

Original article

Predicting factors of dietary behaviors among patients with chronic obstructive pulmonary disease

Ratchanee Prarach^a, Noraluk Ua-Kit^{b,*}^aProgram in Nursing Science, Faculty of Nursing, Chulalongkorn University, Bangkok, Thailand^bFaculty of Nursing, Chulalongkorn University, Bangkok, Thailand

Background: Inappropriate dietary habits in chronic obstructive pulmonary disease (COPD) patients accelerate the symptoms of the disease. Modifying dietary habits to be appropriate reduces the risk factors, and thereby decreases the chance of relapse.

Objective: To analyze the factors that influence dietary behaviors among patients with COPD.

Methods: The sample comprised a total of 132 patients, both male and female with COPD, who were out-patients at the Respiratory Clinic and Out-patient Department (OPD) Medicine, Rajavithi Hospital, and King Chulalongkorn Memorial Hospital. Descriptive and stepwise multiple regression was used for the statistical analysis.

Results: The factors that could predict dietary behaviors with the highest statistical significance included food intake knowledge ($\beta = 0.407, P < 0.05$), social support ($\beta = 0.366, P < 0.05$), and malnutrition ($\beta = -0.140, P < 0.05$), respectively. These factors accounted for 47.5% of the variance in dietary behaviors among patients with COPD ($r = 0.689, P < 0.05$).

Conclusion: The factors that can predict the dietary behaviors of COPD patients are food intake knowledge, social support, and malnutrition. Therefore, nurses should focus on food education regarding appropriate food for the disease, provide nutrition care to patients with malnutrition, and promote social support to enhance the dietary behaviors of COPD patients.

Keywords: Chronic obstructive pulmonary disease, dietary behavior, predictor.

There are approximately 251 million people with chronic obstructive pulmonary disease (COPD), and more than 3 million Thai people suffered from emphysema.^(1,2) COPD is caused by breathing in dust, while enzyme deficiency Alpha1-antitrypsin and most related diseases are caused by smoking.^(1,3) COPD is a chronic illness that exposes people to lifelong health problems.⁽⁴⁾ The most common problems for COPD patients include decreased ability to perform activities, improper use of medications, inadequate nutrition, anxiety about the disease, and a lack of knowledge about pulmonary rehabilitation.⁽⁵⁾

However, dietary behavior is still a major problem in COPD patients. Therefore, this group of patients need to practice dietary behaviors that are appropriate for the disease in order to relieve their symptoms, improve their quality of life, and reduce the risk of death.⁽¹⁾

Regarding research on dietary behavior in COPD patients in Thailand, it was found that 17.0% of COPD patients ate curry rice with coconut milk as an ingredient.⁽⁶⁾ Patients had a poor diet of many vegetables and brown rice.⁽⁷⁾ Patients with COPD had mean scores of health behaviors in terms of food type and dietary formulation at a moderate level⁽⁸⁾, and 90.2% of patients with had inappropriate proportions of carbohydrates, protein, and fat, while patients with mild malnutrition had the most suitable proportions of consumption.⁽⁹⁾ International studies include Pirabbasi E, *et al.*⁽¹⁰⁾ found that more than 65.0% of adults and elderly COPD patients had insufficient intake of energy-rich foods, protein, vitamin C and vitamin E. In addition, Ting H, *et al.*⁽¹¹⁾

*Correspondence to: Noraluk Ua-Kit, Faculty of Nursing, Chulalongkorn University, Bangkok 10330, Thailand.

E-mail: noralukuakit@yahoo.com

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reported that COPD patients in Hong Kong had lower energy and protein intake than the recommended levels. In Vietnam, Nguyen HT.⁽¹²⁾ reported that COPD patients had insufficient energy and protein intake. These improper dietary behaviors affect the reduction of body function, low immunity, quality of life among patients with COPD⁽¹³⁾, and exercise performance, leading an increased risk of acute exacerbations.⁽¹⁴⁾ Consequently, COPD patients need proper dietary behavior modifications to prevent disease exacerbation and disease complications.

