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The Effectiveness of Implementing Nutritional Support on Expected Clinical Outcomes of Patient with Chronic Obstructive Pulmonary Disease Undergoing Mechanical Ventilation

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Abstract: *The study aim was to determine the effectiveness of implementing nutritional support on expected clinical outcomes for Patient with COPD undergoing Mechanical Ventilation. A quasi experimental research design was used. A random sample of 60 adult patients were selected and randomly divided alternatively into two equal groups; 30 in each group: Study group (I) received nutritional support as prescribed by the treating physician. Control group (II) received ordinary hospital diet. The study was conducted in ICU Menoufia university hospital, Menoufia Governorate, Egypt.*

Tools of the study: *Four tools were used for data collection.* ***1- Nutritional assessment tool, 2- COPD Ventilator Parameters, 3- Respiratory assessment tool:*** *It included two parts:*

Part 1. *It assessed respiratory rate, breathing sound, and sputum, use of accessory muscles chest expansion, cyanosis, and cough.*

Part 2: *Dyspnea Analogue Scale and* ***tool 4*** *was used to assess laboratory study.*

Results: *There were statistical significant improvements among the study group in the mean daily caloric intakes, the total energy intake from protein, carbohydrates fiber, vitamins and trace elements, and oxygenation than the control group.*

Conclusions: *The study concluded that nutritional support proved to be an important aspect of patient care that improved oxygenation among the study than the control group.*

Recommendations that *dietitian must be included within the health staff in the ICU, and the hospital menu must be adapted according to patient need.*

Key words: *Chronic obstructive pulmonary disease, COPD Ventilator Parameters, Dyspnea, Oxygenation, Nutritional support*

I. Introduction

Chronic obstructive pulmonary disease (COPD) remains a major public health problem. It is the fourth leading cause of chronic morbidity and mortality in the United States and is projected to rank fifth in 2020 in burden of disease caused worldwide, according to a study published by the world health organization. Yet, COPD remains relatively unknown or ignored by the public as well as public health government [1]. It is a preventable and treatable disease with some significant extra pulmonary effects. COPD includes the following common diseases: chronic bronchitis, emphysema, bronchiectasis, and cystic fibrosis [2].

A clinical diagnosis of COPD should be considered in any patients who have dyspnea, chronic cough or sputum production, and / or a history of exposure to risk factors for the disease. The diagnosis should be confirmed by spirometry assessment of symptoms: Dyspnea is the hallmark symptom of COPD and it is the reason that most patients seek medical attention, and is a major cause of disability[3].

Nutritional support for patients with COPD is especially important in the form of enteral and parenteral nutrition. It should be considered for patients who are difficult to wean from mechanical ventilation in the ICU. Specific nutritional deficiencies, such as hypophosphatemia and impaired lipid synthesis, can also be associated with acute respiratory failure and with an abnormal increase in fat mass respectively [4].

The oral dietary intake should be carefully evaluated in long term ventilated patients, especially for those who often report swallowing dysfunction due to tracheastomy and/or multiple associated factors, such as acute illness, medications, as steroids, neuromuscular blocking agents and general sedatives, prolonged inactivity of swallowing muscles and injury arising from endotracheal intubation. In some patients, meals may increase respiratory frequency, end-tidal carbon dioxide tension and dyspnea [5].

Oral or tube feeding enables nutritional intake to be maintained or increased when the normal intake is in adequate. In COPD patients, enteral nutrition in combination with exercise and anabolic pharmacotherapy has

the potential to improve nutritional status and function. It can be administered through a number of routes. The route chosen depends on anticipated duration of feeding, condition of the GI tract, and potential for aspiration. Nasogastric tube is the most common route of enteral feeding. Small frequent meals are preferable, in order to avoid postprandial dyspnea. Optimal amount of carbohydrate, protein and fat should be provided [6].

Assessment of nutritional status for mechanically ventilated patients is done by four major techniques; physical findings, vital signs, anthropometric measurements, laboratory data and diet history. Physical assessments include measuring and evaluating vital signs and use of accessory muscle of respiration which is a criterion for early weaning from ventilator [7].

The role of nurse is very important in nutritional assessment, in collaboration with other health team members. The nurse must conduct daily rounds with the team to see and discuss the nutrition/feeding plan for patients. Also, must implement specialized care plan; coordinates the follow up care on the tube feeding regimes, performs feeding tube changes and care, help to coordinate and manage the assignment of acute and chronic nutritional access devices [8].

Significance of the Study

Malnutrition is considered a major health problem among hospitalized patients especially COPD [9]**.** It received little attention especially among mechanically ventilated patients which is a major factor in the failure of certain patients to wean from it. Assessment and nutritional support can help those patients to identify problems that can be addressed. Hence the study aims to determine the effectiveness of implementing nutritional support on expected clinical outcomes for Patient with COPD undergoing Mechanical Ventilation.

Aim of the Study

The aim of this study is to determine the effectiveness of implementing nutritional support on expected clinical outcomes for Patient with COPD undergoing Mechanical Ventilation.

