Original Research Article

Assessment of Nutritional Status in Patients with COPD And Its Correlation With Severity of Disease

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Abstract

Background: Patients with COPD are at chronically high risk of nutritional deficiency. Identifying chronic obstructive pulmonary disease (COPD) patients with malnutrition is important to prevent associated mortality due to poor pulmonary function. The present study was carried out with an aim to evaluate the nutritional status of patients with COPD and correlate it with COPD severity. **Methodology:** This was a prospective observational study conducted on fifty three patients admitted with the diagnosis of COPD at a tertiary care hospital in central India from November 2019 to May 2021.Severity of COPD was assessed using spirometry tests GOLD 2019 criteria.Anthropometric measurements and biochemical tests were also conducted in all subjects. Association between MNA scores (Nourished, At risk, Malnourished) and BMI was tested for statistical significance. **Results**: A positive correlation between nutritional status (MNA score) and severity of COPD was seen ($R^2 = 0.622$; $p = 0.01$). Majority of the COPD patients were either malnourished (47.2 %) or at risk of malnutrition (41.5 %). Mean BMI was significantly lower in malnourished cases (16.4±0.73) as compared to at risk and nourished cases (18.33±1.3&18.1±1.3$p<0.05$). Mean length of hospital stay was least in nourished patients (6.8 ±3.5days) and maximum in malnourished patients (17.3 ±7.0 days) p=0.001.**Conclusion:** Majority of the COPD patients were malnourished or at risk of malnutrition. Malnourished patients had more severe disease than "at risk" and nourished COPD patients. Malnourished patients had longer length of hospital stay and higher readmission rate compared "at risk" and "nourished'' patients.

Keywords: COPD, MNA score, BMI, MUAC, WAC, LOHS, Number of hospital Readmissions.

Introduction

Patients with COPD are at chronically high risk of nutritional deficiency [1,2]. Malnutrition associated with advanced lung disease, known as the 'pulmonary cachexia syndrome [3] has been shown to enhance dyspnoea severity; reduce exercise tolerance, skeletal muscle strength and endurance; and significantly affect quality of life. Malnutrition leads to increase exacerbations[9]. Nutritional deficiency is observed in 15% cases of ambulatory COPD patients and 35 to 60% in COPD hospitalized patients[10]. Optimal nutritional status should help to improve the COP general condition, respiratory muscle function and overall sense of well-being necessary to delay the devastating negative consequences that characterize a 'wasting disease'[4].

No such studies in central India on the use of MNA score in COPD patients have been published to date. The present study was undertaken to assess the nutritional status of COPD patients using MNA score and to correlate this with disease severity.

Material and methods

Study design

This was a prospective observational study.

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This study was conducted over a period of 18 months between November 2019 to May 2021 at tertiary care hospital in central India. Clearance was obtained from Institutional Ethical committee. A total of fifty three COPD patients aged 40 years and above, presenting to the Pulmonary Medicine department, and fulfilling the COPD diagnostic criteria according to GOLD 2019 criteriaguideline 2019[1] were evaluated.

Inclusion criteria

COPD patients aged 40 –70 years were included. Cases was diagnosed clinically, radiologically and through spirometry. Severity were of COPD was assessed using the GOLD 2019 criteria.

Exclusion criteria

Patients with any other co-morbid condition that could affect nutritional status i.e thyroid problems, diabetes mellitus, cancer, congestive heart failure, bronchial asthma, bronchiectasis, ,interstitial lung disease,CVA and those requiring surgery etc were excluded from the study .

After general, respiratory examination and chest x ray spirometry was performed shortly after admission. Patients were encouraged to undergo spirometry according to accepted standards[13]. but this was not always possible given their acute illness. Forced expiratory volume in 1 s (FEV1)% predicted was noted . Minimal Nutritional Assessement questionnaire MNA score developed by Nestle Nutrition Institute, Switzerland[5] . used for applying MNA was that systematized by Beck Am et al[11]. On the basis of the MNA findings, patients were categorized as nourished (MNA score 24-40), At risk of malnutrition (MNA score 17-23.5) and malnourished (MNA score <17).Anthropometric parameters height, weight, body

mass index (BMI), mid-upper arm circumference (MUAC) and waist circumference (WAC) were recorded in all patients. A standard protocol for anthropometric measurement as given by the US National Centre for Health Statistics was followed[14]. Biochemical assessments was in all patients. Total protein and serum albumin test were performed at the Central Laboratory of the People's Hospital.