Factors related to the food consumption behaviors of COPD patients are occupation, caregivers⁽¹³⁾, age⁽¹⁵⁾, insufficient income^(7, 9, 13), dyspnea while eating⁽¹⁶⁾, dry mouth from anticholinergic medication⁽¹⁷⁾, anorexia, shortness of breath and lack of energy to eat⁽¹⁸⁾, poor dietary knowledge⁽⁶⁾, malnutrition⁽⁹⁾, dietary assistance⁽⁶⁾, and social support.⁽¹⁹⁾

Based on these factors, COPD patients need to change their behavior to regulate or mitigate the effects of the disease.⁽²⁰⁾ Therefore, the objective of this study was to investigate the factors in fluence dietary behaviors among COPD patients. the investigators selected factors from the literature review in the context of COPD patients, and added the unstudied variables from the literature review including age, income, dyspnea, food intake knowledge, malnutrition, and social support in order to apply the results of the research as a basis for developing a program to promote food consumption behaviors that are suitable for this group of patients.

Materials and methods

Study design and population

This study was a predictive correlation design. The sample group of 132 cases contained both male and female COPD patients with the age of 40 years and over. They were out-patients at the Respiratory Clinic and Outpatient Department (OPD) Medicine, Rajavithi Hospital and King Chulalongkorn Memorial Hospital. The inclusion criteria were patients with COPD in grades 2, 3 and 4. They had no serious signs or symptoms that bothered answering the questionnaire, and they were willing to participate in the study. The exclusion criteria was patients with COPD who were unable to provide information due to extreme fatigue.

This research was approved by the Institutional Review Board of the Faculty of Medicine,

Chulalongkorn University on February 4, 2022 (COA no. 0179/2022) and was approved by the Ethics Committee of Rajavithi Hospital on March 16, 2022 (no. 049/2522). The researchers met potential eligible participants, build a relationship, and clarify the research objectives. The eligible patients who agreed to participate in the study would sign informed consent before responding to the questionnaire.

Research instruments

The demographic data questionnaire was developed by researcher composed of 10 questions including age, gender, marital status, educational level, occupation, income, caregiver, smoking history, duration of COPD, and the severity of COPD.

The Modified Medical Research Council Dyspnea Scale or mMRC⁽²¹⁾ was used for the dyspnea questionnaire with permission from the original developers. A score of 0 was “I only get breathless with strenuous exercise”, a score of 1 was “I get short of breath when hurrying on a level surface or walking up a slight hill”, a score of 2 was “I walk slower than people of the same age on a level surface because of breathlessness”, or “I have to stop for breath when walking at my own pace on a level surface”, a score of 3 was “I stop for breath after walking about 100 meters or after a few minutes on a level surface”, and a score of 4 was “I am too breathless to leave the house or I am breathless when dressing or undressing”. The content validity index was 1.

A food intake knowledge questionnaire⁽²²⁾ was used to evaluate food intake knowledge for COPD patients with permission from the original developers. It was a 20 item question. Correct answers were given one point and wrong answers were given a 0 points. The content validity index was 0.81, and Cronbach’s alpha coefficient was 0.74.

Nutrition Triage⁽²³⁾ was used to evaluate food intake history for COPD patients with permission from the original developers. It was a 8 item question to assess changes in body weight, edema, degree of fat loss, muscle strength, loss of muscle performance, severity of chronic illness and acute illness. This questionnaire was classified into four levels: None or at risk of malnutrition (0 to 4 points), mild malnutrition (5 to 7 points), moderate malnutrition (8 to 10 points), and severe malnutrition (> 10 points). The content validity index was 0.93, and Cronbach’s alpha coefficient was 0.72.

For the social support questions, the study modified the Family Support on Diet Questionnaire⁽⁷⁾ permission from the original developers and modified by using only the family support questions about diet and adding question about social support. This questionnaire was a 20 items questions ranging from 1 to 5 (Likert scale). They were all positive statements. The content validity index was 0.96. The Cronbach's alpha coefficient was 0.95.

The dietary behavior questionnaire⁽⁸⁾ permission from the original developers. This questionnaire was a 20 item questionnaire, comprising of 9 positive questions, and 11 negative questions. A high score means that COPD patients have a good dietary behavior. The content validity index was 1.0. Cronbach's alpha coefficient was 0.87.

Statistical analysis

The analyses were conducted using the SPSS version 22 computer program. Descriptive statistics

of frequency, percentage, mean \bar{x} and standard deviation (SD) were used to analyze the demographic data. Stepwise multiple regression analysis was used to determine the predictive power of age, income, malnutrition, food intake knowledge, and social support to predict the dietary behaviors among patients with COPD. $P < 0.05$ was considered to be the level of significance.

