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Dietary intervention to improve nutritional status, fatigue and quality of life of patient with chronic obstructive pulmonary disease

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Abstract

Background: Chronic Obstructive Pulmonary Disease (COPD) is a major cause of morbidity and mortality and healthcare burden worldwide. Malnutrition is common among people with COPD and is associated with poor prognosis. Malnutrition has a negative effect on the pulmonary function, decreases health-related quality of life, and increases the risk of exacerbations, and healthcare costs. Patients with COPD reported fatigue as second to dyspnoea. It has been proposed that increasing high fat diet may be more beneficial, as fat produces less metabolic CO_2 and has a lower respiratory quotient compared with carbohydrate metabolism. Findings of the study will enable nurses to implement the most effective dietary intervention to improve the nutritional status, functional capacity, and thus quality of life of this population.

Aim: to examine the effect of dietary intervention on the nutritional status, fatigue and quality of life among patients with COPD.

Design: A quasi experimental design was used (Study/Control).

Setting: The study was conducted at the chest department and chest clinic at Menoufia University hospital at Shebin Al Khoom, Menoufia Governorate, Egypt.

Sample: A convenience sample of 150 adult patients with COPD.

Tools: Semi-structured Demographic Sheet; Subjective Global Assessment (SGA); Manchester COPD Fatigue Scale; COPD Health Related Quality of Life; and Three Days Dietary Record Sheet.

Results: The mean age of the participants in the study and control group was 56.18 ± 7.56 and 54.58 ± 9.77 years respectively. There was a statistically significant improvement in the nutritional status of the participants post intervention. There was a statistically significant improvement in the total mean score of fatigue post intervention 21.04 ± 10.9 compared to 32.56 ± 12.79 pre intervention; P <0.001. There was a statistically significant improvement in quality of life post intervention.

Conclusion: High-fat, low carbohydrates dietary intervention can significantly improve nutritional status, fatigue and quality of life in patients with COPD.

Recommendations: COPD patients' nutritional requirements should be assessed individually considering the patient's clinical state, disease severity and activity levels. Encourage nutritional interventions that are tailored to the individual rather than the traditional one-size-fits-all approach.

Keywords: Dietary Intervention, Nutritional status, Fatigue, Quality of Life.

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a life threatening lung disease characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases [1]. COPD is a major cause of morbidity and mortality. It is a healthcare burden worldwide, affecting around 10% of the adult population aged 40 years and older [2]. According to the World Health Organization, it is projected that COPD will considerably increase due to chronic exposure to risk factors and the changing age constitution of the world population. It is expected to be the third leading cause of death worldwide by 2030 [3].

Malnutrition is common among people with COPD and is associated with poor prognosis [4]. Approximately 10 to 45% of patients with COPD have malnutrition [5]. Malnutrition has a negative effect on the pulmonary function, decreases health-related quality of life (HRQL), and increases the risk of exacerbations, length of hospital stay, and healthcare costs [6, 7, 8, 9]. There is evidence that malnourished subjects have worse scores on a respiratory disease-specific quality of life questionnaire than do adequately nourished individuals [10]. Additionally, patients with COPD at risk of malnutrition have an increased risk of hospitalization, longer hospital stays, multiple readmissions and increased mortality [11, 12]. Also, it was reported that a one-year mortality is four-fold higher in patients with a low BMI (<20kg/m2) when compared to obese patients (BMI >25kg/m2) [13]. Malnourished patients with COPD have

been found to have great hyperinflation, poor lung diffusing capacity and reduced exercise tolerance comparing to non-malnourished COPD patients [14]. Additionally, malnutrition is likely to accelerate respiratory function decline, causing loss of lung tissue and a reduction in the contractility of the respiratory muscles. The causes of the poor nutritional status may be related to tissue hypoxia, increased metabolism with decreased food intake, inflammation and medication [15, 16].

Patients with COPD reported fatigue as second to dyspnoea, the most common and distressing symptom in COPD. Fatigue affects the ability to perform activities of daily living and impacts the patient's quality of life. Patients with COPD experience breathing difficulty due to partially obstructed airflow into and out of the lungs. Patients with COPD require a lot of effort to breath. The increased effort needed to breathe uses even more energy; patients can increase their resting energy expenditure (REE) by up to 10% to 15% [17] which can increase fatigue [18]. Approximately 50% of COPD patients experience mild to severe fatigue [19]. COPD is a non-curable disease, which progressively reduces breathing capacity and impairs patients' ability to carry out activities of daily living, and has a negative effect on patients' quality of life [2]. Thus, nurses need to determine ways in which to measure fatigue and they should be able to design nursing interventions which can help relieve a patient of his fatigue.

There is scientific evidence to confirm the role of nutrition in lung function maintenance, respiratory disease prevention, and the treatment and promotion of optimal respiratory health. One of the goals in treating patients with COPD who suffer from hypoxemia, hypercapnia, and malnutrition is to correct the malnutrition without increasing the respiratory quotient, which is defined as the ratio of carbon dioxide produced to oxygen consumed, and minimize the production of carbon dioxide. It has been proposed that increasing a high fat diet may be more beneficial, as fat produces less metabolic CO2 and has a lower respiratory quotient compared with carbohydrate metabolism [21]. The respiratory quotient (RQ) for carbohydrate is 1, the RQ for fat is 0.7, and for protein it is 0.8 which means that eating carbohydrates will yield the most carbon dioxide, while eating fats will yield the least carbon dioxide. The American Dietetic Association recommendation to maintain the nutritional status of COPD patients is that the daily caloric intake of 1.2 to 1.3 times of resting energy expenditure and protein intake of 1.2 to 1.7 grams per kilogram body weight [22].

