ORIGINAL ARTICLE

Dietary Nutrient Intake and Meal-related Situations among Elderly Outpatients with Chronic Obstructive Pulmonary Disease from Respiratory Clinics, Malaysia

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ABSTRACT

Introduction: Chronic obstructive pulmonary disease (COPD) patients usually have dietary problems leading to malnutrition issues. Therefore, this study aimed to determine macro and micronutrient intakes and meal-related situations among outpatients COPD elderly and its adequacy according to their requirements. **Methods:** 140 patients were included in this cross-sectional study at Respiratory Clinics of Hospital Serdang and Institut Perubatan Respiratori. Socio-demographic and health status data were collected by interviewing patients and reviewing their medical records. A three-day diet history (two-day on weekdays, one day on weekend) was analysed using Nutritionist Pro and compared against their requirements. Meal-related situation was assessed using three open-ended questions that related to food shopping, cooking and eating and analysed using content analysis. **Results:** Patients were 70±7 years old, 97% male, 59% Malay, 48% had primary education, 75% married, 72% ex-smokers and 54% presented with comorbidities. Majority of them had no episode of exacerbation for the past one year and in moderate stage of the COPD severity. Mean energy intake was 916±221 kcal/day with 98% of them have under-reported their intake. Almost all patients had inadequate macro and micronutrient intake; energy (97%), protein (97%), carbohydrate (86%), fat (99%), vitamin A (95%), C (86%), D (99%) and E (99%). The meal-related situation reported patients had difficulties with food shopping and preparation and problems during mealtime. **Conclusion:** COPD elderly reported inadequate intake of macro and micronutrients and had problems during mealtime. This indicates the need for Malaysian nutrition guidelines specific to COPD patients and nutrition intervention in the primary setting.

Keywords: Dietary intake, Chronic obstructive pulmonary disease, Elderly, Meal-related situations

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INTRODUCTION

The prevalence of COPD has increased globally, up to 44.2% from 1990 to 2015 (1). In Asia, the increased prevalence of COPD was also observed and it was significant in elderly people (2). In Malaysia, the Epidemiology and Impact of COPD (EPIC) Asia survey reported that the prevalence of COPD was highest in elderly people aged 65 and above (26%) (3). The prevalence of COPD in Malaysia is expected to continue to increase as the number of people aged 60 years or over in Malaysia is projected to be 9.6 million in 2050, which is triple the current number (4). Therefore, COPD in the elderly population is a major concern in Malaysia.

Inadequate food intake is a common issue among elderly people (5). As reported by a local study, the energy intake of elderly people without or with the disease was below the Recommended Nutrient Intake (RNI) for Malaysia (6). Other local studies also reported that elderly people in their studies had a lower intake of energy and protein than Malaysian RNI (7,8). Similar conditions also reported in another country, as most of their elderly people had inadequate energy and protein intake than their requirements (9).

Poor oral intake also reported among COPD patients. A local study stated most of their elderly COPD patients had macro and micronutrients intakes below than Malaysia RNI (10). Other studies also indicated that patients in their studies had lower macro and micronutrients intake than their requirements (11,12). The risk for reduction of food intake becomes greater in chronic disease patients (5). As evidence, the previous study found that elderly

COPD patients had lower energy intake than healthy elderly (13).

Besides that, COPD is a disease that leads to several symptoms such as cough, dyspnea and production of sputum (14). These symptoms could contribute to greater food reduction as it can interfere with individual daily activity and food intake (15). COPD patients reported dyspnea and cough led to difficulties in food shopping and cooking (16). Other than that, decreased food intake among them was reported due to exacerbation, pneumonia, nausea, loss of appetite and others (16). Besides, symptoms of COPD that presented during the meal did interfere with their mealtime which resulting in poor food intake (16).

Inadequate dietary intake in COPD patients was found to be associated with malnutrition (13). Another study also stated that COPD patients were presented with dietary problems contributing to malnutrition (17). Malnutrition in the elderly with COPD was found to correlate with mortality (18). Therefore, dietary intake and meal-related situations in COPD patient especially elderly population become greater issues that need attention.

However, this finding of dietary intake and the meal-related situation is limited in Malaysia, especially in the elderly population. Thus, this present study was carried out to determine the adequacy of macro and micronutrients and meal-related situations of elderly with COPD and to assess its adequacy according to dietary recommendations.

