Chemotherapy Regimen and Incidence of Malnutrition after Chemotherapy in Non-small Cell Lung Cancer

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Abstract: Lung cancer is the leading cause of death worldwide and in Thailand. The treatment of non-small cell lung (NSCLC) with chemotherapy might affected on nutritional status which could correlate with the treatment response and quality of life. Thus, the objectives of this research were to study the nutritional status of patients after chemotherapy and the incidence of malnutrition. This retrospective longitudinal descriptive study was gathering the information from medical records January, 2013 to December, 2014. A 114 patients were met the inclusion criteria which were completed 4 or 6 cycles of treatment. Body mass index (BMI) and percentage of weight loss were used to assess the nutritional status. Malnutrition was classified when BMI under 18.5 kg/m^2 and weight change more than 5%. The average age, baseline weight and BMI were 60.4±10.1 year, 55.0±9.0 kg and 22.0±2.5 kg/m^2, respectively. The incidence of malnutrition was 6.1%. Mean BMI decreased from 22.0 kg/m^2 to 21.5 kg/m^2 after chemotherapy. Patients treated with carboplatin plus paclitaxel showed the highest change of BMI (-0.6 kg/m^2) and docetaxel regimen showed the highest incidence of malnutrition (18.8%). According to the base agents; taxane-based regimen showed the most effect on nutritional status and 85% of those patients were malnutrition. In conclusion, docetaxel and carboplatin plus paclitaxel highly affected on nutritional status. In patients treated with those regimens, they should be closely monitored and gave an adequate nutritional advice for the better treatment response, decrease the side effect from chemotherapy and improve patients' quality of life.

Keywords: NSCLC, nutritional status, chemotherapy.

INTRODUCTIONS

Cancer patients are increasing every year, based on data from the Thai National Cancer Institute registry of cancer in 2013 [1]. Chemotherapy used in treatment to these patients may cause side effects including malnutrition. In cancer patients with malnutrition, the effect on treatment efficacy has been reduced [2] and complications from treatment increased [3]. Causes of malnutrition in cancer patients is not clearly known at present. This can be caused by many reasons such as reduced nutrient absorption, modified metabolism, psychological loss of appetite, side effects from chemotherapy such as oral mucosal ulcers, inflammation of the gastrointestinal mucosa cell, change of food taste, nausea, vomiting or anorexia [4]. Lung cancer patients have malnutrition rate of 45-69% [2]. By using the evaluation form, Patient-Generated Subjective Global Assessment (PG-SGA) found that 93.9% of breast cancer patients had malnutrition and average score of nutrition status was 10.4 point [5].

The importance of adverse drug reactions that affect the nutritional status of cancer patients is recognized especially by pharmacist. No studies have documented the incidence of malnutrition attributable to each chemotherapy regimen in the treatment of non-small cell lung cancer (NSCLC). Therefore, medical personnel should pay attention to the nutritional status of cancer patients, that will affect the treatment efficiency and also the severity of the side effects. Therefore, this study was conducted to study the nutritional status of NSCLC patients receiving chemotherapy in various chemotherapy regimen, as well as the incidence of malnutrition using BMI criteria and reduction of weight of patients after treatment with each chemotherapy. The result will be the information that encourages healthcare professionals to recognize the importance of nutrition in cancer patients. The research data can be used for medical staff to monitor, follow up and provide nutrition advice to patients at risk for malnutrition, enable to prevent and reduce malnutrition. This will improve the quality of life for patients with NSCLC.

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OBJECTIVES

The objectives of this research were to study the nutritional status and the incidence of malnutrition of NSCLC lung cancer patients after chemotherapy.

MATERIALS AND METHODS

Study Design

The retrospective longitudinal descriptive study was designed to study the nutrition status of NSCLC lung cancer patients who treating with chemotherapy regimen at University hospital. The study's protocol was approved by The Research Ethics Committee Faculty of Medicine Chiang Mai University on 5th, March 2015.

