Original Article

Malnutrition Assessment of Chronic Obstructive Pulmonary Disease Patients

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ABSTRACT

Objectives: To assess the prevalence and severity of malnutrition among COPD patients along with the effect of dietary intervention on the disease outcome.
Study Design: This was an interventional, Quasi- experimental study.
Place and duration of Study: The study was conducted at Department of Medicine and Department of Chest Diseases, Jinnah Hospital, Lahore. Total duration was one year from April 2009 to March 2010.
Materials and Methods:
Sample Size: 100 patients with COPD were investigated.
Sampling: Purposive Non-probability sampling.
Results: Majority of the patients were in the age range 50 – 70 years with more males than females. 97% patients had a positive tobacco smoking history. 57 - 78% of the patients included in the study were found to be malnourished, out of which 65 - 68% were moderately malnourished and 10% were severely malnourished according to SGA rating and BMI. There was a strong correlation between COPD staging and malnourishment. 54% patients with stage III COPD were malnourished while 90% patients with stage IV were found to be malnourished.
Conclusion: Malnutrition is invariably observed in COPD patients and is more frequent and more severe in patients with advanced stage disease. Patients with COPD might benefit from a dietary intervention both in terms of pulmonary functions and nutritional state, which might have beneficial effects on prognosis.

Key Words: Malnutrition, Nutritional assessment, COPD, Dietary intervention.

INTRODUCTION

Malnutrition exists everywhere in the world both in the community and in the hospitalized patients[1]. Malnutrition can be chronic or acute. The chronic form may occur in patients with chronic illnesses due to low protein intake, poor food choices or protein depletion. The acute form may occur as a result of reduced or absence of food intake due to disease, drug therapy and depression or from increased energy expenditure in hyper metabolic states[2]. The most commonly applied clinical definition of malnutrition is an unintentional weight loss of at least 10% in three to six months[3,4] The incidence of malnutrition in patients with chronic illnesses is because of many reasons. These could be the disease condition itself, the stress of the disease, the stress of the physical/clinical investigations and the fear of facing the doctors and paramedics. Higher the degree of malnutrition the longer would be the stay in hospital.
The Chronic obstructive pulmonary disease (COPD) refers to a group of conditions that cause shortness of breath and are associated with obstruction of airflow within the lung. COPD includes emphysema and chronic bronchitis. COPD is the fourth leading cause of death in United States. COPD prevalence has increased dramatically in the past few decades and is one of the major causes of bed-confining disability. Most of the time COPD is secondary to tobacco abuse. Men are more likely to have COPD than women and it occurs predominantly in individuals over 40 years of age. Malnutrition occurs in 50 to 60 % of the patients with COPD. Nutritional status disorder causes a serious problem which concerns about $1/8^{th}$ of COPD population[5]. It has been established that severity of dyspnea in COPD patient is significantly greater in the underweight compared with the normal weight. Changes in the nutritional status such as weight loss and malnutrition are very common complications in patients with COPD. Malnutrition in these patients is due to multiple factors including increase in resting energy expenditure, decreased food intake, the effects of certain drugs, and, perhaps most importantly, a high systemic inflammatory response[6]. Progressive weight loss of greater than 5% change in one month or greater than 20% change in one year is considered severe and can lead to malnutrition. Major causes of malnutrition in COPD patients are; poor dietary intake, increased energy expenditure, frequent recurrent infections,

cigarette smoking and poor knowledge of nutrition together with bad living and eating habits. Nutritional manifestations of COPD, notably weight loss and obesity, have been recognized. Now linked to increase in knowledge regarding systemic inflammation, it is becoming clear that poor nutritional status is not only a manifestation of COPD but also a predictor of mortality and health care utilization[7].

In industrialized countries, 25% to 60% of COPD patients have a body weight lower than 90% of their ideal bodyweight or have lost 5 to 10% of their initial body weight. This weight loss is indicative of poor prognosis. The combined results of the two survival analyses provide evidence to support the hypothesis that body weight has an independent effect on survival in COPD. Reduced force expiratory volume in one second (FEV_1) is the best indicator of airway obstruction and is a major predictive factor of survival in COPD[8].

Nutrition assessment is best achieved with a tool that relies on the sum of a variety of evaluations that are easy-to-use, cost-effective, contain an action plan and could be validated[9]. A number of nutrition screening and assessment tools have evolved over the years but traditionally there are two methods available. The first is biochemical and anthropometric data, including measurement of body mass index (BMI), skin fold-thickness, measurement of creatinine/height index, serum albumin, transferin and pre-albumin and the total lymphocyte count in blood. These methods are not particularly sensitive or specific, their normal range is wide and they are influenced by the nature, length and seriousness of the various diseases.