MATERIALS AND METHODS

Study design

This cross-sectional study was registered with the Medical Research & Ethics Committee (MREC) (Registration number: NMRR-17-589-34392). Ethical approval of the study was granted by the Ethics Committee for Research Involving Human Subjects Universiti Putra Malaysia (JKEUPM). The study involving 140 elderly outpatients with COPD was conducted in Hospital Serdang and Institut Perubatan Respiratori, from August 2017 until January 2018. Using convenience sampling, all outpatients presented to the Respiratory Clinic of Hospital Serdang and Institut Perubatan Respiratori for management of their disease were approached. All elderly patients with a confirmed diagnosis and able to stand without aid were invited to take part.

Written informed consent was obtained from the patients. Patients who were unable to respond due to the language barrier, the primary caregiver was asked to be a proxy respondent for questionnaire and interview part.

Measurements

Socio-demographic and health status

Socio-demographic data comprising age, sex, ethnicity, educational level and marital status were collected using a questionnaire. Smoking habit was recorded based on patients' self-claim. Patients were considered as a smoker if they still smoking for about 1 year and ex-smoker if they had stopped smoking for the past 1 year. Data on comorbidities, history of hospitalization or emergency department due to COPD and severity of airflow obstruction were recorded based on patient's medical records.

Dietary intake

Three days of dietary history (two-day on weekdays, one day during the weekend) were used to assess usual food intake of the patients. The first diet history was completed through face to face interview method during their first visit. For the second and third diet history, patients were asked to record their food intake using dietary history form and a copy of household measurements list (19) was provided to facilitate them in reporting the quantity of foods they consumed. This diet history was assessed through one phone call within one week. Helps from family members were obtained during both face to face and phone call interview for patients who were unable to recall their intake or amount of food consumed. Data were analysed using Nutritionist Pro software (V.5.1.0, Axxya Systems, WA, USA). The information derived from this form was converted into data on macronutrients (energy, carbohydrate, protein and fat) and micronutrients (Vitamin A, C, D and E). The vitamins were chosen as a lot of studies had reported that COPD patients usually presented with inadequate antioxidant vitamins and vitamin D (20-23).

Energy requirement was calculated based on the Harris-Benedict equation with a stress factor of 1.2 (13,24,25), while protein requirement was estimated using 1.2 g/kg body weight (25,26). Carbohydrate and fat requirement was based on 40% of energy requirement (25). The requirement of micronutrients was based on Malaysia Requirement Nutrient Intake (27). Adequacy of the reported macro and micronutrients intake was determined as follow:

$$\text{Adequacy: } \frac{\text{Reported macro or micronutrients intake}}{\text{requirements for macro and micronutrients}} \times 100$$

Patients were considered as having adequate macronutrient intake if they complied 100% of their requirements (13,24-26), while micronutrients were based on Malaysia Requirement Nutrient Intake (27). Another study which conducted among elderly with COPD also used full compliance (100%) as cut-off points for the adequacy of dietary intake (28).

Under and over-reporting for energy intake was determined by computing ratio of energy intake / basal metabolic rate (EI : BMR) (29). The value of 1.2 was used as a cut-off point for underreporting and above 1.5 for over-reporting of energy intake (30). These cut-off points also had been used by local study to identify under and over-reporting of energy intake in elderly patients (31).

Meal-related situations

The meal-related situation is described as activities that related to a meal such as food shopping, cooking and eating (15). An interview was conducted using three open-ended questions:

1) What do you do to manage food shopping?; 2) Can you describe how you cook?; 3) Do you have any problems when eating? If you have a problem, can you give an example? (15). The three open-ended questions were extracted from a previous study conducted among COPD patients (15,16). The answers for each question reported by the patients or caregivers were written down by the interviewer. After familiarizing oneself with the data, content analysis was done (15). Meaning units that correspond to the question areas were defined. The meaning units were read through again carefully for condensation and rewriting. Subcategories occurred along with reading. Those subcategories with the same content then are sorted into three categories which include the ability to access food, ability to prepare food and problem during mealtime.

Pre-testing

The questionnaires used for this study was translated from English to Bahasa Melayu by qualify translator. Then, the Bahasa Melayu version was translated back to English version by another qualified translator. After that, 2 versions of questionnaires (Bahasa Melayu and English) were compared. Then, the final version was produced and used for this study.

