

Prevalence of Malnutrition in COPD Inpatients and its Relationship with Nutritional Intakes and Clinical Outcomes

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ABSTRACT

Introduction: Studies suggest that 25% to 40% of Chronic Obstructive Pulmonary Disease (COPD) patients are undernourished. Poor nutritional status in COPD patients is related to increased risk of complications, hospital length of stay (LOS) and mortality. This study aims to investigate the prevalence of malnutrition risk, and to explore its relationship with the nutritional intakes, and the clinical outcomes among a group of COPD inpatients at a local acute hospital.

Method: One hundred eighty records of COPD patients who have seen a dietitian during the admission period from 1 Apr 2017 to 31 Mar 2019 were retrieved. Prevalence of malnutrition risk, protein and energy intake, mortality, LOS and the 28-day emergency readmission after discharge were compared among different risk groups.

Result: The prevalence of malnutrition risk among these 180 COPD patients was 77.8%. The LOS of patients with malnutrition risk was 59% longer than the low risk group (8.9 ± 11.8 days vs. 5.6 ± 3.4 days, $p < 0.05$). The emergency readmission rate within 28 days was higher in the at-risk patients compared to low-risk patients (37.5% vs. 20.0%, OR=2.44, $p < 0.05$), as was the mortality rate (5.0% vs. 0%, OR 4.55, $p < 0.05$).

Eighty-eight patients have Body Mass Index (BMI) records, 60% of them were underweight with $BMI \leq 18.5$ kg/m², in which 26% were categorized as severely underweight ($BMI \leq 16.0$ kg/m²). One hundred fifty-six subjects have energy and protein intake records. The mean intakes were 839kcal and 37g respectively, meeting only 59% and 64% of their requirements.

Conclusion: The prevalence of malnutrition risk is high in COPD inpatients, and such patients are more prone to have poorer clinical outcomes and nutritional status. Increased hospital LOS, higher mortality rate, higher re-admission rate, and lower nutritional intakes are common in malnourished COPD inpatients. Regular nutrition assessment is therefore crucial for COPD patients at early disease stages to prevent and treat malnutrition.

Keywords: Chronic obstructive pulmonary disease; Malnutrition; Pulmonary cachexia syndrome; Dietitian

INTRODUCTION

Malnutrition is extremely common, with a prevalence ranging from 9.2 to 50% in hospitalised patients [1,2]. Specifically, patients with chronic diseases such as Chronic Obstructive Pulmonary Disease (COPD) tend to have higher rates compared to other patients. Studies suggested that 10% to 60% of COPD patients are undernourished [3-5].

COPD, as defined by The Global Initiative for Chronic Obstructive Lung Disease (GOLD), is characterised by progressive airflow obstruction and may not be fully reversible. It is associated with an enhanced chronic inflammatory response in the airways and is the third most common cause of death globally [6,7].

A poor nutritional status in COPD patients is closely related to increased complications, increased healthcare costs, prolonged

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length of hospital stay, increased mortality and increased hospital readmission [8-10]. Unintentional weight loss, underweight and sarcopenia are common in COPD patients, and are highly related to all-cause of mortality and complications [11-13].

The pulmonary cachexia syndrome in COPD patients is defined by unintentional weight loss of 5% to 10% of the initial weight, and studies have identified that 25% to 40% of COPD patients are underweight [14,15].

The causes of the poor nutritional status may be related to tissue hypoxia, disuse atrophy, increased metabolism with decreased food intake, oxidative stress, aging, inflammation and medication [16,17]. Inadequate nutritional intake contributes to disturbances in body composition, impaired lung function, compromised immune function and impaired muscle strength and function [17,18].

Nutrition intervention improves nutrition intakes and clinical outcomes of COPD patients [19]. The nutritional intake of COPD patients is generally inadequate, and the percentage of patients reaching greater or equal to 75% of energy and protein intake requirements are around 59 and 37%, respectively [20,21]. Although well reported internationally, local research on the prevalence of malnutrition in COPD inpatients, their clinical outcomes and nutritional status is limited. Therefore, this retrospective cohort study aimed to determine the malnutrition prevalence, nutritional intake and clinical outcomes of the COPD patients at a hospital in Hong Kong.