Statistical analysis

Data was compiled using MS Excel and analysed using IBM SPSS software version 20. Categorical data was expressed as frequency and proportions whereas numerical data was expressed as mean and SD. Severity of COPD was assessed in relation to nutritional status using chi square test. One way ANOVA was used to determine whether various degrees of nutritional status correlates with severity of COPD as data was normally distributed. Chi square test was used to compare length of hospital stay and number of readmissions in COPD patients with various degrees of malnutrition. P value less than 0.05 was considered statistically significant.

Results

From November 2019 to May 2021 fifty three patients of COPD were evaluated.

Table 1:Baseline characteristics of Patients

Baseline variables		Frequency (n=53)	Percentage
Age (years)	≤ 50	10	18.9
	51 – 60	14	26.4
	61 – 70	18	34
	≥ 70	11	20.8
	Mean	61.74 ± 10.94	
Gender	Male	48	90.6
	Female	5	9.4
Smoker	No	11	20.8
	Yes	42	79.2
Clinical features	Shortness of breath	50	94.3
	Chest pain	32	60.4
	Sputum	30	56.6
Anthropometry	Height (cm)	169±9.9	
	Weight (kg)	50.1±5.9	
	BMI(kg/m^2)	17.4±1.4	
	Mid arm circumference (cm)	8.8±3.8	
	Waist circumference (inches)	30.06±1.96	
Investigations	Protein (mg/dl)	5.92±0.83	
	Albumin (mg/dl)	2.81±0.68	
	FEV1% Predicted	53.87±13.3	
SPO2	Room air (%)	88.06±2.6	

Table 1: shows characteristic COPD patients. Fifty three COPD patients were evaluated between November 2019 to May 2021 with mean age of patients was 61.74 ± 10.94 years. Majority of the patients were between 61 to 70 years of age (54.8%). 90.6% of the COPD patients were males . More than three quarters had history of smoking. Majority of the COPD patients had shortness of breath was the commonest symptom followed by (94.3%), chest pain (60.4%) and sputum production (56.6%). Mean BMI was 17.4±1.4kg/m^2. Mean Mid arm circumference and Waist Circumference were 18.81±3.78 cm and 30.06±1.95 inches respectively. Mean FEV1% Predicted was 53.87±13.28. Mean SpO_2 on room air was 88.09±2.58 %.

Table 2: Association between nutritional status (MNA score) and severity of COPD

MNA score	Severity of COPD			
	Mild GOLD1	Moderate GOLD 2	Severe GOLD 3	Very severe GOLD 4
24 – 40 (Nourished)	2 (33.3)	4 (66.7)	0 (0)	0 (0)
17 – 23.5 (at Risk)	0 (0)	21 (95.5)	1 (4.5)	0 (0)
< 17 (Malnourished)	0 (0)	2 (8)	17 (68)	6 (24)
P value	0.01			

Table-2 Shows association between nutritional (MNA score) status and severity of COPD **.** With worsening MNA score COPD severity increased

Table 3: Association between nutritional status (MNA score) and Anthropometric variables

Anthropometric variables		MNA score			P value
		24 – 40 (n = 6) Nourished	17 – 23.5 (n=22) At risk	< 17 (n = 25) Malnourished	
Height (cm)	Mean	160.5±9.25	166.3±10.7	163.4±6.9	0.45
	95% CI	150.8-170.2	161.6-171.1	160.5-176.3	
Weight (kg)	Mean	47.3±7.3	51±7.5	50.04±3.8	0.420
	95% CI	39.7-54.9	47.7-54.3	48.5-51.6	
BMI (kg/m^2)	Mean	18.1±1.3	18.33±1.3	16.4±0.73	0.001
	95% CI	16.7-19.4	17.8-18.9	16.1-16.7	
Mid arm circumference (cm)	Mean	15.5±2.2	19.4±3.6	19.1±3.9	0.071
	95% CI	13.2-17.8	17.8-20.9	17.5-20.8	
Waist circumference (inches)	Mean	28.8±1.5	30.4±1.7	30.04±2.2	0.219
	95% CI	27.3-30.4	29.7-31.2	29.1-30.9	