Results

The majority of the sample of COPD patients aged 70 years and over, accounted for 69 percent (mean = 70.53, SD = 10.90) of all subjects. Most were males, were married, and had primary education. Most of them were unemployed and had an income of 1 to 10,000 baht. The majority had a history of smoking but had stopped smoking. The duration of COPD was less than 10 years and the severity of COPD was level 2 (Table 1).

Table 1. Frequency and percentage of patient characteristics (n = 132).

| Patient characteristics | Number (n = 132) | Percentage |
|--------------------------------|---------------------|------------|
| Age | | |
| 40 - 59 years | 20 | 15.1 |
| 60 - 69 years | 43 | 32.6 |
| > 70 years | 69 | 52.3 |
| Gender | | |
| Male | 116 | 87.9 |
| Female | 16 | 12.1 |
| Status | | |
| Married | 99 | 75.0 |
| Single | 11 | 8.3 |
| Widowed/Divorced/Separated | 22 | 16.7 |
| Education | | |
| None | 2 | 1.5 |
| Primary school/High school | 99 | 75.0 |
| Diploma/Bachelor's Degree | 31 | 23.5 |
| Occupation | | |
| None | 83 | 62.9 |
| Farmer/Freelancer/Own business | 35 | 26.5 |
| Civil servant/Employee/Other | 14 | 10.6 |
| Income (Baht) | | |
| None | 4 | 3.0 |
| 1 - 10,000 | 111 | 84.1 |
| > 10,000 | 17 | 12.9 |
| Care giver | | |
| None | 2 | 1.5 |
| Spouse/son/daughter | 101 | 76.0 |
| Relatives | 29 | 21.7 |
| No relatives | | |

Table 1. (Cont.) Frequency and percentage of patient characteristics (n = 132).

| Patient characteristics | Number (n = 132) | Percentage |
|--------------------------|---------------------|------------|
| Cigarette smoking | | |
| None | 30 | 22.7 |
| Stopped smoking | 93 | 70.5 |
| Still smoking | 9 | 6.8 |
| Duration of COPD | | |
| < 10 years | 113 | 85.6 |
| > 10 years | 19 | 14.4 |
| Level of COPD | | |
| Level 2 | 62 | 47.0 |
| Level 3 | 38 | 28.8 |
| Level 4 | 32 | 24.2 |

The COPD patients had a low mean score of dyspnea, low food intake knowledge and low risk of malnutrition, and very high social support. Moreover, the overall dietary behavior scores of the COPD patients were good (Table 2).

Food intake knowledge was positively related to the dietary behaviors of the COPD patients with statistical significance at a moderate level ($r = 0.571$, $P < 0.05$). Social support was positively related to the dietary behaviors of the COPD patients with statistical significance at a moderate level ($r = 0.560$, $P < 0.05$).

Malnutrition was negatively related with the dietary behaviors of patients with COPD at a low level ($r = -0.268$, $P < 0.05$) (Table 3).

Food intake knowledge, social support, and malnutrition could predict dietary behaviors among COPD patients by variances explained of 47.5% ($r = 0.689$, $P < 0.05$). Food consumption had the highest predictive coefficient ($\beta = 0.407$, $P < 0.05$), followed by social support ($\beta = 0.366$, $P < 0.05$), and malnutrition ($\beta = -0.140$, $P < 0.05$), respectively (Table 4).

Table 2. Mean, standard deviation (SD) of dyspnea, food intake knowledge, malnutrition, social support, and dietary behavior (n = 132).

| Variables | Mean | SD | Interpretation |
|-----------------------|------|------|-----------------------|
| Dyspnea | 1.4 | 1.0 | Low |
| Food intake knowledge | 11.9 | 3.2 | Low |
| Malnutrition | 1.8 | 1.9 | Risk for malnutrition |
| Social support | 52.1 | 15.9 | High |
| Dietary behavior | 65.2 | 6.6 | High |

Table 3. Correlation between dyspnea, food intake knowledge, malnutrition, social support, and dietary behavior (n = 132).