II. Research Hypothesis

1-Patients who receive nutritional support exhibited improvement in respiratory rate more than control group.

2-The result of arterial blood gases analysis will be improved among patients who receive the nutritional support than the control group.

3-The pulmonary function test improve among patients who receive the nutritional support as compared to their control.

4-Patients who receive nutritional support exhibited normal anthropometric measurements than other patients who did not receive it.

5-Patients who receive nutritional support exhibited no signs of malnutrition than those who did not receive it.

Operational Definition

1. **Expected clinical outcomes**
   For the purpose of this study, expected clinical outcomes were measured by arterial oxygen tension (PaO2), arterial carbon dioxide tension (PaCO2), oxygen saturation (SaO2), pH, Hco3, FiO2, respiratory rate and pulmonary function test.
2. **Nutritional support:**
   Means adjunctive therapy prescribed by the physician and given to the patients in the study group according to patient, needs with a main goal, of preventing, correcting signs of malnutrition.

III. Materials

Research Design:

A quasi experimental research design was utilized.

Research Setting:

The study was conducted at the chest intensive care unit (ICU), of Menoufia University Hospital, Menoufia Governorate.

Subjects:

A sample of 60 mechanically ventilated adult patients with COPD. They were selected randomly and divided alternatively into two equal groups 30 patients in each:

- **Group (I)Study group:** Patients in this group received nutritional supports tailored according to their needs based on the assessment by the researcher and agreed upon by the treating physician
- **Group (II) control group:** Patients received their formula according to the routine hospital diet.

Inclusion criteria:

Conscious adult of both sexes, noninvasive mechanically ventilated patients diagnosed with COPD, admitted within 24 hours to ICU, and expected to stay on the ventilator not less than 14 days

Exclusion criteria:

Any other associated disorders as cardiovascular, immune compromised, diabetes or any other injury or trauma.

Tools

Tools of the study:

Four tools were used in this study to collect the necessary data:

Tool (1) Nutritional assessment tool: This tool was developed by the researcher based on relevant literature review except part two that was developed by" Nutritional Research Group (1996)" and used by the researcher to assess patient nutritional status. The tool contains four parts:

Part (I): Sociodemographic and clinical data as age sex, and marital status.

Part (II): Clinical and physical signs of nutritional deficiency**.** It was developed by **(Rosdable & Kowalski, 2003)** and used by the researcher for detection of clinical signs and symptoms of nutritional deficiency in the skin, eyes, lips, hair, gums, tongue, and nails.

Part (III): **Nutritional assessment: It was used to illicit data about:** 1**.** Patient dietary history, 2. Assessment of dietary intake, 3. Anthropometric measurements which included: Body mass index (BMI), measurement of triceps skin folds thickness (TST), mid arm circumference (MAC) and mid arm muscle circumference (MAMC)

Part (VI): Biochemical measurements: It includes the following laboratory tests; Hemoglobin, hematocrit, Blood urea, serum creatinine, serum albumin, the researchers compare the patient's result with the normal range values [11]**.**

Tool (2) COPD Ventilator Parameters Assessment Tool:

It was developed by the researchers and was used to assess the ventilator parameters which obtained from the readings of the ventilator settings. It includes duration of mechanical ventilation, mode of ventilation, tidal volume (TV) normal value is 500ml or7ml/kg body weight, , minute volume (VE) the normal value of minute volume 5–8 liters per minute , positive end-expiratory pressure (PEEP)where normal value is 5-15 cmh2o and fraction of inspired oxygen(Oxygen concentration) (FIO**2**) were also the normal value40%-100**.** [12]**.**

Tool (3) Respiratory Assessment Tool:

It was used by the researcher to assess respiratory status based on literature review and it was comprised of two parts:

Part 1: Used to assess respiratory rate, breathing sound, sputum, use of accessory muscles, chest expansion, cyanosis, cough **(Boggs, &king, 2007)** [13]**.**

Part 2: Dyspnea Analogue Scale: It was developed by (**Borg, (1998))** [14] and was used by the researcher to assess dyspnea. Responses ranged from zero to ten where zero indicated no dyspnea while (5&6) indicate severe dyspnea and (10) indicate maximum dyspnea.

II.4.4 Tool (4) Laboratory studies:

It was developed by the researchers to assess progress of patient's respiratory status and oxygenation & establish base line data about lung function as pulmonary function test (spirometry) & arterial blood gases measurement (ABGs) patients respiratory responses were identified against normal value where PH normal range: 7.35 -7.45, PaO2 normal range: 80-100 mm hg, PaCO2 normal range: 35-45 mm hg, HCO3 normal range: 22-26meq/l, So2 normal range: 92-100%.

IV. Methods

Written approval: Permissions to carry out the study was obtained from the responsible authorities to conduct the study.