Table-3 Shows association between Nutritional status and Anthropometric variables . Mean BMI was significantly lower in malnourished cases (16.4±0.73) as compared to at risk and nourished cases ($p<0.05$). We observed no significant difference in other mean anthropometric variables in patients with respect to various nutritional status ($p>0.05$)

Table 4:Association between severity of COPD and investigational parameters

Investigations		Severity of COPD				P value
		Mild (n=2)	Moderate (n=27)	Severe (n=18)	Very severe (n = 6)	
Protein (mg/dl)	Mean	6.17 ±0.75	6 ± 1.41	5.96 ±0.89	5.78 ±0.73	0.78
	95% CI	5.3 - 6.9	-6.7 - 18.7	5.6 - 6.3	5.4 - 6.1	
Albumin (mg/dl)	Mean	3 ±0.63	2.93 ±0.67	2.61 ±0.69	2.50 ±0.71	0.37
	95% CI	2.3 - 3.6	2.6 - 3.1	2.2 - 2.9	-3.8 - 8.8	
FEV1% Predicted	Mean	73.50±0.71	61.85 ±7.31	46.89 ±2.86	29.67 ±0.82	0.01
	95% CI	71.1 - 87.8	58.9 - 64.7	45.4 - 48.3	28.8 - 30.5	

Table -4 Shows association between severity of COPD and investigational parameters. Mean FEV1% Predicted lower in very severe stage of COPD. ($p<0.05$).

Table 5: Association between nutritional status (MNA score) and annual hospital readmissions .

MNA score	Number of Annual readmissions		
	0	1-2	>3
24 – 40 (Nourished) (n=6)	6 (100)	0 (0)	0 (0)
17 – 23.5 (at Risk) (n=22)	21 (95.5)	1 (4.5)	0 (0)
< 17 (Malnourished) (n=25)	4 (16)	11 (44)	10 (40)
χ^2	35.4		
P value	0.01		

Table 5 Shows association between nutritional status (MNA score) and hospital readmissions. Patients with MNA score of 17 or more ("at risk" or "nourished") had no or low hospital readmission over one year period. 21 out of 25 malnourished patients were readmitted during the same period. With worsening of nutritional status the number of hospital readmissions increased.

Table 6:Association between nutritional status(MNA score) and length of hospital stay

MNA score			
	Mean	95% CI	P value
24 – 40 (Nourished) (n = 6)	6.8 ±3.5	3.2-10.5	0.001
17 – 23.5 (At risk) (n = 22)	8.4 ±2.3	7.3-9.4	
< 17 (Malnourished) (n = 25)	17.3 ±7.0	14.4-20.2	

Table 6 Shows association between nutritional status (MNA score) and length of hospital stay. Mean length of hospital stay was least in nourished patients (6.8 ±3.5days) and maximum in malnourished patients (17.3 ±7.0 days). Mean length of hospital stay increased with worsening nutritional status .The association in between length of hospital stay and malnutrition was statistically highly significant ($p<0.05$).

Discussion

We did this study to evaluate the nutritional status in COPD patients and correlate it with COPD severity. A total of fifty three COPD patients were evaluated with Mean BMI (16.4±0.73) was significantly lower in malnourished patients (MNA<17) as compared to 'at risk'(MNA 17-23.5) and 'nourished' patient (MNA 24-40) ($p<0.05$) . We did not observe any difference in Weight, Mid Arm Circumference and Waist Circumference in patients with respect to MNA scores ($p>0.05$) . Being a hospital based study, 96% of our patients had severe to very severe disease. With worsening nutritional status GOLD severity of COPD increased. Out of 25 malnourished patients (MNA <17) , 23 were in GOLD stage 3 and 4 . On the other hand, only 1 out of 22 "at risk" patients (MNA 17-.23.5) was in GOLD stage 3 and 4. Similarly, in nourished patients (MNA 24-40), GOLD severity was either 1 or 2.