Significance of the Study

It was found that improved nutritional status was associated with significant improvements in functional capacity, respiratory muscle strength and quality of life [23]. The majority of nutritional interventions studies in COPD patients have been conducted in high-income countries rather than low and middle income countries. Dietary interventions tailored to meet the specific needs of people with low to moderate economic status will facilitate the implementation and sustainability of behavior changes. Additionally, despite the fact that fatigue is a significant symptom in patients with COPD, it is often ignored in clinical practice [24]. A better understanding of the nature of fatigue in patients with COPD will provide guidance for the development and testing effective interventions for this important yet ignored symptom. Thus, the current study aim was to examine the effect of dietary intervention on the nutritional status, fatigue and quality of life of COPD patients with low to moderate economic status. Findings of the study will enable nurses to implement the most effective dietary intervention to improve the nutritional status, functional capacity, and thus quality of life of this population.

Aim of the study

The aim of the current study was to examine the effect of dietary intervention on the nutritional status, fatigue and quality of life among patients with Chronic Obstructive Pulmonary Disease.

Research Hypotheses

1. Patients with COPD who are receiving the tailored dietary intervention are likely to have improved nutritional status compared with COPD patients who have not received the intervention.
2. Patients with COPD who are receiving the tailored dietary intervention experience decreased fatigue levels compared with COPD patients who have not received the intervention.
3. Patients with COPD who are receiving the tailored dietary intervention experience an improved quality of life compared with COPD patients who have not received the intervention.

Methods

Design: A quasi experimental design was used (Study/Control).

Setting: The study was conducted at the chest department and chest clinic at Menoufia University Hospital at Shebin Al Khoom, Menoufia Governorate, Egypt.

Sample: A convenience sample of 150 adult patients with COPD was selected. Patients who met the study inclusion criteria were recruited to participate in the study. Inclusion criteria included: a) adult patients >19 years old, < 65 years old; b) Stable patients diagnosed with moderate-to-severe COPD (Stage II and III) as defined by the Global Initiative for Chronic Obstructive Lung Disease (COLD) 2006 guidelines; Forced Expiratory Volume (FEV1) / Forced Vital Capacity (FVC) ratio of less than 70% at initial evaluation. Patients were excluded to participate in the study if they have: a) Acute exacerbation within the past 15 days; b) Patients with any medical conditions that could impair level of activity or worsen quality of life such as cardiovascular diseases or arthritic disorders; c) Patients suffering from any chronic illness such as diabetes mellitus, chronic liver disease, tuberculosis, lung cancer or malignancy. These patients might require a therapeutic diet.

Sample Size Calculation: Accepting the Type I error is equal to 0.05% and expecting absolute precision is equal to 5% with a power of (1-β) 80%, a sample size of 150 patients was calculated. This also includes additional subjects, expecting 20% of them to be drop outs during the study period [25].

Tools for Data Collection

Semi-structured Demographic Sheet developed by the researcher to collect data such as age, gender, marital status, educational level, occupation, place of residence and smoking habits.

II) Subjective Global Assessment (SGA) tool developed by Destky *et al* (1987) [26] to assess nutritional status based on the history and physical examination.

SGA is the recommended nutritional screening method by the American Society of Parenteral and Enteral Nutrition (ASPEN) [27]. Collins (2018) [28] suggested that SGA is the only prompt, reliable method to assess nutritional status in COPD. SGA has seven variables representing the patients' recent weight change, dietary intake, gastrointestinal symptoms, loss of subcutaneous fat, and signs of muscle wasting [29, 30]. **(**A seven point scoring system was applied to the seven variables, 7 = normal nutritional status; 1 = severe Protein-Energy Wasting (PEW). The patients were then classified into three categories based on their symptoms: well nourished (A) (score 1-14), suspected or moderate malnutrition (B) (5%–10% weight loss, intake reduction in the previous weeks, and subcutaneous tissue loss) (score 15-35), and severe malnutrition (C) (>10% weight loss, severe loss of muscle mass and subcutaneous tissue, or the presence of edema) (score 36-49). The SGA has been found to be reliable and valid for assessing Protein-Energy Wasting (PEW) [31, 32, 33]. A single SGA assessment has been shown to be associated with morbidity, hospitalization, and mortality in several clinical studies [34, 35, 36]. Another study showed the validity of SGA as a nutritional screening method with a good correlation with anthropometric and biochemical parameters which suggest malnutrition [37].

III) Manchester COPD Fatigue Scale (MCOPDFS) developed by Al-Shair, *et al*., (2009) [38]. MCOPDFS is a self-administered scale that measures total fatigue. The scale consists of 27 items with three dimensions: physical (11 items), cognitive (7 items) and psychosocial (9 items). The scale is a five-point Likert scale rated as Never, Rarely, Sometimes, Usually or Always. This was scored as 0, 0.5, 1, 1.5 or 2. The total score ranged from 0 to 54; the higher the score, the more the fatigue. In the present study, the reliability of MCOPDFS was evaluated by test-retest reliability ($r = 0.97$, $p<0.001$). The intra-class correlation coefficients for the scale and its physical, cognitive and psychosocial dimensions were 0.97, 0.96, 0.91 and 0.95, respectively.

III) COPD Health Related Quality of Life (COPD HRQoL) developed by Ninot *et al*., (2010) [39]. COPD HRQoL is a self-administered questionnaire specifically designed for repeated assessment quality of life of patients with COPD. The questionnaire consists of 11 items covering three components of (4 HRQoL at a higher level includes patient's physical or functional (3 items), psychological items), and social (4 items) of quality of life. Patient responses are rated on a four-point scale from not at all, a little, average, a lot to extremely. The total score ranged from 11 to 55. The lower score means the better quality of life and the higher score means the worse quality of life. The HRQoL provides a valid and reliable measure of COPD-specific HRQoL. The COPD HRQoL showed good internal consistency and good reproducibility ($r = 0.88$). The Chrombach's alphas were 0.80 for the functional component, 0.68 for the psychological component, 0.77 for the social component and 0.89 for the whole scale.

