	20	20.0	67	67.0		
Fat	16	16.0	16	16.0		
Nail						
Pink and Smooth	40	40.0	9	9.0	39.476	.000**
Spooning	14	14.0	10	10.0		
Clubbing	9	9.0	8	8.0		
White	3	3.0	4	4.0		
Bluish	6	6.0	9	9.0		
Pale	11	11.0	15	15.0		
Rippled	6	6.0	10	10.0		
Yellow	2	2.0	7	7.0		
Longitudinal Brown	5	5.0	6	6.0		
Cracked	1	1.0	8	8.0		
Brittle	1	1.0	4	4.0		
Ridging	2	2.0	4	4.0		
Short and Overcut	0	.0	6	6.0		
Skin Color						
Normal	45	45.0	32	32.0	12.900	.02*
Pale	22	22.0	18	18.0		
Jaundice	12	12.0	13	13.0		
Flushed	4	4.0	12	12.0		
Cyanotic	15	15.0	14	14.0		
Mottled	2	2.0	11	11.0		
Skin Turgor						
Normal	74	74.0	49	49.0	13.198	.000**
Dehydrated	26	26.0	51	51.0		
Bed Sores						
Not Present	97	97.0	69	69.0	27.782	.000**
Present	3	3.0	31	31.0		

Table 4: *Comparison of Patient's Clinical Assessment Pertinent to Body Built and Integumentary Assessment on Admission and after One Week*

It is apparent from table (5) that no significant differences among patients regarding body mass categories (X2=4.74; p=0.8) and wt (t=1.251; p=0.24).

Anthropometrics Measurements	On admission		A week after admission		X^2/t	*P* - value
	No.	%	No.	%		
Body mass index						
Normal	35	35.0	35	35.0	4.745	.845 NS
Under weight	1	1.0	1	1.0		
Obese	23	23.0	23	23.0		
Overweight	41	41.0	41	41.0		
Mean + SD	**23.2±11.2**		**22.7±12.5**		**T=1.451**	**.091**
Weight	78.89 ± 13.42		76.99 ± 13.19		T=1.251	.247

Table 5: *Comparison of Patients' Anthropometrics Measurements on Admission and One Week after Admission (no = 100)*

Table (6) it is apparent that significant statistical difference between patients regarding serum means albumin and total lymphocyte count, so the albumin decreased more after one week. On the contrary, lymphocyte count increased since admission (1%) to (10%) one week after admission.

Biochemical indices	On admission		A week after admission		X^2 /fisher T value	*P* – value
	No.	%	No.	%		
Serum albumin						
Hypo	80	80.0	88	88.0	X^2 = 2.381	0.123
Normal	20	20.0	12	12.0		
Mean + SD	**3.14**	**0.24**	**3.04**	**0.23**	**T=3.037**	**.003****
Lymphocyte						
Normal	99	99.0	90	90.0	X^2 =7.792	.005**
High	1	1.0	10	10.0		
Mean + SD	**6.88**	**1.63**	**7.84**	**1.94**	**T=3.743**	**.000****
Total Cholesterol						
Low	61	61.0	61	61.0	X^2 =2.831	0.243
Normal	5	5.0	11	11.0		
High	34	34.0	28	28.0		
Mean + SD	**195.63**	**27.10**	**191.45**	**25.48**	**T=1.099**	**1.099**

Table 6: *Frequency of Patients in the Normal or Deficient or Over Amounts of Biochemical Indices and Comparison of Their Means at First and Seventh Day (N = 100).*

Table (7) it is apparent that no statistical differences among patients' characteristics and health relevant data by their Body Mass Index categories on Admission and after one week