In the study by Yuceege M B et al[15] (2013) malnourished patients had lower FEV_1 , FVC , and PEF compared to those without malnutrition but the difference was not statistically significant. Mean BMI was significantly lower in very severe and severe COPD as compared to mild and moderate cases ($p<0.05$). We did not observe any significant difference in mean Weight, Mid Arm Circumference and Waist Circumference with respect to severity of COPD ($p>0.05$). Yazdanpanah L et al[16] and Leila Y et al[17] found that body mass index , Mid-Arm Muscle Circumference, Triceps skin fold thickness and Fat-Free Mass did not change significantly with severity of COPD. Chaudhary et al[20] showed that mean arm circumference and mean calf circumference declined significantly with increased severity of COPD ($p<0.001$).

Patients with MNA score 17 or more had no or low hospital readmissions in a one year period. Nourished patients with MNA 24-40 did not have readmissions. Only one "at risk" patient MNA 17-23.5 was readmitted. Patients with MNA score <17 (malnourished) had repeated admissions. Out of the 25 malnourished patients, 21 were readmitted in the following one year. 40% were re-admitted 3 or more times and an equal number, 1 – 2 times. Ting et al[19] found higher 28 days hospital readmissions in malnourished patients. Snider et al[20] gave Oral nutritional supplements to malnourished COPD patients and found that supplements decreased hospital length of stay and risk of 30-day hospital readmissions **.** Zapatero et al[21] also found higher risk of 30 days hospital readmissions in malnourished patients. Practically no patient in our study had re-admission within 30 days. Hence, we studied readmissions over one

year. Nutritional status has been observed as an important predictor of outcome in admitted COPD patients. As the nutritional status declined, recovery was slower. Mean length of hospital stay was highest in malnourished patients (MNA <17) at 17 .3 ± 7 days . "At risk (MNA score 17-23.5) and "nourished" patients(MNA 24-40) had significantly less length of hospital stay (8.4± 2.3 days and 6.8±3.5 days respectively) . Ting et al[19] found that malnourished patients had longer length of hospital stay than those who were undernourished (8.9 days vs 5.6 days, p <0.05) . Maia et al assessed nutrition in respiratory patients including lung Ca, Asthma, Pneumonia , TB, COPD and found that patients with high under nutrition risk had longer length of hospital stay, with approximately 50% of patients discharged to home only after 14 days of hospitalization ($p < 0.001$) . On the other hand, patients with low under nutrition were discharged to home after a median of 10 days (14 days vs 10 days, p <0.006 respectively) .In a cohort study done by Georgia et al the mean hospital length of stay for malnourished patients was almost four times higher than that of well nourished COPD patients (14.1 days vs 3.7 days)[20,21]

Limitations of the study

Our study had certain limitations

1. We recorded all admissions occurring in our hospital. It is possible that a few patients were admitted with COPD exacerbation at some other hospital without our knowledge
2. Many patients could not be contacted on telephone as they did not own a telephone.
3. The study was interrupted by the COVID pandemic. Hence, many patients could not be followed up during this period.

Conclusion

Our study concluded that majority of the COPD patients were malnourished or at risk of malnutrition. Malnourished patients had more severe disease that "at risk" and "nourished" COPD patients. Malnourished patients had longer length of hospital stay and higher readmission rate compared to "at risk" and "nourished" patients.