IV) Three Days Dietary Record Sheet developed by Thompson and Byers, (1994) [40] used to record all food and beverages consumed over three consecutive days. The consumed items can be measured using a scale or other household items, such as measuring cups or spoons, or estimated using a portion size guide. The completed records were entered into a software program, Nutrition Data System for Research (NDSR) for analysis.

Pilot Study

A pilot study was conducted on 10% of the total sample (15 patients) to assess the clarity and the applicability of the used tools and to estimate the time needed to fill the questionnaires. The pilot sample was excluded from the final analysis.

Ethical Considerations

An official permission was obtained from the Faculty of Nursing and hospital directors to conduct the study prior to the initiation of data collection. During the initial interview, the purpose of the study and data collection procedure was explained to the participants. A written informed consent was obtained from the subjects who were willing to participate in the study. The participants were informed that participation in the study is voluntary and they can withdraw from the study at any time. The researchers assured all participants that any obtained information would be strictly confidential.

Data Collection Procedure

Patients who met the study inclusion criteria were interviewed individually by the researcher. Data collection process continued for ten months from the beginning of December 2018 to the end of September 2019 using the prepared questionnaire. Both groups were matched against the study inclusion criteria as much as possible in relation to age and sex. Patients were randomly assigned into two equal groups (75 each group). Assigning the subjects to the study and control groups took place by writing the names of the participants on a slip of paper, placed in a container, mixed well, and then drawn out one at a time until assigning the required sample size. The researcher drew the names out of the container. The study group received the tailored dietary intervention. The control group received the routine hospital care.

The Study Group (Intervention): The study group received the tailored dietary intervention including oral instruction supported by a written instruction booklet. The major dietary intervention goal was to correct the malnutrition without increasing the respiratory quotient and minimize the production of carbon dioxide. The dietary intervention was designed according to the American Lung Association Nutrition Guidelines recommendation for COPD (2017). The total kilocalories consisting of 55% fat, 28% carbohydrate and 17% proteins. While designing the dietary intervention, emphasis was placed on improving food and drink choices. This included culturally specific foods to suit the residents of a rural area and sensitivity to the costs of foods to accommodate people with low socioeconomic level. The calculated total kilocalories have been distributed

over a six small meals (Three basic meals and three snacks in between) to avoid dyspnea. Participants in the study group were given a prepared list of a variety of foods to choose from. Participants were given the freedom to create their own meal from the items in the list. Participants were also instructed to record the items they ate in a daily record sheet. For participants who cannot read or write, the researcher scheduled a weekly follow up phone call to ask them about the foods they consumed over the week. The researcher met with the participants once a month to collect the food diary sheets and sent these sheets to a dietitian to analyze and calculate the amount of kilocalories per day for each participant. Also, participants were give a supportive instruction booklet that included information about foods that should be avoided, examples of complex carbohydrates that should be used instead of simple carbohydrates, good sources of protein, the recommended amount of fiber per day, and examples of mono- and poly-unsaturated fats.

The Control Group: Participants in the control group received regular hospital meals and were asked to record their food intake in the 24-hour dietary record sheet. Sheets were analyzed regarding total kilocalories per day and the amount of calories of each food component.

The Initial Session: The first time the researcher met the participants was considered the baseline measure. Participants were interviewed in the chest department and chest clinic to complete the study questionnaires and to collect data. The study questionnaires included a demographic data sheet that included age, gender, marital status, educational level, income and occupation. Data regarding smoking habits, current medical history, family history and co-morbidities were collected. The Subjective Global Assessment (SGA) tool; Manchester COPD Fatigue Scale; COPD Health Related Quality of Life questionnaire, and the 24-Hours Dietary Recall sheet, to collect data about patient's dietary intake and habits, were completed by the participants in both groups. Forced Expiratory Volume in one second (FEV1) and Forced Vital Capacity (FVC) was calculated from the flow volume curve measured by routine spirometry. Anthropometric measurements including height, weight, mid-arm circumference, triceps skin folds, and calf were taken by the researcher. Height was measured to the nearest 0.1 cm barefooted using a wall-mounted stadiometer. Weight was measured to the nearest 0.1 kg using a digital weighing scale. Body mass index (BMI) was calculated as weight divided by height squared (kg/m2). Mid-arm circumference and calf circumference were measured with a single standard measuring tape. Skin fold calipers were used to measure triceps skin folds and the actual skin fold thickness was reported in millimeters. The Final Session: The researcher interviewed the participants again after three months at the end of the intervention and re-administered the study questionnaires to identify the effect of the tailored dietary intervention on the nutritional status, fatigue and quality of life.