Personal data	On admission				A week after admission				fisher	*P* – value
	Normal	Underweight	Obese	Over weight	Normal	Underweight	Obese	Over weight		
	%	%	%	%	%	%	%	%		
Age										
20- 29	8.6	.0	.0	4.9	8.6	.0	.0	4.9	15.075	.089
30- 39	8.6	.0	13.0	4.9	8.6	.0	13.0	4.9		
40- 49	34.3	100.0	26.1	46.3	34.3	100.0	26.1	46.3		
50- 59	48.6	.0	60.9	43.9	48.6	.0	60.9	43.9		
	7.538 (.581)				**7.538 (.581)**					
Gender										
Female	17.0	.0	13.0	22.0	17.0	.0	13.0	22.0	2.964	.397
Male	18.0	1.0	10.0	19.0	18.0	1.0	10.0	19.0		
Fisher(*P*–value)	**1.482 (.686)**				**1.482 (.686)**					
Diagnosis										
Chest	19.0	1.0	13.0	28.0	19.0	1.0	13.0	28.0	4.826	.185
Cardiac	16.0	.0	10.0	13.0	16.0	.0	10.0	13.0		
Fisher(*P*– value)	**2.413 (.491)**				**2.413 (.491)**					
Conscious level										
Conscious	34.0	1.0	23.0	38.0	32.0	1.0	20.0	27.0	10.119	.02*
Unconscious	1.0	.0	.0	3.0	3.0	.0	3.0	14.0		
Fisher(P– value)	**2.294 (.514)**				**8.931 (.03*)**					
Tube Feeding Placement										
Oral	.0	.0	.0	.0	.0	.0	2.0	2.0	5.133	.08
Nasal	1.0	.0	1.0	6.0	3.0	.0	1.0	12.0		
Fisher(P–value)					**5.119 (.08)**					

Table 7: *Comparison of Patients' Characteristics and Health Relevant Data by their Body Mass Index Categories on Admission and after One week (No = 100)*

Table (8) showed no statistical significance differences among patients' age groups regarding biochemical means measures except lymphocyte. So the lymphocyte increased a week after admission in age groups (30-39) and (50-59) when compared to them on admission.

Biochemical Measurements	On admission				A week after admission				F	P value
	20- 29	30- 39	40- 49	50- 59	20- 29	30- 39	40- 49	50- 59		
	$\bar{x}$ ± SD	$\bar{x}$ ± SD	$\bar{x}$ ± SD	$\bar{x}$ ± SD	$\bar{x}$ ± SD	$\bar{x}$ ± SD	$\bar{x}$ ± SD	$\bar{x}$ ± SD		
Albumin	3.3 ±.3	3.1 ± .3	3.1 ± .3	3.2 ± .3	3.1 ± .3	3.1 ± .2	3.0 ± .2	3.0 ± .2	.879	.453
F (*P* – value)	**1.823 (.148)**				**.311 (.818)**					
Lymphocyte	6.3 ± 2.1	6.8 ± 1.9	6.6 ± 1.3	7.2 ± 1.8	7.6 ± 1.5	8.2 ± 2.7	7.4 ± 1.6	8.2 ± 2.0	2.615	.05*.
F (*P* – value)	**1.351 (.262)**				**1.446 (.234)**					
Total Cholesterol	191.6 ± 16.8	200.5 ± 26.4	194.6 ± 28.8	196.1 ± 27.3	194.6 ± 21.6	197.8 ± 26.1	189.2 ± 24.1	192.0 ± 27.2	.350	.789
F (*P* – value)	**.142 (.934)**				**.290 (.832)**					

Table 8: *Comparison of Patients' Biochemical Means indices by their Age Groups on Admission and after One week (No = 100)*

Table (9) shows that there no significant correlation between anthropometrics and selected biochemical indices on admission and a week after admission

Biochemical Measurements	On admission		A week after admission	
	BMI	Weight	BMI	Weight
	r (p-value)	r (p-value)	r (p-value)	r (p-value)
Albumin	.475 (.247)	.245 (.147)	.345 (.167)	.274(.157)
Lymphocyte	.145 (.842)	.189 (.317)	.205 (.372)	.201 (.289)
Total Cholesterol	.751(.125)	.374 (.412)	.301(.225)	.314 (.314)

Table 9: *Correlation of Patients' Anthropometrics with Biochemical Measures on Admission and after One week (no = 100)*

Discussion

Nutrition assessment refers to a comprehensive evaluation of nutrition status including medical history, dietary history, physical examination, anthropometric measurements, and laboratory data. On the other hand, nutrition screening is the process of identifying patients at risk for malnutrition or who are presently malnourished **(Bector, Vagianos, Suh, & Duerksen, 2016)**. Malnutrition is still a well-known problem for the hospitalized patients, notably critically ill patients. Malnutrition has been correlated with prolongation of hospital stays. Therefore, appropriate nutrition management may minimize the morbidity and mortality related to malnutrition **(Agarwal et al., 2019)**.