To ensure the quality of the study, a pre-test was carried out at Institut Perubatan Respiratori which involved 30 of elderly outpatients with COPD. As a result of pre-test, all the patients able to understand the word used in the questionnaire.

Statistical Analysis

All data were entered and analysed using IBM SPSS version 22. For normality, skewness, normal Q-Q plot and detrended normal Q-Q plot were used. The data was considered as normally distributed if the skewness value between -1 and +1 (32). Univariate analysis was used for descriptive analysis. Continuous data were presented as mean and standard deviation, while category data were reported as frequency and percentage. The p-value <0.05 was considered as statistically significant.

RESULTS

A total of 269 elderly outpatients with COPD were presented at the Respiratory Clinic during the study period. However, only 197 of them had COPD with a confirmation by doctor and results on spirometry tests were eligible to participate. Of these, 162 patients were agreed to participate. 22 patients were excluded due to incomplete questionnaires. Thus, only 140 (86%) patients were used for analysis.

The characteristics of patients who were recruited in this study are showed in Table I. The mean age of patients in this study was 70±7 years. Majority of the patients were male (97%), Malay (59%), had primary education (48%) and married (75%). For smoking habits, the percentage of ex-smokers (72%) was the highest, followed by current smokers (22%), and non-smokers (6%). Most of them were presented with comorbidities (54%) and hypertension (74%) was the most common comorbidities. In terms of the history of exacerbation, majority of the patients had no episode of exacerbation for the past one year (57%). Only 27% of them had one episode and 16% of them with more than one episode in a year. For the severity of airflow obstruction, more

Table I: Characteristics of elderly with COPD (n=140) in Hospital Serdang and Institut Perubatan Respiratori

Variables	n (%)
Socio-demographic	
Age (year)	70±7
Gender	
Male	136 (97)
Female	4 (3)
Race	
Malay	82 (59)
Chinese	37 (26)
Indian	21 (15)
Educational level	
None	16 (11)
Primary schooling	67 (48)
Secondary schooling	42 (30)
Tertiary schooling	15 (11)
Marital status	
Single	8 (6)
Married	105 (75)
Divorced/Widowed	27 (19)
Smoking habits	
Smoker	30 (22)
Ex-smoker	101 (72)
Non-smoker	9 (6)
Health status	
Co-morbidities	
Not present with co-morbidities	64 (46)
Present with co-morbidities	76 (54)
Hypertension	56 (74)
Diabetes Mellitus	29 (38)
Heart disease	18 (24)
Dyslipidaemia	14 (18)
Chronic Kidney Disease	6 (8)
History of hospitalization or visit emergency department due to COPD	
None	79 (57)
At least one episode	38 (27)
More than one episode	23 (16)
Severity of COPD*	
Mild	14 (13)
Moderate	58 (53)
Severe	34 (31)
Very severe	3 (3)

*based on n=109; missing data (n=31) due to unavailability of latest spirometry test

than half of the patients were in the stage of moderate, followed by severe stage (31%), mild (13%) and very severe stage (3%).

Table II shows the dietary intake of the patients. The mean energy intake of the patients was 916±221 kcal/day. Table III shows the result of under and over-reporting for energy intake of the patients. Almost all of the patients (98%) might have underreported with none of them had over-report their energy intake. The mean intake of other macronutrients (protein, carbohydrate and fat) was 40.3±12.7 g/day, 115±29 g/day, 33±11 g/day. The mean intake of Vitamin A, C, D and E were 121±206 ug/day, 31±34 mg/day, 1.0±5 ug/day, 3±2 mg/day respectively. For adequacy of macro and micronutrient intakes, almost all patients did not achieve their intake requirement as follows: energy (97% of inadequacy), protein (97%), carbohydrate (86%), fat (99%), vitamin A (95%), vitamin C (86%), vitamin D (99%) and vitamin E (99%).