Study Subject

NSCLC lung cancer patients who treating with chemotherapy regimen at University hospital during 1st, January 2013 to 31st, December 2014 were recruited to the study by the following criteria, inclusion criteria; lung cancer patients who with NSCLC (diagnosis by physician), started and finished the treatment with only chemotherapy regimen during 1st, January 2013 to 31st, December 2014, had BMI equal and greater than 18.5 kg/m^2 before started the first cycle of chemotherapy treatment. Lung cancer patients who treatment plan did not complete, with others type of cancer, death during the time of study period and incomplete data to collect were excluded from the study.

Data Collection and Analysis

Patients data in hospital medical record were collect by using the data collection forms. The general data collected were demographic data of patients, stage of cancer, comorbidity disease, number of cycle of chemotherapy and adverse drug reaction. The nutritional status data including chemotherapy regimen, weight, height, body mass index before 1st, at 4th or 6th cycle of chemotherapy treatment cycle and factor that effect to nutrition status. Nutrition status effect to pain also were collected

Data would be shown as frequency and percentage. Malnutrition criteria used were BMI least than 18.5 kg/m^2 and weight loss at 4th cycle or 6th cycles compare to before start the 1st cycle are more than 5 kg.

RESULTS

Totally 352 patients who were treated during January, 2013 to December, 2014 at University Hospital. The 114 patients were met the inclusion

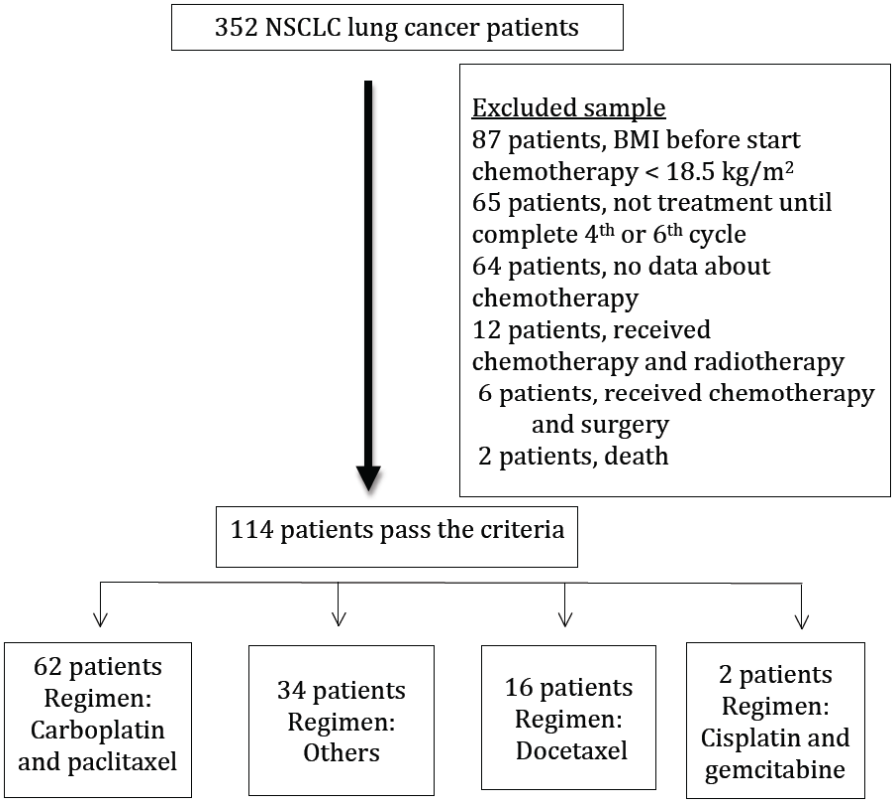

Figure 1: Flowchart of recruitment.

Table 1: Demographic and General Characteristic of Patients Recruited into the Study (n=114)

Characteristic	Number (%)
Gender	
Male	66 (57.9)
Female	48 (42.1)
Mean age (years), Mean ± SD	60.4±10.1
Less than 60 years	55 (48.2)
Equal or greater than 60 years	59 (51.8)
Mean weight before treatment (kg), Mean ± SD	55.0±9.0
Mean BMI before treatment (kg/m^2), Mean ±SD	22.0±2.5
Mean height (cm), Mean ± SD	157.8±0.1
Cancer stage	
2	4 (3.5)
3	5 (4.4)
4	90 (78.9)
No data	15 (13.2)
Treatment regimen	
Carboplatin plus Paclitaxel	62 (54.4)
Cisplatin plus Gemcitabine	2 (18.0)
Docetaxel	16 (14.0)
Others	34 (29.8)
Number of treatment cycle	
4 cycle	75 (65.8)
6 cycle	39 (34.2)
Comorbidity	58 (50.9)

criteria which were completed 4th or 6th cycles of treatment**,** as show in Figure **1**.