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------------|----------|--------|-------|---------|---------|--------|-------|
| Behavior | 1.000 | | | | | | |
| Age | 0.038 | 1.000 | | | | | |
| Income | 0.054 | -0.060 | 1.000 | | | | |
| Dyspnea | -0.077 | 0.029 | 0.016 | 1.000 | | | |
| Knowledge | 0.571** | -0.005 | 0.012 | 0.093 | 1.000 | | |
| Malnutrition | -0.268** | 0.054 | 0.079 | 0.292** | -0.120 | 1.000 | |
| Social support | 0.560** | 0.091 | 0.047 | -0.34 | 0.402** | -2.17* | 1.000 |

** $P < 0.01$, * $P < 0.05$; Behavior = dietary behavior

Table 4. Predictive ability of dyspnea, food intake knowledge, malnutrition, social support, and dietary behavior (n = 132).

| Variable | B | SEB | β | T | P-value |
|-----------------------|-------|-------|---------|--------|---------|
| Constant | 2.424 | 0.090 | - | 24.759 | 0.000 |
| Food intake knowledge | 0.822 | 0.143 | 0.407 | 5.811 | 0.000 |
| Social support | 0.151 | 0.029 | 0.366 | 5.135 | 0.000 |
| Malnutrition | -1.96 | 0.092 | -0.140 | -2.132 | 0.035 |

Discussion

The findings from the study revealed that the dietary behaviors among patients with COPD had a high food consumption behavior score, which explains that patients had the proper dietary habits because participants had mild to moderate severity of the disease. The duration of the disease was less than 10 years. That is patients with COPD had learning experiences obtained from knowledge and advice from health care providers. They might have caregivers help them when they were home. The treatment plan has been followed regularly. This is consistent with the study of Warahut J. ⁽⁶⁾, which reported that COPD patients had very appropriate dietary habits, and de Batlle J, *et al.* ⁽²⁴⁾, who also reported that patients with COPD in Spain having moderate to severe disease obtained the main nutrients, adequate vitamins, and minerals as recommended.

Food intake knowledge was positively correlated to the dietary behaviors of patients with COPD. If the patient has knowledge about types of food to be eaten or avoided, it will them had proper dietary habits, which is consistent with Warahut J. ⁽⁶⁾ who reported the positive relationship between knowledge of food intake and food consumption behaviors. Social support was also positively related to the dietary behaviors in patients with COPD. It can be explained that most participants had husband/wife caregivers or children to help take care of food for them. They also received advice from health care providers in terms of diet, making them to be able to select proper choices of diet. This is consistent with the findings of Warahut J. ⁽⁶⁾ indicating about the positive relationship between dietary assistance with food intake and food consumption behaviors. The study of Jaiyen K. ⁽⁷⁾ also reported the positive relationship between family support and appropriate health behaviors.

Malnutrition was negatively related with the dietary behaviors of patients with COPD. The findings are consistent with the research of Thongvisat K, *et al.* ⁽⁹⁾ reporting that COPD patients with mild

malnutrition ate appropriate proportions of food. Cochrane W. and Afolabi O. ⁽²⁵⁾ reported that COPD patients with malnutrition often had more food problems and less eating.

The finding of this study identified the variables that did not conform to the research hypothesis. That is age was not related to the dietary behaviors of the COPD patients. This can be explained that most subjects were elderly people with underlying medical conditions that cause physical changes and deterioration of various organs. In addition, chronic diseases such as heart disease, high blood pressure and osteoporosis were also found ⁽²⁶⁾ in elderly people who learn to develop proper eating with their disease. Subjects in this study were elderly people with low levels of COPD severity. They could access food on their own, making them be able to take care of themselves when eating. Moreover, income was not related to COPD patients' dietary behaviors. This could be interpreted that although most older subjects in this study did not work, they received compensations from the governmental welfare support, making them have sufficient incomes to purchase nutritious diet appropriate with their disease. Furthermore, those who had caregivers could buy proper food for them. This supports Chuenchom C, *et al.* ⁽²⁷⁾ reporting that COPD patients had good nutritional health-promoting behaviors because they had sufficient income. Dyspnea was not related to dietary behaviors in COPD patients. This is possible because most patients with COPD had moderate dyspnea ⁽²¹⁾ with duration less than 10 years. They could still help themselves for eating and living.

Conclusion

Food intake knowledge and social support were positively related to the dietary behaviors in patients with COPD, whereas malnutrition was negatively related to the food consumption behaviors in patients with COPD. Food intake knowledge, malnutrition, and social support were able to predict dietary

behaviors among patients with COPD. The findings of this study should be used as a part of nursing practice the dietary behaviors in patients with COPD should be encouraged for future research exploration.

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Conflicts of interest statement

Each of the authors has completed an ICMJE disclosure form. None of the authors declare any potential or actual relationship, activity, or interest related to the content of this article.

Data sharing statement

The present review is based on the references cited. Further details, opinions, and interpretation are available from the corresponding authors on reasonable request.

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