Concerning the percentage distribution of patients' gender, the present study revealed that more than half of them were female.. This result is inconsistent with **Lee et al., 2015** who reported that 63.6% of them were male. Also **(Bo et al., 2003)** reported in his study that male patients who admitted to intensive care unit were more than females. Also the current study differ with **(Leifheit-Limson et al., 2013)** who studied the prevalence of traditional cardiac risk factors and secondary prevention among patients hospitalized for acute myocardial infarction and variation by age, sex, and race and found that 67% of myocardial infarction patients are male .This result come inconsistent with **(Mohammed & Mohammed, 2016)** who studied "impact of designed nursing educational protocol on health promotion for patients undergoing coronary artery stent outcome" and reported that the most of patient were male and nearly half of them were employed. This come inconsistent with **(Herliani, Rahayu, Purba, & Harun, 2019)** who studied Patients' Needs on Nutritional Counseling and Risk Factor Management Among Myocardial Infarction Patients in Cardiac Rehabilitation and reported that the majority of patients in this study were men (73.7%) and married (94.8 %), with a mean age of 56.37 years (ranging from 44 to 74 years)..

Regarding assessment patients' feeding pattern and gastrointestinal problems on admission and after one week, the present study revealed significant differences among them on admission and after one week. This finding is interpreted and confirmed in light of McClave et al., 2016 who studied guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patients' and reported that critical illness is typically associated with a catabolic stress state in which patients demonstrate a systemic inflammatory response coupled with complications of increased infectious morbidity, multiple organ dysfunction, prolonged hospitalization, and disproportionate mortality and the formulas are entirely inadequate in design to provide a high protein hypo caloric diet.

As well, the present study showed that the majority of the studied admitted patients were on oral feeding and more than two third of the studied sample was without nutritional problems. After one week , this proportion reduced and some GIT problems appeared such as dysphagia, anorexia and vomiting This result come in the line with Lee et al., 2015 who found that more than two third of the studied sample moderately malnourished. Similarly, our finding is in line with Alsharif, Alsharif, Aljuraiban, & Abulmeaty, 2020 who reported that some patients complained of enteral feeding intolerance . The researcher's point of view

that most patients suffer from nutritional problems due to stay in hospital, limitation of their preferences in food choices and psychological upsets.

Regarding comparison of patient's clinical assessment pertinent to body built and integumentary assessment on admission and after one week, the current study showed that less than half of sample admitted with normal skin and this proportion decreased to become less than one third after one week of admission and become affected with pressure ulcer. From the researcher's point of view, the incidence of pressure ulcer may have relevant to decreased albumin level , poor hydration status , inadequate skin care , restricted change position , and restricted ambulation . This result is confirmed by **Cremasco, Wenzel, Zanei, & Whitaker, 2013** who studied Pressure ulcers in the intensive care unit and its relationship with nursing workload, illness severity and pressure ulcer risk. That study revealed that critically ill patients were more susceptible to various complications due to the severity of their clinical condition, the use of complex treatments that result in longer hospital stays.

As well, our finding is congruent with **Neloska L, et al , 2016** who studied the Association between malnutrition and pressure ulcers in elderly in long-term care facility and found that Nutritional status was statistically significantly different between patients with and without pressure ulcer ($p < 0.0001$) and showed that hypoproteinemia, and hypoalbuminemia, were was positively associated with pressure ulcer prevalence. Also, Posthauer, Banks, Dorner, & Schols, 2015 who studied the role of nutrition for pressure ulcer management confirmed that nutrition and hydration play an important role in preserving skin and tissue viability and supporting tissue repair processes for pressure ulcer healing. As well, **Bo et al., 2003** showed that the majority of the studied patients admitted without bed sores and more than one quarter were developing bed sore after one week of admission.

Regarding the skin turgor, the present study showed that more than half of the studied patients become dehydrated after one week of admission. This finding may have relevance to a decrease in fluid intake in most of cardiothoracic patients, side effects of certain medications such as diuretics. Moreover, common fever in ICU patient is another factor for causing poor skin turgor and dehydration.

Regarding comparison of patients' weight on admission and after one week, the present study showed that the body weight of the studied patients decreased after one week of admission. However, no significant statistical differences were found in the patients' weight. The researcher's point of view is that body weight of patients need more than week to become more significantly decreased. This finding come in accordance with Sheean et al., 2013 who studied multiple methods to classify malnutrition among elderly patients admitted to the medical and surgical intensive care units (ICU) and reported that occurrence of malnutrition was associated with longer hospital stay. As well, our finding is in line with **Weijs, Mogensen, Rawn, & Christopher, 2019** who studied protein intake, nutritional status and outcomes in ICU survivors that was conducted in a Single center and revealed no significant statistical differences in the patient's weight on admission and one week after..