Table II: Dietary intake of elderly with COPD (n=140) in Hospital Serdang and Institut Perubatan Respiratori

Dietary intake	Inadequate n (%)	Adequate n (%)
Macro nutrients		
Energy[a]	136 (97)	4 (3)
Protein[a,b]	136 (97)	4 (3)
Carbohydrate[a]	121 (86)	19 (14)
Fat[a]	139 (99)	1 (0.7)
Micro nutrients[c]		
Vitamin A	133 (95)	7 (5)
Vitamin C	120 (86)	20 (14)
Vitamin D	138 (99)	2 (1)
Vitamin E	139 (99)	1 (0.7)

The adequacy was based on:
a; Individual requirement (Source: Pingleton, 1996)
b; Individual requirement (Source: Bauer et al., 2013)
c: Recommended Nutrient Intake for Malaysia

Table III: Under and over-reporting of energy intake of elderly with COPD (n=140) in Hospital Serdang and Institut Perubatan Respiratori

Energy intake	n (%)
Underreport	137 (98)
Normal	3 (2)
Over report	0 (0)

Table IV shows the meal-related situation of the patients. Half of the patients (51%) claimed that their food shopping was managed by others who could be their wife, children or maid. Only 30% of the patients claimed that they had no problems with food shopping, described as follow:

I have no problem with food shopping, I can carry groceries upstairs without a breathing problem (Chinese Man, A1)

Problems with food shopping were described as difficulties to carry groceries in the shop. Therefore, they (4%) chose to use trolley during food shopping, while other patients depended on the help of others, described as follow:

I ask help from the workers there to carry heavy things (Malay Man, B1)

Patients also reported that they cannot carry heavy things anymore because it could lead to shortness of breath. Besides, some patients also claimed that they no longer purchased groceries on their own due to COPD. This situation was described as follow:

I no longer manage shopping on my own, because I am at risk of fainting, so my children will do everything for me (Indian Man, C1)

While other patient said that:

My ability to do food shopping declined due to COPD, not due to ageing (Malay Man, B2)

Most of the patients (97%) were males. Therefore, they reported that their foods were prepared by their wife, children or maid. Only 14% of them prepared foods by themselves with no problem. However, a minority of them (3%) claimed to have difficulty to cook, described as follow:

I cannot cook any fried food, it can lead to shortness of breath (Chinese Man, A2)

While others claimed that:

I always help my wife in the kitchen, but when she fries something, I will start to have shortness of breath (Malay

Table IV: Meal-related situation of elderly with COPD (n=140) in Hospital Serdang and Institut Perubatan Respiratori

Categories	Subcategories	Meaning units	n (%)
What do you do to manage food shopping?			
Ability to access food	Manage by others	Family members	72 (50)
		Maid	2 (1)
		Others (old folk's home)	2 (1)
	Manage by themself	Without help	42 (30)
		With help	10 (7)
	No food shopping	Eat outside	16 (11)
Can you describe how you cook?			
Ability to prepare food	Cooked by others	Family members	102 (65)
		Maid	4 (3)
		Others (old folk's home)	2 (1)
	Cooked by themself	No problem	17 (11)
		Smell of frying influence breathing	4 (3)
	Eat outside		27 (17)
Do you have any problems when eating? If you have a problem, can you give an example?			
Problem during meal-time	No problem		78 (50)
	Problems	Coughing	46 (30)
		Phlegm	3 (2)
		Shortness of breath	14 (9)
		Asthma attack	1 (1)
		Early satiety	3 (2)
		Loss of appetite	3 (2)
		Tired	2 (1)
		Vomiting	1 (1)
		Choking	4 (3)

Man, B3)
Patients who cooked by themselves claimed that they chose to cook simple dishes, like fried fish, eggs or soup. The patient said:
I just cook something easy to prepare because I easily feel tired (Malay Man, B4)
Half of the patients in this study stated that they had no problems at all during meals. The most frequently mentioned problem during the meal was coughing. Patients claimed they coughed during the meal but not in every meal, while others said that coughing during the meal is normal. The patient said:
Sometimes I cough during the meal, but I still can eat as usual (Malay Man, B5)
While others complained that:
Cough and phlegm during the meal can interfere with my food intake (Chinese Man, A3)
Therefore, patients had a loss of appetite and eat less due to these problems. The patient said:
I needed to eat slowly to avoid cough or shortness of breath during the meal (Chinese Man, A4)
While others said that:
If I experience shortness of breath, I need to stop eating and eat again, small and frequent meal (Malay Man, B6)
I need to avoid certain foods like fried food and spicy food because it will lead to shortness of breath (Malay Man, B7)
Patients stated that taking medication before the meal could relieve the problem during the meal.