This assessment is based on clinical observation, weight change and clinical examination (edema, dehydration, loss of subcutaneous fat and muscle depletion)[3,9].

MATERIALS AND METHODS

This interventional, quasi-experimental study was carried out from April 2009 to March 2010 in Department of Medicine and Chest Diseases, Jinnah Hospital, Lahore. A total of 100 subjects were included in the study.

RESULTS

During the study period a total of 120 COPD patients were enrolled but 20 patients did not turn up for follow up, hence data was restricted to evaluation of 100 patients. The baseline characteristics of the study population are summarized in table-1.

Correlation between COPD stage and ad BMI is shown in table-2. Characteristics of patients sin group-A and B are shown in table-3.

Comparison of controls and cases before dietary intervention is summarized in tbale-4.

Mean of controls and cases before dietary intervention is given in table-5.

Table-6 shows comparison of COPD stage between controls (without dietary intervention) and cases (after dietary intervention).

Table-7 shows comparison of means between controls (without dietary intervention) and cases (after dietary intervention.

Comparison of COPD stage between cases before and after dietary intervention is given in table-8.

Table-9 depicts the comparison of means between cases before and after dietary intervention.

Table # 1: Baseline characteristics for each variable in 100 patients

Variables		Frequency (n)	Cumulative Percent (%)
Age (yrs)	30-50	31	31.0
	51-70	64	95.0
	71-90	5	100.0
Sex	Male	94	94.0
	Female	6	100.0
Smoking History	+ve	97	97.0
	-ve	3	100.0
COPD	Stage I	5	5.0
	Stage II	30	35.0
	Stage III	44	79.0
	Stage IV	21	100.0
SGA Rating	Well nourished	25	25.0
	Moderately malnourished	65	90.0
	Severely malnourished	10	100.0
BMI	>20	22	22.0
	18.5-20	68	90.0
	<18.5	10	100.0
MUAC (cm)	≤21	63	63.0
TSFT (mm)	≤11	63	63.0
Hb (gm/dl)	≤13.5	61	61.0
TLC (cell/µl)	≤1.5	25	25.0
Serum Albumin (mg/dl)	≤3.5	26	26.0

Table # 2: Correlation between copd stage and bmi

			Body Mass Index			Total
			>20	18.5-20	<18.5	
COPD	Stage I	Count	1	4	0	5
		% Within Body Mass Index	4.5%	5.9%	.0%	5.0%
	Stage II	Count	15	15	0	30
		% Within Body Mass Index	68.2%	22.1%	.0%	30.0%
	Stage III	Count	6	37	1	44
		% Within Body Mass Index	27.3%	54.4%	10.0%	44.0%
	Stage IV	Count	0	12	9	21
		% Within Body Mass Index	.0%	17.6%	90.0%	21.0%
Total			22	68	10	100

Table # 3: Characteristics of Patients in Group A and Group B

Variables		**Group A**	**Group B**
		n (%)	**n (%)**
COPD	Stage I	5 (10%)	-
	Stage II	30 (60%)	-
	Stage III	11 (22%)	33 (66%)
	Stage IV	4 (8%)	17 (34%)
SGA Rating	Well nourished	19 (38%)	6 (12%)
	Moderately malnourished	30 (60%)	35 (70%)
	Severely malnourished	1 (2%)	9 (18%)
BMI	>20	17 (34%)	5 (10%)
	18.5-20	32 (64%)	36 (72%)
	<18.5	1 (2%)	9 (18%)
MUAC (cm)	≤21	26 (52%)	37(74%)
TSFT(mm)	≤11	24 (48%)	39 (78%)
Hb (gm/dl)	≤13.5	25 (50%)	36 (72%)
TLC(cells/µl)	≤1.5	10 (20%)	15 (30%)
Serum Albumin (mg/dl)	≤3.5	9 (18%)	17 (34%)

Table #4: Comparison of Controls and Cases Before Dietary Intervention

Variables		Controls (A_1& B_1)	Cases (A_2 &B_2)
		n (%)	n (%)
COPD	*Stage I*	4 (8%)	1 (2%)
	Stage II	16(32%)	14 (28%)
	Stage III	21 (42%)	23 (46%)
	Stage IV	9 (18%)	12 (24%)
SGA rating	Well nourished	12 (24%)	13 (26%)
	Moderately malnourished	34 (68%)	31 (62%)
	Severely malnourished	4 (8%)	6 (12%)
BMI	>20	9(18%)	13 (26%)
	18.5-20	37 (74%)	31 (62%)
	<18.5	4 (8%)	6 (12%)