Tools development:

Tool I part 2 was adopted from the" Nutritional Research Group (1996)", while, Tool I part 3 was developed by **Rosdable & Kowalski, (2003)** [10]**.**

Tool II, Tool III part 1 and tool IV were developed by the researcher after reviewing of the relevant literature, while Tool III part 2 was developed by **(Borg, 1998)** [14].

Validity: All tools were tested for content validity by five experts in the field of critical care nursing, a nutritionist and medical specialist in the field to ascertain relevance and completeness Reliability.

Protection of human rights: A written consent was obtained from the family after explaining the nature and aim of the study and the dietary intervention. Protections of human rights were considered, confidentiality and privacy of information were ascertained.

Pilot study: It was carried out on 5 patients to test the feasibility and applicability of the developed tool; accordingly the needed modifications were done. Patients of the pilot study were excluded from the study.

The study was conducted in the following phases:

Assessment phase:

1- Immediately within 24 hours of admission, patients of both groups were assessed using the four tools (I, II, III, IV) to collect base line data.

2-Specific food, beverages in the form of formula received, the amount, type of formula and food intake problems as vomiting were recorded daily for 14 days from admission to ICU for both groups using tool the nutritional assessment tool.

Planning phase:

Based on the assessment of the study group, the researchers identified the priorities, expected outcome criteria, immediately a long term goals for nutrition, route of administration of nutritional support, amount, and mode, a plan of care for nutritional support was developed and revised by the treating physician and the hospital dietician to be tailored and implemented for each patient in the study group. The routine hospital diet was given for the control group as usual without interference from the researcher.

Implementation phase:

Group (I) study group: In this phase, the study group received the individually developed formula in the intensive care unit from the first day of admission till 14 days of hospitalization based on analysis of needs of each patient using **computer program for Food Analysis Program, Faculty of Home Economics, Menoufia University(1998),** and compared with **National Dietary Reference Intake (DRI) (2011).**This formula included the following nutrients: protein, carbohydrates, fat, fiber, sodium, potassium, calcium, vitamin A and vitamin C and it was administered orally or through Ryle tube based on physician's prescription.

Evaluation phase

Patients of both groups were immediately assessed on admission and post nutritional support implementation and at the end of the first week and second week) using 3 tools, tool 1, II, and III to determine the effectiveness of implementing nutritional support on expected clinical outcomes for Patient with COPD undergoing mechanical ventilation. After two weeks from receiving the dietary program, each patient in the study group and control group was finally re- assessed (post- test) to determine the effectiveness of implementing nutritional support on expected clinical outcomes for Patient with COPD undergoing Mechanical Ventilation.

Statistical analysis:

After data collection, raw data was coded and scored and a coding instruction manual was prepared. Data were fed to the computer using Epi-Info (version 3.0) and statistical analysis was performed using Statistical Package for Social Sciences (SPSS version 18.0). Significance of the obtained results was judged at the 5 % level of significance.

Descriptive statistics were computed on all variables. Comparison between patients of the study and control groups was formulated. Differences in terms of general profile (demographic, socio-economic, and clinical), nutritional assessment parameters, and clinical outcomes of the nutritional intervention were tested using the $\chi 2$, Monte Carlo test, Fisher's Exact and Student-t tests of significance [15].

V. Results

Table 1 presented the demographic characteristics of both study and control groups undergoing mechanical ventilation. The table showed that a high proportions of patients of both study and control groups (70.0% and 63.3%respectively) were in the age group of 50 to 60 years. Over half of each patient of both groups (53.3%) was males. Male: female ratio was 1.14: 1 with no significant difference. Married patients constituted the majority of both study groups (96.7%, 76.7%). Also, 46.7% of study group was illiterate as compared to 33.3% of their controls.

Table 2 illustrated the food daily intake of for patients of both groups based on the implemented nutritional support. The table clarified statistical significant differences between the means of the study and control group in all nutrients of daily food intake. In addition, the table illustrated that the study group received 96.4% of the adequate energy requirements, 98.2% of adequate protein, carbohydrates requirements and 92.0% of adequate fat requirements. While the control group received almost two thirds and less of their daily requirements of nutrients.

Table 3 showed a comparison between patients of both study and control groups in relation to anthropometric parameters 2 weeks post nutritional support implementation. The table revealed that anthropometric parameters of study group were higher than that of the control group after two weeks of implementation of the nutritional support. The mean weight of the study group (62.86 ± 9.07 kg) was significantly higher than that for the control group (58.72 ± 10.49 kg) where $p = 0.018$.

The mean BMI was significantly higher for the study group (26.36 ± 37 kg/m2) than the control group (22.55 ± 3.75 kg/m2).

The mean triceps skin fold thickness (TST) of the study patients (10.65 ± 1.74 cm) was significantly higher than that for the control group (8.82 ± 2.93 cm), where $p = 0.005$.

A statistical significant difference was observed between **the mean mid-arm muscle circumference (MAMC)** of the study group (26.24 ± 4.32 cm) compared to that for the control group (22.37 ± 3.74 cm) where p = 0.000.