Table V shows the distribution of meal-related situation by the inadequacy of energy intake among patients. Majority of the patients who had inadequate energy intake reported that their food shopping (55%) and food preparation were managed by others (77%). About 43% of the patients who had inadequate energy intake claimed to have a dietary problem during mealtime.

Table V: Distribution of meal-related situation by inadequacy of energy intake among elderly with COPD (n=136) in Hospital Serdang and Institut Perubatan Respiratori

Categories of meal-related situation	Inadequate energy intake n (%)
Ability to access food	
Managed by others	74 (55)
Managed by themself	48 (35)
No food shopping	14 (10)
Ability to prepare food	
Cooked by others	105 (77)
Cooked by themself	14 (10)
Eat outside	17 (13)
Problem reported by patients or caregiver during mealtime	
No problem	77 (57)
Problems	59 (43)

DISCUSSION

Patients mostly reported an inadequate energy, protein, carbohydrate and fat intake as compared to their requirements. These findings were similar to that of a previous local study; that most of their elderly patients had energy and protein intakes below than Malaysian Recommended Nutrient Intake as determined by diet history (10). Low intakes also have been reported in COPD patients in other countries, which was assessed using the Food Frequency Questionnaire (FFQ) (11,12,28). Similar to macronutrient, the present study found almost all elderly with COPD in this study had inadequate vitamin A, C, D and E intakes. Consistent results were found in other studies that most of their patients had inadequate antioxidant intakes (10,12,28). Other studies had also shown that adequate intakes of antioxidant could reduce the exacerbation rate (33-35), that vitamin E can reduced oxidation stress (36) and that vitamin D was related to lung function (37,38).

Inadequate macro and micronutrient intakes in COPD elderly patients in this study may be explained by both, COPD itself and the ageing process. Systematic inflammation and tissue hypoxia in COPD lead to an increment of metabolic rate, which created an imbalance of macro and micronutrients in the body (39). This issue becomes even worse as COPD patients are also presented with a reduction in food intake. As evidence, most of the patients claimed that their food intake has interfered with cough, shortness of breath, choking and phlegm that usually presented during meal. Other than that, some of them stated that the presence of COPD caused difficulties in their food shopping and cooking. COPD patients in another study also reported that COPD did interfere with their activities related to the meal (15). COPD patients also complained about limited food access as they had difficulties in food shopping (15,16). They claimed that walking during food shopping is a burden. Carrying groceries and walking at the same time during food shopping also seem like impossible for some of them (15,16).

Limit to food access, difficulty with cooking, poor appetite and intake leading to poor nutritional status (40,41) and malnutrition being more prevalent among the elderly (42-45), reducing their health-related quality of life (46-48). The negative energy balance can be explained by the increase in protein breakdown and decline in protein synthesis, leading to abnormal body composition and muscle wasting (11). As a result of muscle wasting, the COPD patients experience weight loss and reduction of peripheral muscle strength which then cause limited physical capability (11).

There is no specific guideline on macro and micronutrient for COPD that available in Malaysia. Clinical practice guidelines on COPD in Malaysia (14) published in 2009, which is not the latest data. Besides, the guideline

focus on the management of COPD in the medical part with an only small part on nutrition for COPD patients emphasizing on a balanced diet with adequate calorie intake and regular exercise (14). Thus, the development of nutrients guidelines in COPD patients in Malaysia is needed.

The limitation of this study is that the patients have underreported their dietary intakes. Other studies indicated similar results (31,49). Older age and smoking are contributors to underreporting (50). As evidence, a previous study reported that smokers had lower macro and micro intakes compared to non-smokers (51). The help from caregivers obtained for diet history, might also adversely influence the results. Despite the limitation, this study highlights the baseline data for macro and micronutrient intakes among Malaysian COPD patients.

CONCLUSION

This study has shown that elderly with COPD had inadequate energy, protein, carbohydrate, fat, vitamin A, C, D and E intakes and also presented with dietary problems during their mealtimes. These problems indicated the needs of nutrition screening among elderly with COPD. Besides, nutrition intervention is important in this population to prevent malnutrition which can lead to poor prognosis in COPD patients. Therefore, a nutrition guideline for Malaysian COPD patients should be developed to help to improve their nutrition intakes.

ACKNOWLEDGEMENT

The authors would like to thank all patients who generously shared their time and experience for the study and to Universiti Putra Malaysia for providing research funding under Putra Grant-Putra Young Initiative (IPM) (9517400).

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