On the contrary , this result come inconsistent with **Patkova et al., 2017** who studied energy, protein, carbohydrate, and lipid intakes and their effects on morbidity and mortality in critically ill adult patients and reported that patients have found that less than half of them have weight loss above 10 kg in the period immediately after admission to the ICU. This weight loss may be associated with the increased metabolic rate of these patients and with the impaired use of nutritional substrates. In addition this result come inconsistent with **Arbab et al., 2019** who reported that the majority of the patients were either overweight or obese.

Regarding the comparison for studied patients' selected biochemical indices on admission and on discharge after one week, the present study showed that the percentage of patients with decreased level of serum albumin increased on discharge, and lymphocyte level increased after one week of admission. This finding supported by Nachvak **M, et al, 2018** who conducted Nutritional assessment in ICU patients with enteral feeding in Amol hospitals and reported that the prevalence of malnutrition increased significantly in ICU patients during hospitalization. Similarly, our study finding is consistent with **Daneshzad E, et.,al 2015** who conducted a study entitled " Nutritional assessment in critically ill patients" and their results showed that high percent of patients in ICU had serum albumin level lower than normal range.

On the same line , our finding is partially agreed with **Lee et al., 2015** who found that there were a correlations between the bioelectrical impedance analysis (BIA) results and length of ICU stay, length of hospital stay, and duration of mechanical ventilation. From the researcher's point of view, this may have relevance to poor nutrition that affects the level of albumin and high risk of infection in hospital that increase the lymphocyte. On the other hand , this finding comes inconsistent with **Hejazi et al., 2016** who investigated nutritional assessment in critically ill patients' and reported that biochemical measures did not change significantly during the patients' stay in the ICU. As well , our finding is inconsistent with **Arbab et al., 2019** who studied assessing nutritional status of critically ill patients using serum pre-albumin levels revealed no association of low serum pre-albumin with length of stay and mortality..

Regarding comparison of patients' biochemical means indices by their age groups on admission and after one week, the present study showed that no significant correlation between patients' age groups with their biochemical measures on admission and after one week except patients cholesterol. The current finding is agreed with **Hejazi et al., 2016** who studied nutritional assessment in critically ill patients' and found that biochemical measures did not change significantly during the patients' stay in the ICU. On the contrary ,this finding is contradicted with **Lee et al., 2015** who reported that biochemical measurement of critical ill patient in different age groups were affected during hospitalization due to poor nutrition and exposure to infection..

Regarding correlation of patients' anthropometrics with biochemical measures on admission and after one week, the present study showed that there no significant correlation between anthropometrics and selected biochemical indices evaluated in this study on admission and a week after admission. This finding is partially consistent with **Montenegro-Neto, NA,et., al, 2011** who studied the correlation between anthropometric measurements and biochemical cardiovascular risk markers in the hypertensive elderly and revealed poor association between lipid profile and the anthropometric measurements. On the other hand, our finding contradicted with **Nzeagwu, CO (2016)** who evaluated the nutritional Status using anthropometry and biochemical Indices in Older Persons in Nigeria and showed positive association ($p< 0.01$) between BMI and both TC and LDL.

Conclusion:

The study concluded that the administered hospitalized nutritional formula among cardiothoracic ICU patients caused an impact causing decreased albumin level, increased lymphocytic count, bed sores, dysphagia and dehydration after one week of admission when compared to the immediate admission time.

Recommendations

Based on the findings of this study the following recommendations were made

- Evaluate the effect of applying nutritional care protocol based on nutritional assessment on the nutritional outcomes of ICU patients.
- Replication of the study on larger probability sample to ensure generalization.
- Patient's documentation system must include nutritional status assessment data such as all anthropometric measurements, and all biochemical indices.

Limitation of the Study

The study was conducted in one hospital. Therefore, the findings may not be representative of the general patients of intensive care unit in Egypt. This may threatens the external validity of the findings. Hence another research in long and extended time is needed for collection of data. Moreover, fewer studies were conducted on this target of population. Moreover, the current study was confined to some selected antropometrics such as body mass index and weight as well as confined to utilizing some selected biochemical indices such as lymphocytes, albumin and total cholesterol.

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