Table 4 showed the percentage distribution of COPD patients of both groups (study and control) related to clinical signs of malnutrition on admission. The table illustrated presence of malnutrition among the two groups in all signs of malnutrition except for skin where the study group had more loss of skin turgor than the control group.

Table 5 illustrated the percentage distribution of COPD patients of both groups (study and control) in relation to clinical signs of malnutrition 2 weeks post nutritional support implementation. The table illustrated high statistical significant improvement among the study group than that of the control regarding the clinical signs of malnutrition except for tongue and skin.

Table 6 presented the baseline biochemical tests for both study and control groups. The table showed no statistical significant differences between the two groups at the base line assessment.

Table 7 presented the biochemical tests for both study and control groups 2 weeks post nutritional support implementation. The table also showed statistical significant improvement among the study group than the control in all levels of hemoglobin, hematocrit, blood urea, serum creatinine, and serum albumin.

Table 8 showed the percent distribution of COPD patients of both study and control groups related to respiratory assessment before nutritional support implementation. The tables showed no statistical significant differences were found between the two groups. The majorities of patients in the two groups had shallow respiratory rate, air hunger, productive cough and inter costal retraction,

Tables 9 showed respiratory assessment of COPD patients of both study and control groups two-weeks post nutritional support implementation .Moreover, the table showed that high statistical significant improvement was found among the study group in all parameters of respiratory assessment two weeks post implementing the nutritional support than the control group.

Table 10 presented a comparison between the degree of dyspnea among the study and control groups two-weeks post nutritional support implementation. The table clarified that 43.3% of the study group had no dyspnea and 63.4% had slight dyspnea and none of them had sever dyspnea, compared to 3.3% of the control group who complained of sever dyspnea and 63.4% who had moderate dyspnea. The differences were highly significant.

Table (1) Demographic characteristics of COPD patients both study and control groups undergoing mechanical ventilation.

Demographic Characteristic		Study group (n=30)		Control group (n=30)		StatisticalSignificance chi-square test (p value)
		No.	%	No.	%	
Age group (years)	20-	1	3.3	3	10.0	Monte – CarloTest = 1.100(0/77)
	30-	1	3.3	1	3.3	
	40-	7	23.3	7	23.3	
	50-60	21	70.0	19	63.3	--------
Sex	Male	16	53.3	16	53.3	
	Female	14	46.7	14	46.7	
MaritalStatus	Single	1	3.3	3	10.0	Monte-CairoTest=7.286*(0.026)
	Married	29	96.7	23	76.7	
	Wido	0	0.0	4	13.3	

* Significant of 0.05 Level

* Demographic characteristics of patients

Table (2) Food daily intake for patients of both groups based on the implemented nutritional support.

Nutrient	Average Dietary Reference Intake(DRI)	Study group (n=30)		Control group(n=30)		Student t-Test (p value)
		Mean ±SD	% ofDRI	Mean ±SD	% of DRI	
Total energy (Kcal/d)	2204	2124.80± 0.000	96.4	1352.51± 204.83	61.4	5.239* (0.000)
Protein	56	55.00± 0.00	98.2	37.72± 14.36	65.4	3.852* (0.003)
Carbohydrates (g/hg/d)	130	128.00± 0.00	98.5	123.92± 52.73	95.3	2.345* (0.021)
Total fat (g/d)	25	23.00± 0.00	92.0	32.31± 6.34	129.2	3.081* (0.008)
Fiber (g/d)	30	30.00± 0.000	100.0	6.42± 2.39	21.4	5.824* (0.000)
Sodium	1.5	1.481.48± 0.00	98.7	2.13± 0.83	142.0	2.428* (0.036)
Potassium (g/d)	4.7	4.2± 0.00	98.4	1.37± 0.72	29.1	3.026* (0.007)
Calcium (mg/d)	1.2	1.10± 0.31	91.7	0.80± 0.23	66.7	2.346* (0.037)
Vitamin a(ug/d)	700	679.00± 0.00	97.0	337.59± 227.46	48.2	4.582* (0.000)
Vitamin c (mg/d)	75	73.00± 0.00	97.3	16.63± 4.82	22.2	5.061* (0.000)

*Values are expressed as mean ± standard deviation
*The nutritional study is calculated as following Total cal.=basal energy expenditure x 1.2 or 30bal/kg, fat=30% of total cal., protein=1gm/kg/d, CHO=the remainder of the total caloric requirement, sodium=not exceed 2 g/day
*Significant at 0.05 level of significance

Table (3) Comparison between patients of both study and control groups in relation to anthropometric parameters 2 weeks post nutritional support implementation.

Anthropometric parameter	Study group (n=30)	Control group (n=30)	Student t-Test (p value)
	Mean ±SD	Mean ±SD	
Weight (kg)	62.86± 9.07	58.72± 10.49	2.245* (0.018)
BMI (kg/m^2)	26.36± 37	22.55± 3.75	3.657* (0.001)
TST (cm)	10.65± 1.74	8.82± 2.93	2.934* (0.005)
MAMC (cm)	26.24± 4.32	22.37± 3.74	3.706* (0.000)

BMI= body mass index (kg/m^2).
TST= triceps skin fold thickness (mm).
MAMC=mid muscle circumference (cm).
- Values are expressed as means and standard deviations
*Significant at 0.05 level of significance

Table (4) Percentage distribution of COPD patients of both groups (study and control) related to clinical signs of malnutrition on admission.