Results

Characteristics of the study sample

The mean age of the participants in the study and control group was 56.18 ± 7.56 and 54.58 ±9.77 years respectively. More than half of the study (68.0%) and the control groups (62.7%) were male. Thirty-eight percent of the study group and 48.0% of the contol group were illiterate. More than two thirds of the study group (74.7%) and more than half of the control group (53.3%) were not working. The majority of the participants in both groups were married (study 73.3% and control 76.0% respectively). The majority of the participants in both study and control groups were residents of rural areas (study 76.0% and control 70.7%). Regarding smoking, about half of the study group (49.3%) and 70.7% of the control group were smokers. Thirty-six percent of the participants in the study group and 32% in the control group were classified as underweight according to their calculated BMI. See table (1)

Table 1: Demographic Characteristics and Clinical Data of the Study Sample

	Study Group (n = 75)		Control Group (n = 75)	
	No.	%	No.	%
Age (years)				
Mean ± SD	56.18 ± 7.56		54.58 ±9.77	
Range	39.0 – 75.0		29.0 – 75.0	
Gender				
Male	15	68.0	47	62.7
Female	24	32.0	28	37.3
Education				
Illiterate	29	38.7	36	48.0
Primary	21	28.0	11	14.7
Secondary	20	26.7	21	28.0
University	5	6.7	7	9.3
Occupation				
Working	19	25.3	35	46.7
Not work	56	74.7	40	53.3
Marital status				
Single	3	4.0	6	8.0
Married	55	73.3	57	76.0
Widower	13	17.3	10	13.3
Divorced	4	5.3	2	2.7
Residence				
Urban	18	24.0	22	29.3
Rural	57	76.0	53	70.7
Smoking				
Yes	37	49.3	53	70.7
No	38	50.7	22	29.3

Obesity classification according to BMI				
Underweight	27	36.0	24	32.0
Normal weight	23	30.7	23	30.7
Overweight	17	22.7	17	22.7
Obese class I	4	5.3	6	8.0
Obese class II	4	5.3	5	6.7

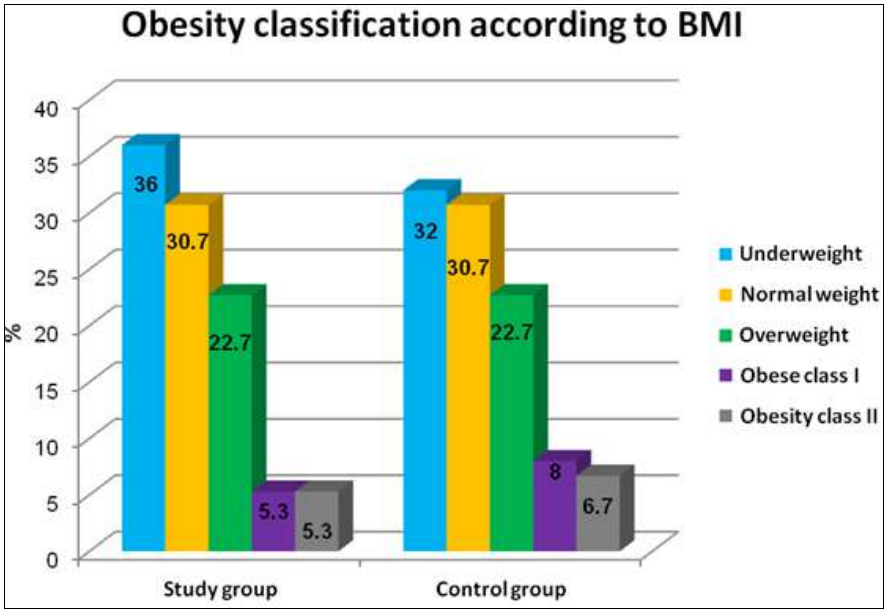

Fig 1: shows that Thirty-six percent of the participants in the study group and 32% in the control group were classified as underweight according to their calculated BMI.

Table 2: Effect of the Dietary Intervention on Nutritional Status Post Intervention

	Study Group (n=75)				Control Group (n=75)				χ^2	p-value	χ^2	p-value
	Pre intervention		Post intervention		Pre intervention		Post intervention					
	No	%	No	%	No	%	No	%				
SGA categories												
*Well nourished	18	24.0	68	90.7	16	21.3	30	40.0	0.15	0.69	42.50	<0.001
*Mild to moderate malnourished	57	76.0	7	9.3	59	78.7	45	60.0		NS		HS
*Severely malnourished	0	0	0	0		0	0	0				
Total Score	13.49 ± 3.45		11.25 ± 3.22		13.26 ± 7.56		15.0 ± 4.30		t=0.67 NS	0.41	t=5.60	<0.001 HS
Paired t	4.39				2.78							
p- value	<0.001 HS				0.007 S							

Table (2) shows that 76% of the participants in the study group were classified as mild to moderately malnourished and 78% of the participants in the control group were classified as mild to moderately malnourished. There was a statistically significant difference between the study and control group post intervention. There was a decline in the number of participants classified as mild to moderate malnourished from 76% pre intervention to 9.3% post intervention. Also, there was an increase in the number of participants classified as well nourished from 24% pre intervention to 90.7% post intervention. This indicates that there was a statistically significant improvement in the nutritional status of the participants post intervention.

Table 3: Effect of the Dietary Intervention on Fatigue Post Intervention

MCOPDFS	Study Group (n=75)		Control Group (n=75)		Test of Significance	p- value	Paired t	p-value
	Pre-intervention Mean ± SD	Post-intervention Mean ± SD	Pre intervention Mean ± SD	Post intervention Mean ± SD				
Physical	12.36 ± 4.44	9.11 ± 4.41	11.30 ± 4.09	13.50 ± 5.23	Mann Whitney =0.56	0.57 NS	Mann Whitney = 4.95	<0.001 HS
Cognitive	7.70 ± 2.64	5.30± 3.14	7.06 ± 3.12	8.83 ± 3.55	Mann Whitney =0.57	0.56 NS	Mann Whitney =6.65	<0.001 HS
Psychosocial	9.24 ± 3.80	6.94 ± 4.21	8.46 ± 3.30	10.26 ± 4.21	Mann Whitney = 0.52	0.59 NS	Mann Whitney = 4.24	<0.001 HS
Total MCOPD FS Score	28.64 ± 10.26	21.04 ± 10.99	26.16 ± 10.24	32.56 ± 12.79	Mann Whitney =0.15	0.87 NS	Mann Whitney = 5.22	<0.001 HS

Table (3) shows that there was a statistically significant improvement in the total mean score of fatigue level post intervention 21.04 ± 10.9 compared to 32.56 ± 12.79 pre intervention; *P*<0.001. This indicates that the dietary intervention was effective in decreasing fatigue level.