Most of patients were male with advanced/metastasis disease. The average age, baseline weight and BMI were 60.4±10.1 year, 55.0±9.0 kg and 22.0±2.5 kg/m^2, respectively. The chemotherapy regimens were carboplatin plus paclitaxel, cisplatin plus gemcitabine, docetaxel and others. Half of patients (50.9 %) were with comorbidity disease.

Mean BMI decreased from 22.0 kg/m^2 to 21.5 kg/m^2 after chemotherapy. Patients treated with carboplatin plus paclitaxel showed the highest change of BMI (-0.6 kg/m^2). After treated with chemotherapy 11 (9.7%) patients and 32 (28.1%) patients were BMI less than 18.5 kg/m^2 and weight loss 5% or greater, respectively (Table **2**).

It was found that the incidence of malnutrition was 6.1%. Docetaxel regimen showed the highest incidence of malnutrition (18.8%) (Table **3**).

Table 2: Number of Patients According to BMI and Weight Loss after Treatment with Chemotherapy

Treatment regimen	BMI (kg/m^2)		Weight loss	
	Number (%)			
	<18.5	≥18.5	<5 %	≥5 %
Carboplatin+paclitaxel(n=62)	5	57	45	17
Cisplatin+gemcitabine(n=2)	0	2	2	0
Docetaxel(n=16)	3	13	10	6
Others(n=34)	3	31	25	9
Total(n=114)	11(9.7)	103(90.3)	82(71.9)	32(28.1)

Table 3: Number and Incidence of Malnutrition after Treatment with Chemotherapy

Treatment regimen	Number (%)		Incidence, n = 114
	Malnutrition	Normal nutrition	Malnutrition
Carboplatin+paclitaxel(n=62)	3(4.8)	59(95.2)	2.6
Cisplatin+gemcitabine(n=2)	0(0)	2(100)	0
Docetaxel(n=16)	3(18.8)	13(81.2)	2.6
Others T(n=34)	1(2.9)	33(97.1)	0.9
Total (n=114)	7(6.1)	107(93.9)	6.1

Table 4: Nutrition Status after Treatment with Chemotherapy According to Based Regimen

Based regimen	Number (%), n = 114	
	Malnutrition	Normal nutrition
Platinum + taxane-based (n=72)	3 (4.2)	69 (95.8)
Taxane-based (n=19)	3 (15.8)	16 (84.2)
Platinum-based (n=16)	0 (0)	16 (100)
Others (n=7)	1 (14.3)	6 (85.7)
Total (n=114)	7 (6.1)	107 (9.93)

Table 5: Pain and Nutrition Status of Patients after Treatment with Chemotherapy

	Number (%), n = 114	
	Malnutrition	Normal nutrition
Pain (n=36)	5(13.9)	31(86.1)
No pain (n=78)	2(2.6)	76(97.4)

Malnutrition were 15.8% and 4.2% in taxane-based regimen and Platinum plus taxane-based regimen respectively. These account for 85% (6 of 7) of all malnutrition developed patients (Table **4**).

Pain was found in 36 patients. Among these patients, 5 (13.9%) patients had malnutrition (Table **5**).

Factors are expected to affect malnutrition are age, sex, disease progression, number of chemotherapy cycles. This study found as the following, age: 7.3% and 5.1% of patients with malnutrition were aged less than 60 and older than 60 years respectively; sex: males exhibited malnutrition in 5 cases, 7.6% of males, while females had malnutrition in 2 cases, 4.2% of females; Stage of disease: malnutrition found in patients with stage III and stage IV disease, accounting for 20% and 5.6%, respectively; number of treatment cycles: 7 patients who with malnutrition were undergoing chemotherapy 4 cycles; Pain: 36 patients had painful complications, 50% of these patients lost weight more than 5% and 6 patients had BMI less than 18.5 kg /m^2.