Clinical Signs of malnutrition		Study groups (n=30)		Control group (n=30)		Monte Carlo test(p value)
Site	Signs	NO	%	NO	%	
Head and neck	Normal	8	26.7	2	6.7	6.763 (0.056)
hair	Lake of natural shine	7	33.3	14	46.7	
	Dry	15	50.0	13	43.3	
	Sparse	0	0.0	1	3.3	
	Normal	7	23.3	6	20.0	
eyes	Dry pale membranes	21	70.0	22	73.3	0.100 (0.951)
	Redness	2	6.7	2	6.7	
	Normal	2	6.7	2	6.7	
lips	Redness	1	3.3	0	0.0	1.613 (0.656)
	Swelling	4	13.3	0	0.0	
	Cracked	23	76.7	25	83.3	
	Normal	24	80.0	28	93.4	
	Scarlet	2	6.7	0	0.0	
Tongue	Raw tongue	4	13.3	1	3.3	3.760 (0.452)
	Purplish color	0	0.0	1	3.3	
	Normal	7	23.3	3	10.0	
	Cavities	4	13.3	4	13.3	
teeth	Tender	17	56.7	22	73.3	3.675 (0.452)
	Decay	2	6.7	1	3.3	
	Normal	14	46.7	13	43.3	
gums	Spongy , bleeds easily	10	33.3	15	50.0	3.137 (0.219)
	Inflamed	6	20.0	2	6.7	
	Normal	3	10.0	2	6.7	
	Depigmentation	2	6.7	0	0.0	
skin	Loss of skin tugor	23	76.7	17	56.7	10.737* (0.013)
	Flakiness of skin under eyes	2	6.7	11	36.7	
	Normal	3	10.0	0	0.0	
muscles	Weakness	27	90.0	29	96.7	5.617
	sparse	0	0.0	1	3.3	

* Significant at 0.05 level

Table (5) Percentage distribution of COPD patients of both groups (study and control) in relation to clinical signs of malnutrition 2 weeks post nutritional support implementation.

Clinical Signs of malnutrition		Study groups (n=30)		Control group (n=30)		Monte Carlo test(p value)
Site	Signs	NO	%	NO	%	
Head and neck	Normal	21	70.0	5	16.7	19.241* (0.000)
hair	Lake of natural shine	3	10.0	10	33.3	
	Dry	6	20.0	14	46.7	
	Sparse	0	0.0	1	3.3	
	Normal	28	93.3	7	23.3	
Eyes	Dry pale membranes	2	6.7	21	70.0	34.559*

	Redness	0	0.0	2	6.7	(0.000)
	Normal	28	93.3	14	46.7	
Lips	Redness	1	3.3	0	0.0	26.938*
	Swelling	1	3.3	1	3.3	(0.000)
	Cracked	0	0.0	15	50.0	
	Normal	29	96.7	26	86.6	
	Scarlet	1	3.3	0	0.0	
Tongue	Raw tongue	0	0.0	2	6.7	4.176
	Purplish color	0	0.0	2	6.7	(0.124)
	Normal	12	40.0	2	6.7	
	Cavities	3	10.0	4	13.3	
Teeth	Tender	12	40.0	24	80.0	16.305*
	Decay	3	10.0	0	0.0	
	Normal	27	90.0	15	50.0	
Gums	Spongy , bleeds easily	1	3.3	14	46.7	17.263*
	Inflamed	2	6.7	1	3.3	(0.000)
	Normal	14	46.7	9	30.0	
	Depigmentation	1	3.3	0	0.0	
Skin	Loss of skin tugor	6	20.0	12	40.0	4.521
	Flakiness of skin under eyes	9	30.0	9	30.0	(0.210)
	Normal	16	53.3	3	10.0	
Muscles	Weakness	14	46.7	25	83.3	15.683
	sparse	0	0.0	2	6.7	(0.000)

* Significant at 0.05 level of significant

Table (6) Baseline biochemical tests for both study and control groups undergoing mechanical ventilation

Biomoglobin (g/dl)	**Study groups (n/=30)**	**Control groups (n/=30)**	**Student- t test**
	Mean ±SD	**Mean ±SD**	**(P value)**
Heamoglobin (g/dl)	12.86±0.79	13.06±1.68	0.623(0.313)
Heamatocrit (%)	42.11±14.69	43.56±5.28	0.509(0.613)
Blood urea (mg/dl)	11.70±5.41	12.63±4.28	1.706(0.169)
Serum creatinine (mg/dl)	0.78±0.17	0.81±0.18	0.732(0.467)
Serum albumin (mg/dl)	3.27±0.31	3.33±0.17	1.457(0.239)

* Significant at 0.05 level of significance

Reference range	**MALE**	**FMALE**
Heamoglobin (g/dl)	13-18 g/dl	12-16 g/dl
Heamacrit (%)	42-54%	38-46%
Blood urea	7-20 mg/dl	7-20 mg/dl
Serum creatinine	0.8-1.3 mg/dl	0.8-1.1 mg/dl
Serum albumin	3.5-5 mg/dl	3.4-5 mg/dl

Table (7) Biochemical tests for both study and control groups 2 weeks post nutritional support implementation.