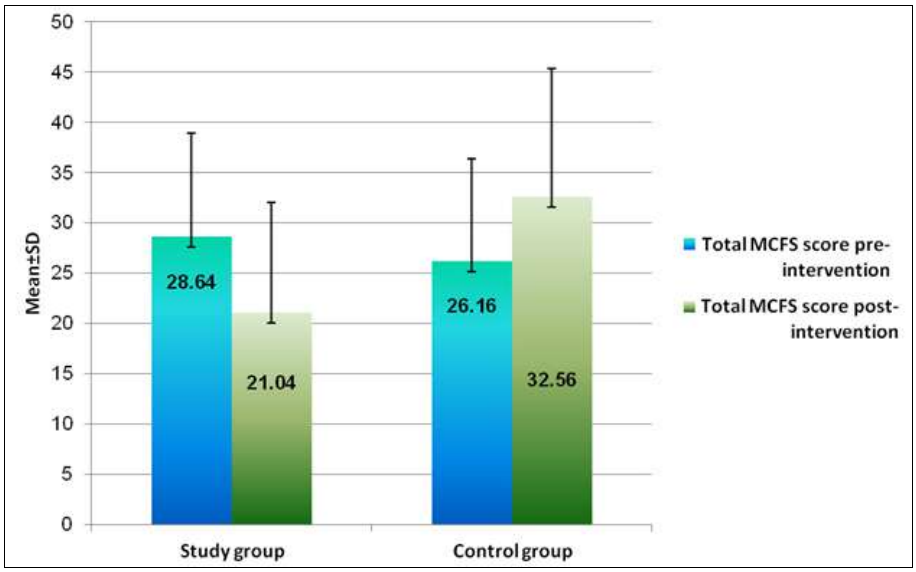

Fig 2: shows that there was a statistically significant decrease in the fatigue level post intervention.

Table 4: Effect of the Dietary Intervention on Quality of Life Post Intervention

COPD health related quality of life	Study Group (n=75)		Control Group (n=75)		Test of Significance	p- value	Paired t	p- value
	Pre intervention Mean ± SD	Post intervention Mean ± SD	Pre intervention Mean ± SD	Post ntervention Mean ± SD				
Functional Score	10.61 ± 2.22	8.94 ± 1.82	10.08 ± 2.07	10.26± 2.63	**t**= 1.51	0.13 NS	**t**= 3.56	0.001 HS
Psychological Score	12.18 ± 2.89	9.84 ± 3.21	11.33 ± 2.88	12.93± 3.31	**t**= 1.80	0.07 NS	**t**= 5.80	<0.001HS
Social Score	9.40 ± 4.18	8.37 ± 4.05	10.44 ± 2.89	11.73± 3.86	Mann Whitney = 2.71	0.007 S	Mann Whitney = 4.75	<0.001 HS
Total COPD HRQoL	32.20 ± 8.08	27.21 ± 8.20	30.30 ± 7.69	34.93± 9.25	**t**= 1.46	0.14 NS	**t**= 5.40	<0.001 HS

Table (4) shows that there was a statistically significant improvement in quality of life post intervention. The total mean score of HRQoL was 27.20% in the study group compared to 34.93% in the control group post intervention Table (5) The Three Days Dietary Record Post Intervention

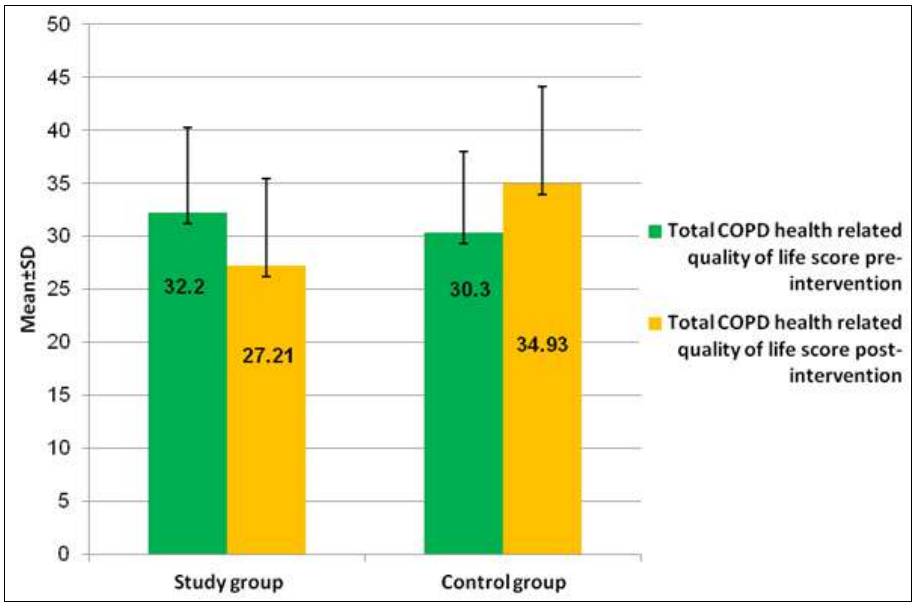

Fig 3: shows that there was a statistically significant improvement in quality of life post intervention.