DISCUSSION

The most widely used chemotherapy regimen in present study was docetaxel, the first choice of therapy for patients with NSCLC [6]. Before patients treated with taxane-based regimens they might receive other chemotherapy regimens which may also resulted in malnutrition. It was found that the chemotherapy regimen comprised of taxane had the highest incidence of malnutrition, these may result from this regimen causes gastrointestinal disturbances, including nausea, vomiting, anorexia, altered taste reception [7]. These adverse reaction effect to nutrition status of the patients.

Marin CMM *et al.* [4] report that the incidence of malnutrition in lung cancer patients was 30-60%. However, lung cancer patients in Marin C's report were NSCLC patients and were not treated with chemotherapy alone. In the present study, we recruited patient treatment with chemotherapy only. It was found that the chemotherapy regimen has the greatest incidence of malnutrition was docetaxel.

According to report of 66 breast cancer patients study, using the PG-SGA model for determine nutrition status [5], the malnutrition rate of 93.9% were reported. The difference in the incidence from present study may be caused by the different types of cancer and the nutritional assessment criteria using. Present study is a retrospective study, the data used for the nutrition assessment were only BMI, weight and height, while those study use PG-SGA [5] which data using were included others data of patients such as percent weight loss, eating ability, condition effecting to eat, activity and physical examination data. However, in present study, a BMI of less than 18.5 kg/m^2 and a weight loss of more than 5% were combined and would be appropriate to identify malnutrition. The using only BMI or the loss of weight has some limitation according to the different conditions of the disease such as high amount of water in body, edema, large mass of tumor, that is not truly reflect the patient's weight [3, 8, 9]. Previously studies were use BMI less than 18.5 kg/m^2 and weight loss of more than 5% in determining malnutrition and showed good relation to the change of nutrition status [8, 10].

The progression of lung cancer, stage 3 and 4 in the present study, is related in the same way to the change of nutritional status. This may be due to the tumors affect the eating ability including mental stress, pain, anorexia, nausea, vomiting and diarrhea, affect decreasing in absorption of food, affect metabolisms of carbohydrates, protein, and lipid. [11]. The greater the risk of malnutrition, the greater the stage, the more likely the patient to experience an abnormal metabolic condition, decreasing in eating, including the spread of the tumor area, which increase in cancer cells that more affect the body. In this study, stage 4 patients had malnutrition 5 times more than stage 3 patients.

Before each cycle of chemotherapy treatment, physician would assess patient about the response to chemotherapy and readily of patient depending on the ECOG score. Present study was not found malnutrition patient in 6th cycle group, but found in the 4th cycle group (9.3%). Patients receiving chemotherapy during 6th cycles may be more physically active, better nutrition status than patient in 4th cycles, enough to continue to 6th cycle.

Elderly patient's fat free mass (FFM), which consists of muscles, tissues, skin and bones, which decrease with age, but increase accumulation of fat mass, [11] resulting in high risk of malnutrition, influenced by both cancer and the effects of chemotherapy. In this study, the incidence of malnutrition is higher in younger patients, this may due to the physical characteristics of the elderly, the fat mass was higher that the malnutrition was assessed by BMI and weight loss may not be accurate. It should be assessed with other aspects such as eating habits, eating ability and digestive function.

Pain were more common in patients with a weight loss greater than 5 kg and most commonly in patients with BMI less than 18.5 kg/m^2. Patients with pain experienced a greater incidence of malnutrition than those with no pain. The results of the study were consistent with Kiss NK *et al.* [2], which shows that the pain is a part of the decline in eating. However, this study did not find any correlation between pain and nutritional status.

SUMMARY

Based on present study, chemotherapy of docetaxel and carboplatin plus paclitaxel have a significant impact on the nutritional status of patients. Healthcare professionals should be aware of the nutritional care of lung cancer patients receiving chemotherapy in the taxane group and should be closely monitored. Provide appropriate nutrition advice to patients, aim to increase the response to treatment and reduce side effects from chemotherapy and give patients better quality of life.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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