Biochemical test	**Study groups (n=30)**	**Control groups (n/=30)**	**Student- t test**
	Mean ±SD	Mean ±SD	(P value)
Haemoglobin(g\m)	12.94±1.03	11.76±1.10	4.294*(0.000)
Heamatocirt (%0)	42.42±2.68	37.97±2.46	6.717*(0.004)
Blood urea (mg\di)	8.58±4.21	11.67±2.82	7.090*(0.002)
Serum creatinine (mg\di)	0.87±0.20	1.39±0.37	2.513*(0.018)
Serum albumin (mg\di)	4.39±0.56	3.36±0.16	4.084*(0.019)

* Significant at 0.05 level of significance

Reference range	**MALE**	**FMALE**
Heamoglobin (g/dl)	13-18 g/dl	12-16 g/dl
Heamacrit (%)	42-54%	38-46%
Blood urea	7-20 mg/dl	7-20 mg/dl
Serum creatinine	0.8-1.3 mg/dl	0.8-1.1 mg/dl
Serum albumin	3.5-5 mg/dl	3.4-5 mg/dl

Table (8) Percent distribution of COPD patients of both study and control groups related to respiratory assessment before nutritional support implementation.

Respiratory			**Study patient (n/=30)**		**Control patient (n/=30)**		**Statistical significance**
Item	**Sub-item**	**signs**	**No.**	**%**	**No.**	**%**	**(P value)**
1-respiratory rate	Rate	mean± SD	38.47±7.94		31.37±8.04		T=0.496(0.000)
	Rhythm	Regular	16	53.3	14	46.7	X^2=0.496 (0.518)
		Irregular	14	46.7	16	53.3	

	Depth	deep	2	6.7	1	3.3	(0.395) #
		Shallow	28	93.3	29	96.7	
2-chest expansion		Normal	8	26.7	6	20.0	X^2=2.963 (0.085)
		Limited	22	73.3	24	80.0	(0.692)#
3-air hunger		No	2	6.7	0	0.0	(0.639)
		Yes	28	93.3	30	100.00	
4-cough		Dry	3	10.0	2	6.7	
		Productive	27	90.0	28	93.3	Monte carlo test
Sputum	Color	White	17	63.0	57.1		3.052 (0.052)
		Blood Stained	6	22.2	5	17.9	
		YellowGreen	4	14.8	7	25.0	
	Order	No order	18	66.7	22	78.6	X^2=1.206 (0.272)
		Foul	9	33.3	6	21.4	
	Consistency	Thin	6	22.2	8	28.6	X^2=4.737
		Thick and Tenacious	21	77.8	20	71.4	(0.113)
5-inter costal retraction		No	2	6.7	2	6.7	--
		Yes	28	93.3	28	93.3	
6-Use accessory muscles		No	1	3.3	0	0.0	(0.992)#
		Yes	29	96.7	30	100.0	
7-cyanoisis		Absent	27	90/0	30	100.0	0.051#
		Peripheral	3	10.0	0	0.0	
8-body tempreture		Normal	13	43.3	12	40.0	Monte Carlo
		hypothermia	4	13.4	3	10.0	Test= 1.017
		hyperthermia	13	43.3	15	50.0	(0.313)
9-breathing sound	On right side of the lung	Normal	112	36.6	9	30.0	Monte Carlo
		Absent	0	0.0	2	6.7	Test= 1.017
		Diminished	6	20.0	8	26.7	(0.313)
		Wheezes	2	6.7	5	16.6	
		Cripitation	11	36.7	6	20.0	
	On left side of the lung	Normal	15	50.0	10	3.33	Monte Carlo
		Absent	0	0.0	1	3.4	Test=3.675
		Diminished	3	10.0	8	26.7	(0.425)
		Wheezes	2	6.7	4	13.3	
		Cripitation	10	33.3	7	23.3	

P value of fisher exact test

Tables (9) Respiratory assessment of COPD patients of both study and control groups two-weeks post nutritional support implementation.