Table 5: The Three Days Dietary Record Post Intervention

Three Days Dietary Record	Study Group (n=75) Mean ± SD	Control Group (n=75) Mean ± SD		
Pre-intervention	1659.17 ± 420.07	1731.77 ± 426.26	**t**= 1.82	0.06 NS
Post-intervention	1978.35± 493.70	1678.22 ± 518.13	**t**= 6.29	<0.001 HS
Test of sig.	Paired t=10.26	Paired t=2.01		
P Value	<0.001HS	0.04 S		

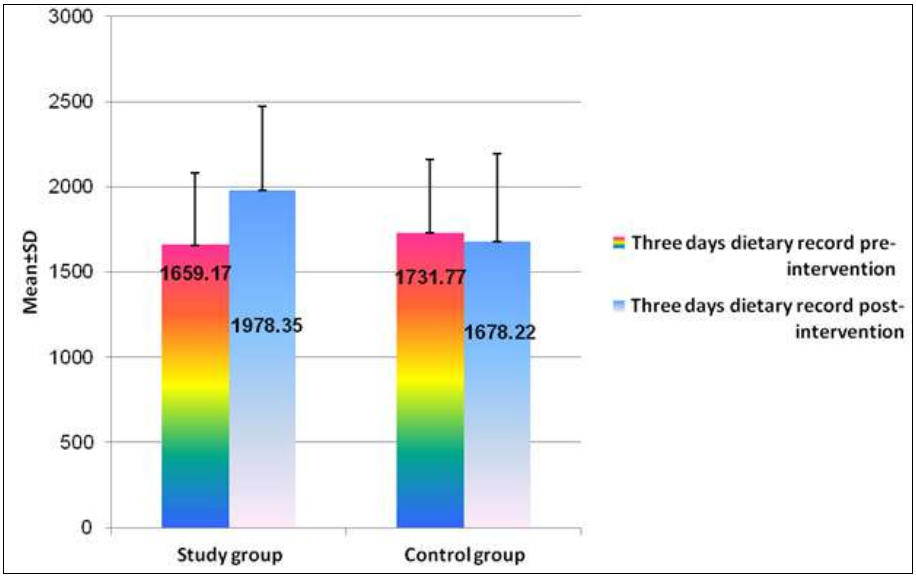

Fig 4: shows that there was a statistically significant increase in the total kilocalories of the participants post intervention

Table 5 shows that the total kilocalories increased in the study group 1978.35 kcl compared to 1678.22 Kcl in the control group post intervention which indicate that the tailored dietary intervention improved dietary intake of the participants.

Discussion

The importance of adequate nutrition in patients with COPD is well-established. According to the European Respiratory Society statement, "a healthy/well-balanced diet is beneficial to all patients with COPD, not only for its potential pulmonary benefits, but also for its proven benefits in terms of metabolic and cardiovascular risk" [4].

Dietary Intervention and Nutritional Status

The scientific community has begun to pay close attention to diet as an integral part of COPD management, from prevention to treatment. Improved nutritional status was found to be associated with significant improvements in functional capacity, respiratory muscle strength and quality of life [23]. The current study hypothesized that patients with COPD who are receiving the tailored dietary intervention are likely to have improved nutritional status compared with COPD patients who have not received the intervention. The findings of the present study supported the hypothesis and found that there was a statistically significant improvement in the nutritional status of the participants in the study group compared to the participants in the control group post intervention. The findings of the study are similar to what was found in a systematic review and meta-analyses of nutritional support that nutritional supplements significantly improved respiratory muscle strength, handgrip strength, weight gain (2 kg or greater), exercise performance, an d quality of life [23]. Also, similar findings have been reported by two randomized controlled trials of non-malnourished COPD patients who found that oral nutritional support resulted in significant increases in body weight and exercise performance [41].

However, the findings of the current study was different from the findings of Gupta, *et al*., (2014) [25] who found that the individualized counseling and the nutrition education teaching support was not successful in promoting nutrient intake and improvement in nutritional status. The differences in the findings can be explained by the fact that the studied sample in Gupta, *et al*., (2014) [25] study were well stabilized and had moderate to severe COPD.

Dietary Intervention and Fatigue

Around 50% of patients with stable moderate to severe COPD, experiences mild to severe fatigue, [42] which is considerably higher compared with patients without COPD [43]. It was suggested that an improvement in fatigue would result in a significant improvement in quality of life [44]. The current study hypothesized that patient with COPD who are receiving the tailored dietary intervention experience decreased fatigue level compared with COPD patients who have not received the intervention. The findings of the present study supported the hypothesis and found that there was a statistically significant improvement in the total mean score of fatigue level post intervention.

To my knowledge, this is the first study to examine the beneficial effects of tailored nutritional intervention on fatigue levels of patients with COPD. Thus, it is difficult to compare the current study's findings with previous similar/different findings.

Dietary Intervention and Quality of Life

Patients with COPD tend to have poor health related quality of life as a result of reduced lung function. Approximately one third of COPD patients suffer from malnutrition [45]. Nutritional interventions might result in significant improvements in functional capacity and quality of life as well as decreasing morbidity and mortality for COPD patients [46, 47]. The current study hypothesized that patients with COPD who are receiving the tailored dietary intervention experience improved quality of life compared with COPD patients who have not received the intervention. The findings of the present study supported the hypothesis and found that there was a statistically significant improvement in quality of life post intervention. These findings are similar to what was reported by Khan, *et al*., (2016) [48] who found that nutritional intervention was successful in increasing weight, exercise capacity and health related quality of life of 60 stable COPD patients. In contrast, different findings were reported by Otte *et al*. (1989) [49] who did not recognize any changes in well-being after nutritional intervention. A possible explanation of the differences in the findings may be due to the small sample size of Khan, *et al*., (2016) study.

Limitations of the Study

The duration of intervention was too short (only three months). There is evidence that the impact of any nutrition or health education intervention may require a longer period to manifest itself.