Reference

1. Global Initiative for Chronic Obstructive Lung Disease. Available from https://goldcopd.org/wp-content/uploads/2019/12/GOLD-2020-FINAL-ver1.2-03Dec19_WMV.pdf Last accessed on 15th March 2021.
2. Rogers RM , Donahoe M , Costantino J . Physiologic eff ects of oral supplemental feeding in malnourished patients with chronic obstructive pulmonary disease. A randomized control study . Am Rev Respir Dis . 1992 ; 146 (6): 1511 - 1517 .
3. Anne Marie B. The Nutritional Status of Patients with Chronic Obstructive Pulmonary Disease.Am Rev Respir Dis 1981; 124:376-381
4. Landbo C, Prescott E, Lange P, et al. Prognostic value of nutritional status in chronic obstructive pulmonary disease. Am J Respir Crit Care Med 1999; 160: 1856–1861.
5. Silva M C G B. Subjective overall rating. In: Waitzberg D L. Oral nutrition and enteral vs. parenteral in practical clinics. 3rd ed. Sao Paulo, Brazil: Atheneu, 2000: pp 241–253.
6. Waitzberg D L, Ferrini M T. Physical examination and anthropometry. In: Waitzberg D L. Oral nutrition and enteral vs parenteral in practical clinics. 3rd ed. Sao Paulo, Brazil: Atheneu, 2000: pp 255–278
7. Blossner M, De Onis M, Prüss-Ustün A. Malnutrition: quantifying the health impact at national and local levels. World Health Organization; 2005.
8. Burak Mete B, Pehlivan E, Gülbaş G, Günen H. Prevalence of malnutrition in COPD and its relationship with the parameters related to disease severity. International journal of chronic obstructive pulmonary disease. 2019;13:3307.
9. Beck Am, Ovesen L, Osler M.The 'Mini Nutritional Assessment' (MNA) and the 'Determine Your Nutritional Health' Checklist (NSI Checklist) as predictors of morbidity and mortality in an elderly Danish population Br J Nutr199;8131–6.
10. Knodrup J, Allison SP, Elia M, Vellas B, Plauth M. ESPEN guidelines for nutrition screening 2002. Clin Nutr 2003;22: 415-21
11. Miller M R, Hankinson J, Brusasco V, et al. Standardisation of Spirometry. Eur Respir J 2005; 26: 319–338.
12. National Health and Nutrition Examination Survey (NHANES III). Anthropometric procedures manual. Atlanta, GA, USA: National Center for Health Statistics, Centers for Disease Control and Prevention, 2007. www.cdc.gov/nchs/data/nhanes/nhanes_07_08/manual_an.pdf Accessed January 2019
13. Metropolitan Life Insurance Company. New weight standards for men and women. Statist Bull Metrop Life Insur Co 1983; 63: 1–4.
14. Gupta B, Mishra R. Subjective global assessment of nutritional status of chronic obstructive pulmonary disease patients on admission. Int J Tuberc Lung Dis. 2010 ;14(4):500-5.
15. Yuceege M B M.D. et al.: The Evaluation of Nutrition in Male COPD Patients Using Subjective Global Assesment and Mini Nutritional Assesment .International Journal of Internal Medicine 2013, 2(1): 1-5
16. Yazdanpanah L, F Shidfar Assessment of Nutritional Status in Chronic Obstructive Pulmonary Disease Patients Iranian J Publ Health,2009;38(3).39-45
17. Leila Y, Farzad S, Ali JM, Hassan H, Hamid H. Energy and Protein Intake and Its Relationship with Pulmonary Function in Chronic Obstructive Pulmonary Disease (COPD) Patients. Acta Medica Iranica. 2010;48:374-9
18. Chaudhary SC, Rao PK, Sawlani KK, Himanshu D, Gupta KK, Patel ML. Assessment of Nutritional status in chronic obstructive pulmonary disease patients. IJCMR. 2017;4(1):268-71.
19. Ting HY, Chan SH, Luk EK, To QM, Wong CY, Choo KL. Prevalence of Malnutrition in COPD Inpatients and its Relationship with Nutritional Intakes and Clinical Outcomes. J Aging Sci. 2020;8:219.
20. Snider JT, Jena AB, Linthicum MT, Hegazi RA, Partridge JS, LaVallee C, Lakdawalla DN, Wischmeyer PE. Effect of hospital use of oral nutritional supplementation on length of stay, hospital cost, and 30-day readmissions among Medicare patients with COPD. Chest. 2015;147(6):1477-84.
21. Zapatero A, Barba R, Ruiz J, Losa JE, Plaza S, Canora J, Marco J. Malnutrition and obesity: influence in mortality and readmissions in chronic obstructive pulmonary disease patients. Journal of Human Nutrition and Dietetics. 2013;26:16-22

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