Respiratory			**Study patient (n/=30)**		**Control patient (n/=30)**		**Statistical significance**
item	**Sub-item**	**signs**	**No.**	**%**	**No.**	**%**	**(P value)**
1-respiratory rate	Rate	mean± SD	19.57±4.11		29.20±7.82		T=5.971*(0.000)
	Rhythm	Regular	30	100.0	28	93.3	(0.923) #
		Irregular	0	0.0	2	6.7	
	Depth	Normal	28	93.3	24	80.0	Monte Carlo
		Deep	0	0.0		13.3	test = 4.686*
		Shallow	2	6.7		6.7	(0.038)
2-chest expansion		Normal	21	70.0		10.0	*(0.000)#
		Limited	9	30.0		90.0	
3-air hunger		No	24	80.0		40.0	X^2= 10.000*
		Yes	6	20.0		60.0	(0.002)
4-cough		No	4	13.3		0.0	Monte Carlo
		Dry	5	16.7		20.0	test = 4.683*
		Productive	21	70.0		80.0	(0.028)
Sputum	Color	White	19	90.5		66.7	Monte Carlo test
		Blood Stained	2	9.5		12.5	7/814* (0.007)
		Yellow Green	0	0.0		20.8	
	Order	No order	20	95.2		79.2	*(0.001)#
		Foul	1	4.8		20.8	
	Consistency	Thin	16	76.2		37.3	X^2=9.234*
		ThickandTenacious	5	23.8		62.5	(0.001)
5-inter costal retraction		No	27	90.0	13	43.3	*(0.000)#
		Yes	3	10.0	16	56.7	
6-Use accessory muscles		No	26	86.7	6	20.0	
		Yes	4	13.3	24	80.0	*(0.000)#
7-cyanosis		Absent	30	100.0	30	100.0	-----
8- body temperature		Normal	29	96.7	22	73.3	Monte Carlo test
		hypothermia	1	3.3	5	16.7	= 7.381* (0.003)
		hyperthermia	0	0.0	3	10.0	
9- breathing sound		Normal	24	80.0	18	60.0	Monte Carlo test

	On right side of the lung	Diminished	2	6.7	5	16.7	= (5.013* (0.031)
		Wheezes	1	3.3	3	10.0	
		Cripitation	3	10.0	4	13.3	
	On left side of the lung	Normal	22	73.3	18	60.6	Monte Carlo test = (5.900* (0.038)
		Diminished	2	6.7	5	16.6	
		Wheezes	1	3.3	2	6.7	
		Cripitation	5	16.6	5	16.6	

P value of fisher exact test

* Significant at 0.05 level of significance

VI. Discussion

COPD is the fourth leading cause of death in the United State. Persons with COPD have an increased risk of mortality compared to those who do not, with consequent reduction in life expectancy (C**ancer Lung Association, 2010).**

General profile of the study group and their controls

The findings of the present study revealed that there were no statistical significant differences in the basic data between the study and control groups regarding to age, occupation, sex and education except in marital status. Also, it showed that the majority of the studied subjects of both groups were in the late adult period while the minority of the studied subjects of both groups was in middle adult age. These findings are congruent with the finding of the **European Respiratory Society (2009)** [5] illustrated that the prevalence of COPD is higher among late adulthood patients.

Regarding to sex, over half of each of both study and control groups were males .This finding is in the same line with **Kenneth et al. (2001)** [16] who reported that COPD is more prevalent in males than females. This could be attributed to the higher smoking rate among males than females. Meanwhile, this finding contradicts with **Jindal (2006)** [17] who found that women are more susceptible to COPD due to indoor air pollution.

As for marital status, the findings showed that the majority of the patients in both groups were married. This finding is supported by the findings of **Barnes (2000)** [18] who reported that the majority of his sample was married.

This finding contradicts with the finding of **Halbert, et al. (2003)** [19] who examined the associations between marriage and COPD and illustrated that marriage significantly correlates with reduced risk of COPD, compared to their controls.

Regarding to level of education, the majority of patients of the study group of patients were illiterate compared to the control. While none of both groups had basic education, and this result was in line with **Cutler (2007)** [20] who found that illiteracy represent high rate for hospital admission and is also supported by **Hughe (2009)** [21]**.** This may be attributed to educated people are more likely to care for themselves and practice healthful life style as intake of healthy food, performed exercise, and respect follow up.

Concerning daily food intake of the study and control patients based on 24-hour dietary and caloric recall, the mean daily intake for both the study and control groups was less than the Dietary Reference Intake (DRI) at the baseline assessment. This finding is congruent with the result of **Merce et al., (2005)** [22] who conducted a study to investigate the effects of oral nutritional on quality of life of patients with COPD at base line; they found that all patients needed oral nutritional supplements to achieve the required daily energy intake and the Required Daily Allowance (RDA).

After implementing of the nutritional support the results of this study revealed that the mean daily caloric intake for the study group was higher than that for the control group and this difference was statistically significant.

Concerning **the total energy intake,** post implementing the nutritional support, the findings revealed a statistically significant increase in the total consumption of protein, carbohydrate, fat, vitamins and minerals among the study group than that of the control group, and improved than the baseline assessment. This finding is congruent with the findings of **Furie and Kelly (2008)** [23]**, Rabadi et al., (2008)** [24] **and Strazzullo et al., (2008).** These findings reflect the success of the implementing the nutritional support to provide the study group with the daily requirements of caloric and energy intake [25].