The current study selection is based on convenience sampling. This may cause selection bias.

Findings of the study must be limited to the single setting under investigation and to the specific population studied, or to another similar population meeting all of the inclusion criteria in the study.

Conclusion

The current study findings demonstrate that a high fat, low carbohydrate dietary intervention can significantly improve nutritional status, fatigue and quality of life in patients with COPD as compared with the traditional high- carbohydrates, low- fat diet.

Recommendations

COPD patients' nutritional requirements should be assessed individually considering the patient's clinical state and disease severity and activity levels.

Encourage nutritional interventions that are tailored to the individual rather than the traditional one-size-fits-all approach.

Implications for Nursing Practice

Nutritional interventions should be directed towards improving the quality of life through strategies of self care and education. There is a need for effective strategies to support the patients through nutrition counseling activities.

Increase nurses' awareness about the importance of designing a tailored nutritional intervention to improve nutritional status, fatigue and quality of life among patients with COPD.

Implications for Future Research

Extend the study period more than three months. Extending the follow-up period will provide more comprehensive information about the beneficial effects of nutritional intervention over a long period of time among patients with COPD.

Replication of the study is recommended using a larger more random sample to achieve appropriate representation of the population; and conducting the study on a larger scale to include multiple settings.

References

1. Vestbo J, Hurd SS, Agusti AG, Jones PW, Vogelmeier C, Anzueto A. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: Gold executive summary. Am J Respir Crit Care Med. 2013; 187:347-365.
2. Adeloye D, Chua S, Lee C, Basquill C, Papana A, Theodoratou E *et al*. Global and regional estimates of COPD prevalence: Systematic review and meta-analysis. J Glob. Health. 2015; 5:020415.
   Burden of COPD https://www.who.int/respiratory/copd/burden/en
3. Schols AM, Ferreira IM, Franssen FM *et al*. Nutritional assessment and therapy in COPD: a European Respiratory Society statement. Eur Respir J. 2014; 44(6):1504-1520.
4. Schols AM. "Nutrition as a metabolic modulator in COPD". Chest. 2013; 144(4):1340-1345.
5. Postma DS, Bush A, van den Berge M. Risk factors and early origins of chronic obstructive pulmonary disease. Lancet. 2015; 385:899-909.
6. Berthon BS, Wood LG. Nutrition and respiratory health—Feature review. Nutrients. 2015; 7:1618-1643.
7. Zheng PF, Shu L, Si CJ, Zhang XY, Yu XL, Gao W. Dietary Patterns and Chronic Obstructive Pulmonary Disease: A Meta-analysis. COPD. 2016; 13:515-522.
8. Vasankari T, Harkanen T, Kainu A, Saaksjarvi K, Mattila T, Jousilahti P. Predictors of New Airway Obstruction—An 11 Year's Population-Based Follow-Up Study. COPD. 2019; 16:45-50.
9. Goris AHC, Schols AMWJ, Weling-Sheeoers CAP *et al*. Tissue depletion in relation to physical function and quality of life in patients with severe COPD. Am J Respir Crit Care Med. 1997; 155:A498.
10. Steer J, Norman E, Gibson GJ *et al*. Comparison of indices of nutritional status in prediction of in-hospital mortality and early readmission of patients with acute exacerbations of COPD. Thorax. 2010; 65:A127.
11. Weekes CE, Emery PW, Elia M. A nutrition screening tool based on the BAPEN four questions reliably predicts hospitalisation and mortality in respiratory outpatients. Proc Nutr Soc. 2007; 66: 9A.
12. Collins PF, Stratton RJ, Kurukulaaratchy R, Warwick H, Cawood AL, Elia M. 'MUST' predicts 1-year survival in outpatients with chronic obstructive pulmonary disease. Clin Nutr Suppl. 2010; 5(2):17.
13. Ezzell L, Jensen GL. Malnutrition in chronic obstructive pulmonary disease. Am J Clin Nutr. 2000; 72:1415-6.
14. Langen RCJ, Gosker HR, Remels AHV, Schols AMWJ. Triggers and mechanisms of skeletal muscle wasting in chronic obstructive pulmonary disease. Int. J Biochem Cell Biol. 2013; 45(10):2245-2256.