METHODS

This study was approved by the Joint Chinese University Hong Kong-New Territories East Cluster Clinical Research Ethics Committee. Electronic dietetics records of COPD patients who have seen a dietitian for nutrition intervention were retrieved during the period from 1 Apr 2017 to 31 Mar 2019 at the North District Hospital in Hong Kong. An electronic dietetics record was established by the dietitian for every inpatient consultation. Information such as malnutrition risk, body weight, height and

nutritional intakes are entered after each consultation. Malnutrition Screening Tool (MST) was used to screen all inpatients upon admission.

The MST is a 2-question, 5-point scale screening tool designed for the adult hospital population. It categorizes individuals into 3 nutritional risk levels: low risk, medium risk, and high risk of malnutrition. Questions including weight loss history and recent amount of oral intake are asked by a nurse during admission, and scores from both questions are added for a final MST score. Patients who score 0-1 are at a low risk of malnutrition, those who score a 2 are at medium risk, and those scoring 3 or greater have a high risk of malnutrition. A total of 180 patients with the principal diagnosis of COPD were retrieved for analysis.

Prevalence of malnutrition, mortality, length of stay (LOS) and the 28-day emergency readmission after discharge were compared between different risk groups. Out of these 180 records, 156 contained energy and protein intakes, which were compared among different risk groups. Nutritional adequacy was assessed by comparing actual intake and estimated nutritional requirements. Of the 180 records, 88 had both body weight and height information.

The body mass index (BMI) values of these 88 patients were compared among the different risk groups. One-way ANOVA, independent t test and Pearson's chi-square test were used to analyse the outcomes and to compare the variable means among the different malnutrition risk groups. A p value of <0.05 was considered statistically significant. Statistical analyses were performed using SPSS (Windows version 21; IBM Corp, Armonk [NY], US).

RESULTS

Mean patient age was 78.7 ± 10.1 years; 15% were female. The prevalence of malnutrition risk among these 180 COPD patients was 77.8%, of which 25.0% and 52.8% were categorized as high and medium risk, respectively (Table 1).

Table 1: Nutritional parameters of COPD patient in different malnutrition risk groups.

Malnutrition risk	Nutritional parameters			
	Prevalence (%) (n=180)	Energy intake (Kcal) (n=156)	Protein intake (g) (n=156)	BMI kg/m ² (n=88)
Low	22.2	1,092.4 ± 458.4	47.2 ± 20.4	19.6 ± 3.5
Medium	52.8	805.8 ± 384.9	34.7 ± 15.9	18.5 ± 3.2
High	25	697.2 ± 357.8	31.2 ± 19.2	16.2 ± 2.7
p value		< 0.01	< 0.01	< 0.01

* Data are presented as mean ± standard deviation (range); mean ± standard deviation or no. (%) of patients; Body Mass Index=BMI

The LOS of patients with malnutrition risk (medium-risk and high-risk groups) was 59% greater than that of the low-risk group (8.9 ± 11.8 days vs. 5.6 ± 3.4 days, $p < 0.05$; Table 2).

Table 2: Patient demographic information based on malnutrition risk.

	All	Low risk (MST ≤ 1)	At risk (MST ≥ 2)		Odds ratio	p value
		MST ≤ 1	MST=2	MST ≥ 3		
n	180	40	95	45		
Age (years)						
Mean ± SD	78.7 ± 10.1	76.2 ± 10.3	80.1 ± 9.6	77.9 ± 10.4	-	< 0.05
Women	26	7	14	5	-	
Men	154	33	81	40	-	
Length of hospital stay, d	8.2 ± 10.6	5.6 ± 7.3	9.7 ± 13.3	7.2 ± 3.3	-	< 0.05
Readmission within 28 d	61	8	53	1.9	< 0.05	
Mortality	5	0	5	4.6	< 0.05	

* Data are presented as mean ± standard deviation (range), mean ± standard deviation, Malnutrition Screening Tool=MST, d=days