Anthropometric measurements

The result of this study revealed that **the mean height at the base line assessment**, for the study and control groups were similar with no statistical significant difference. However, the mean weight of the study group was slightly lower than that for the control group and this difference was not statistically significant. But post nutrition support implementation for two weeks the mean weight of the study group improved and became higher than that for the control group with statistically significant difference. This improvement could be related to the success of implementing the nutritional support.

Also, at the baseline assessment, the mean body mass index (BMI), mean mid arm muscle circumference (MAMC), and the mean triceps skin thickness (TST) were within the normal level for both groups with no statistical significant differences. However, post two weeks of implementing the nutritional support, the BMI, MAMC of the study group was significantly higher than that of the control group. This finding was supported by **Ugur & Tanseli (2007)** [26]**, Albin (2000)** [27]**.** However, the TST of the study group was lower post implementing of the nutritional support than that of the control group. This finding means improvement because subcutaneous tissue is replaced by fat as store for energy.

Concerning clinical signs of malnutrition, the present study revealed that patients of both groups showed clinical signs of malnutrition related to hair, eye, lips, teeth and gums, skin and muscle weakness, with no statistical significant differences between the study and control groups at the baseline assessment. However, after two weeks of implementing the nutritional support, there was statistical significant improvement in all clinical signs of malnutrition. This finding was similar to the findings of **Dudek (2001)** [28]**, Gates and Fink (2001)** [29]**,** who emphasized the need for implementing a nutritional support to COPD patient undergoing mechanical ventilation to replace the loss and lack of adequate nutrients during the prolonged hospitalization.

Regarding Biochemical parameters, the findings revealed no statistical significant differences found between the study and control group at the baseline assessment. However, post two weeks of implementation of the nutritional support, the serum hemoglobin and hematocrit level, serum blood urea, serum albumin level and creatinine level was statistically significantly improved .These findings were in the same line with the findings of **El- Sayed (2007)** [30]**, Ugur and Tanseli (2007)** [26]**, Smeltzer and Bare (2009)** [31] **and Harita (2008) (19)** who found statistical significant improvement in all biochemical parameters of the patients post implementing the nutritional support. Theses improvement could be due to improvement in essential nutrients as iron, vit b12, and minerals and also to improvement in kidney function due to improved nutrition.

Oxygenation of the studied groups was assessed through arterial blood gases, pulmonary function tests, respiratory assessment parameters and degree of dyspnea [32]**.**

Arterial blood gases

The mean PH level, PaO2, PaCo2, HCo3, SO2, was nearly equal in both study and control groups with no significant differences observed at the base line assessment. However, post two weeks of nutritional support, there was a statistical significant improvement in all parameters of arterial blood gases among the study group than the control group. This result was supported **by Selman et al. (2000)** [33]**, Apependini (2000)** [18] they stated that the mean value of PaO2and Paco2, and SO2 turned to be within normal values in the second week compared to the baseline, which could be attributed to the success of the nutritional support in providing adequate control of arterial blood gases. Also, improvements in arterial blood gases for the study group attributed to good nutritional support which affect the weaning process and improve oxygenation.

Likewise, there was no statistical significant difference of the mean values of FVC, and FEV1 at the baseline assessment. Meanwhile, the mean values of FVC, and FEV1 became significantly higher among the study group than the control group. This finding is supported by study done by **Breslin & Volz (2000)** [34]**, and Pieter & Jan Willem (2011)**[35]**.** This finding means that the nutritional support improves the muscles of respiration and lung function for the study group.

Respiratory rate

The mean respiratory rate of the study group was nearly equal to their controls; they were almost equal in having shallow respiration, with no statistical significant difference. However, there was statistical significant improvement post two weeks of implementation of the nutrition support among the study group. Also, in the baseline assessment, the majority of patients in both groups had air hunger, cough, and inter costal retraction, use of accessory muscles, wheezes and cyanosis. These complaints were statistically improved among the study group post two weeks of implementation of the nutrition support than that in the control group. These findings were congruent with the findings of **Stephen et al, (2009)** [36] **and Mahler (2013)** [27]**,** This improvement is due to improvement in respiration is due to improvement in nutritional status of the study group post two weeks of implementation of the nutrition support.

Regarding the Baseline degree of dyspnea among the study and control patients according to Dyspnea Analogue Scale Score, post two weeks of nutritional support implementation, None of the patients in the study had sever dyspnea compared to about tenth of the control group. The differences observed as regards the degree of dyspnea between the two groups was statistically significant. These results were consistent with the result reported by **Klaus & Rabe (2006)** [38].

VII. Conclusions

Based on the findings of the current study, it can be concluded that nutritional support had been proven to be an important aspect of patient care and improve oxygenation as there were statistical significant improvement among patients in the study group than that for patients in the control group.

Recommendations

1. Nutritional screening, assessment and monitoring should be part of patient care plan.
2. The hospital menu must be adapted according to patient need to provide suitable caloric requirement.

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