15. Remels AHV, Gosker HR, Langen RC, Schols AMWJ. The mechanisms of cachexia underlying muscle dysfunction in COPD. J Appl Physiol; 2012; 114(9):1253-1262.
16. The Merck Manuals Online Medical Library. Chronic obstructive pulmonary disease. Available at: http://www.merck.com/mmpe/sec05/ch049/ch049a.html
17. Stridsman C, Skär L, Hedman L *et al*. Fatigue affects health status and predicts mortality among subjects with COPD: report from the population-based OLIN COPD study. COPD. 2015; 12:199-206.
18. Peters JB, Heijdra YF, Daudey L *et al*. Course of normal and abnormal fatigue in patients with chronic obstructive pulmonary disease, and its relationship with domains of health status. Patient Educ Couns. 2011; 85:281-5.
19. Jones PW, Prince M, Wijkstra PJ, Patel V, Saxena S, Maj M *et al*. Quality of life in patients with chronic obstructive pulmonary disease. Eur Respir Mon. 2006; 38:375-86.
20. Cai B, Zhu Y, Ma Y, Xu Z, Zao Y, Wang J *et al*. Effect of supplementing a high-fat, low-carbohydrate enteral formula in COPD patients. Nutrition. 2003; 19:229-32.
21. American Dietetic Association, Chicago Dietetic Association, South Suburban Dietetic Association (Ill.), Dietitians of Canada, Dietitians of Canada. In: Manual of Clinical Dietetics, (6th edn), American Dietetic Association, Chicago, USA, 2000.
22. Collins PF, Elia M, Stratton RJ. Nutritional support and functional capacity in chronic obstructive pulmonary disease: a systematic review and meta-analysis. Respirology. 2013; 18:616-29.
23. Kouijzer M, Brusse-Keizer M, Bode C. COPD-related fatigue: impact on daily life and treatment opportunities from the patient's perspective. Respir Med. 2018; 141:47-51.
24. Gupta B, Kant S, Mishra R. Effect of nutrition education intervention on symptomatic markers of Indian patients with chronic obstructive pulmonary disease. Journal of Nutritional Health & Food Engineering. 2014; 1(3):105-114.
25. Detsky AS, McLaughlin JR, Baker JP *et al*. What is subjective global assessment of nutritional status? JPEN J Parenter Enteral Nutr. 1987; 11:8-13.
26. ASPEN Board of Directors, the Clinical Guidelines Task force. Guidelines for the use of parenteral and enteral nutrition in adult and pediatric patients. JPEN. 2002; 26:1SA-38SA.
27. Collins PF. Nutrition support in pulmonary and cardiac disease. In: Hickson M, Smith S (eds) Advanced Nutrition and Dietetics in Nutritional Support, 2018, 270-277.
28. McCusker FX, Teehan BP, Thorpe KE, Keshaviah PR, Churchill DN. How much peritoneal dialysis is required for the maintenance of a good nutritional state? Canada-USA (CANUSA) Peritoneal Dialysis Study Group. Kidney Int. Suppl. 1996; 56:S56-61.
29. Visser R, Dekker FW, Boeschoten EW, Stevens P, Krediet RT. (1999). Reliability of the 7-point subjective global assessment scale in assessing nutritional status of dialysis patients. Adv Perit Dial; 15:222–5.
30. Enia G, Sicuso C, Alati G, Zoccali C. Subjective global assessment of nutrition in dialysis patients. Nephrol Dial Transplant. 1993; 8:1094-8.
31. Jones CH, Wolfenden RC, Wells LM. Is subjective global assessment a reliable measure of nutritional status in hemodialysis? J Ren Nutr. 2004; 14:26-30.
32. Steiber A, Leon JB, Secker D *et al*. Multicenter study of the validity and reliability of subjective global assessment in the hemodialysis population. J Ren Nutr. 2007; 1(7):336-42.
33. Pifer TB, McCullough KP, Port FK *et al*. Mortality risk in hemodialysis patients and changes in nutritional indicators: DOPPS. Kidney Int. 2002; 62:2238-45.
34. Kalantar-Zadeh K, Kopple JD, Block G, Humphreys MH. Association among SF36 quality of life measures and nutrition, hospitalization, and mortality in hemodialysis. J Am Soc Nephrol. 2001; 12:2797-806.
35. Stenvinkel P, Barany P, Chung SH, Lindholm B, Heimburger O. A comparative analysis of nutritional parameters as predictors of outcome in male and female ESRD patients. Nephrol Dial Transplant. 2002; 17:1266-74.
36. Moriana M, Civera M, Artero A, Real J, Caro J, Ascaso J. Validity of subjective global assessment as a screening method for hospital malnutrition: Prevalence of malnutrition in a tertiary hospital. Endocrinology Nutrition. 2014; 61:184-189.
37. Al-Shair K, Kolsum U, Berry P, Smith J, Caress A, Singh D *et al*., Development, dimensions, reliability and validity of the novel Manchester COPD fatigue scale. Thorax. 2009; 64(11):950-955.
38. Ninot G, Delignières D, Fortes M. L'évaluation de l'estime de soi dans domaine corporel: 35–48. Revue STAPS. 2010; 53:35-48.
39. Thompson F, Byers T. Dietary assessment resource manual. J Nutr. 1994; 124(11):2245S-2317S.
40. Steiner MC, Barton RL, Singh SJ *et al*. Nutritional enhancement of exercise performance in chronic obstructive pulmonary disease: a randomized controlled trial. Thorax. 2003; 58:745-51.
41. Peters JB, Heijdra YF, Daudey L *et al*. Course of normal and abnormal fatigue in patients with chronic obstructive pulmonary disease, and its relationship with domains of health status. Patient Educ Couns. 2011; 85:281-5.
42. Baghai-Ravary R, Quint JK, Goldring JJ *et al*. Determinants and impact of fatigue in patients with chronic obstructive pulmonary disease. Respir Med. 2009; 103:216-23.
43. Al-shair K, Kolsum U, Singh D, Vestbo J. The Effect of Fatigue and Fatigue Intensity on Exercise Tolerance in Moderate COPD. Lung. 2016; 194:889-895.
44. Mallampalli A. Nutritional management of the patient with chronic obstructive pulmonary disease. Nutr Clin Pract. 2004; 19:550-56.
45. Rawal G, Yadav S. Nutrition in chronic obstructive pulmonary disease: a review. J Transl Int. Med. 2015; 3(4):151-154.
46. Collins PF, Stratton RJ, Elia M. Nutritional support in chronic obstructive pulmonary disease: a systematic review and meta-analysis. Am J Clin Nutr. 2012; 95(6):1385-1395.

47. Khan NA, Kumar N, Daga MK. Effect of Dietary Supplementation on Body Composition, Pulmonary Function and Health-Related Quality of Life in Patients with Stable COPD, Journal of Respiratory Disease, Thoracic Surgery, Intensive care and Tuberculosis. 2016; 15(4):225-235.
48. Otte KE, Ahlburg P, D'Amore F, Stellfeld M. Nutritional repletion in malnourished patients with emphysema. JPEN J Parenter Enteral Nutr. 1989; 13(2):152-6.