In terms of clinical outcomes, the emergency readmission rate within 28 days was higher in the at-risk patients than in the low-risk patients (37.5% vs. 20.0%, odds ratio=1.9, $p<0.05$), as was the mortality rate (5.0% vs. 0%, odds ratio 4.6, $p<0.05$; Table 2). Of the 88 patients who had BMI recorded, 60% of them were underweight with a BMI ≤ 18.5 kg/m², of which 26% were categorized as severely underweight (BMI ≤ 16.0 kg/m²). The mean BMI values of these 88 patients were significantly different among the three risk groups (low risk 19.6 ± 3.5 kg/m², medium risk 18.5 ± 3.2 kg/m², high risk 16.2 ± 2.7 kg/m², $p<0.01$; Table 1). For 156 subjects, energy and protein intake records were available. The mean energy and protein intakes were 839 kcal and 37 g, respectively, meeting only 59% and 64% of the estimated energy and protein requirements. Energy intake differed significantly among the different risk groups (low risk $1,092.4 \pm 458.4$ kcal, medium risk 805.8 ± 384.9 kcal, high risk 697.2 ± 357.8 kcal $p<0.01$; Table 1). Protein intake also reduced significantly with increasing malnutrition risk (low risk 47.2 ± 20.4 g, medium risk 34.7 ± 15.9 g, high risk 31.2 ± 19.2 g, $p<0.01$; Table 1).

DISCUSSION AND LIMITATION

Among the COPD inpatients included in this study, the prevalence of malnutrition risk was 77.8% (52.8% at medium risk and 25.0% at high risk), which is much higher than 9.2% to 60% reported in other studies [1-5]. These findings can be explained by the different inpatient population and disease severity because the prevalence of malnutrition risk in other studies were focused on patients in general wards and outpatient settings [1-5]. However, COPD is a progressive disease; study indicated that the condition of COPD inpatients can worsen during hospitalization. The LOS of malnourished COPD patients is longer than that of low-risk patients, which was reflected in another COPD malnutrition study with similar

results [22]. Besides, both mortality and hospital readmission rates are higher in those COPD patients at malnutrition risk. In terms of studies on how malnutrition in COPD affects mortality and hospital readmission, few overseas studies and a local acute hospital malnutrition risk study demonstrated that patients with higher malnutrition risk are more prone to have higher mortality and hospital readmission rates [1,23-26]. According to the World Health Organization, the normal BMI range for Asian is 18.5–23.0 kg/m² [27]. The present study suggests that 60% of COPD inpatients are underweight, which is similar to the findings of other overseas studies [14,15]. Limited studies have considered the nutritional intakes of hospitalised COPD patients, and we found that patients with higher malnutrition risk have a low energy and protein intake. Systemic reviews suggests nutritional intervention can improve LOS, re-admission rate and nutritional intakes [28-30]. To maintain the nutritional status of COPD patients, 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 is recommended [31]. However, our findings suggested that energy and protein intake were well below recommended levels, meeting only 59 and 64% of the energy and protein requirements, similar to other studies [21,32]. Since the data were collected from the electronic dietetics patient record system retrospectively, one of the limitations of this study was the high number of missing data for both anthropometric and nutritional intake measurements. The high number of missing data may reduce the statistical power of the study and may induce biased estimates, leading to invalid conclusions [33,34]. As a retrospective cohort study, the clinical outcome findings can be subject to confounding factors such as disease severity, present of other comorbidities, and other operational and environmental factors such as discharge planning and placement arrangement [35]. Another limitation of this study is the narrow patient population that included only four specialty departments. Findings of this study may not be

generalized to patients in other specialties in acute and sub-acute hospital settings.

CONCLUSION

The prevalence of malnutrition risk is high in COPD inpatients, and such patients are more prone to have poorer clinical outcomes and nutritional status. Increased hospital LOS, higher mortality rate, higher re-admission rate, and lower nutritional intakes are common in malnourished COPD inpatients. Regular nutrition assessment is therefore crucial for COPD patients at early disease stages to prevent and treat malnutrition.

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