Table # 5: Mean of Controls and Cases Before Dietary Intervention

	Controls (A_1& B_1)	Cases (A_2 & B_2)
	Mean ± SD	Mean ± SD
MUAC	21.01 ± 3.78	21.05 ± 3.89
TSFT	12.11 ± 4	11.89 ± 3.25
Hb level	12.5 ± 1.9	12.7 ± 1.96
TLC	3.74 ± 0.51	3.67 ± 0.48
S. Albumin	2.43 ± 0.97	2.5 ± 1

Table # 6: Comparison of Copd Stage Between Controls (Without Dietary Intervention) & Cases (After Dietary Intervention)

COPD	Controls (A_1& B_1)	Cases (A_2 & B_2)
	n (%)	n (%)
Stage I	4 (8%)	2 (4%)
Stage II	16 (32%)	14 (28%)
Stage III	21 (42%)	23 (46%)
Stage IV	9 (18%)	11 (22%)
Total	50 (100%)	50 (100%)

Pearson Chi-Square p value 0.405

Table # 7: Comparison Of Means Between Controls (Without Dietary Intervention) And Cases (After Dietary Intervention)

	Controls (A_1 & B_1)	Cases (A_2 & B_2)	p value
	Mean ± SD	Mean ± SD	
MUAC	21.12 ± 3.81	21.43 ± 3.88	0.644
TSFT	12.13 ± 3.99	12.3 ± 3.30	0.806
Hb level	12.6 ± 1.93	12.75 ± 1.84	0.286
TLC	2.48 ± 0.99	2.49 ± 0.97	0.583
S. Albumin	3.7 ± 0.99	3.73 ± 0.44	0.241

DISCUSSION

In our study we found that the prevalence of malnutrition was significantly higher in the COPD patients coming to our healthy facility, 65-68% patients had moderate malnourishment according to SGA rating and BMI respectively, while 10% had severe

Table # 8: Comparison of Copd Stage Between Cases Before and After Dietary Intervention

COPD	Cases before Dietary Intervention	Cases after Dietary Intervention
	n (%)	n (%)
Stage I	1 (2%)	2 (4%)
Stage II	14 (28%)	14 (28%)
Stage III	23 (46%)	23 (46%)
Stage IV	12 (24%)	11 (22%)
Total	50 (100%)	50 (100%)

Pearson Chi-Square p value 0.000

Table # 9: Comparison of Means Between Cases Before and After Dietary Intervention

	Before Dietary Intervention	After Dietary Intervention	p value
	Mean ± SD	Mean ± SD	
MUAC	21.05 ± 3.89	21.43 ± 3.88	0.029
TSFT	11.89 ± 3.25	12.3 ± 3.3	0.022
Hb level	12.7 ± 1.97	12.94 ± 1.76	0.073
TLC	2.52 ± 1.00	2.65 ± 0.93	0.030
S.Albumin	3.67 ± 0.48	3.7 ± 0.42	0.182

Malnourishment. The decrease in TSFT, MUCA, BMI and results of SGA questionnaire indicate a depletion of both subscutaneous fat stores and lean body mass, which fulfill criteria of marasmic protein caloric malnutrition. In present study, malnutrition predominantly affected body fat stores; TSFT was below the cut off value in 63% of our patients. Similar findings have been reported in studies conducted in stable COPD patients in whom MUAC was found to be moderately decreased in about 42% of the patients [11,12].

In this present study the malnourished patients showed more severe bronchial obstruction than their well nourished counter parts. 54% of moderately malnourished patients had stage III. COPD and 90% of severely malnourished patients had stage I (FEV1 - 30%) disease. Similar results have been reported in various other studies. There is a positive correlation between body weight and FEV_1[12,13].

Comparison between control group (A1 and B1) without any dietary intervention and cases (A2 and B2) with dietary intervention after 3 months follow up revealed no significant improvement in nutritional parameters. Since the two comparative groups were not well matched for age, sex and other baseline characteristics, the insignificance of results was encountered. Despite limitation in the use of body weight as a measure of nutritional status, it presents the only measure of nutritional status, it has been clearly associated with n adverse outcome[14].

A systemic review of randomized controlled trials of routine protein adults based on anthropometric idices. Other nutritional intervention studies carried out in malnourished patients with COPD showed weight gain but insignificant improvements in respiratory muscle function. FEV_1 did not respond to nutritional therapy but FVC increased significantly in the supplemented group and a strong trend for improved general well being was observed[15].

Screening tools, such as body composition measurements and the SGA questionnaire, are valuable for determining which patients need further nutrition evaluation. The benefit of body composition measurement is that it is a rapid and cost effective method for determining which patients at nutritional risks[16].

CONCLUSION

Malnutrition is invariably observed in COPD patients and is more frequent and more severe in patients with advanced stage disease. Patients with COPD might benefit from a dietary intervention both in terms of pulmonary function and nutritional state which might have beneficial effects on prognosis.

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