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Effect of Nutritional Formula on Fatigue Among Patients With Advanced Lung Cancer at a University Hospital-Egypt.

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Abstract:
Background: Lung cancer is the most common cancer and cause of death worldwide. Almost 50 percent of lung cancer cases are found in the developing countries. The estimated numbers of new lung cancer cases in the Arab world show a gradual increase every year. Cancer lung and its treatment modalities increase incidence of fatigue. Many studied documented that patients with cancer related fatigue described it as more distressing than other cancer-related symptoms such as pain, depression, and nausea. Correction of anemia, exercises, dietary supplements rich in vitamins specially beta-carotene, yoga, complementary and alternative medicine have been suggested as strategies/ guidelines of managing fatigue. Natural nutritional supplementations were recommended by oncologists, nurse specialists, as well authors in the field of applied nutrition and they recommend juicing fruits and vegetables. One of the recommended formulas for fighting fatigue consisted of carrot, beetroot, mixed with celery juice (energy juice). Carrot juice is known as a miracle juice as it removes bacterial infection, beetroot act as anti cancer factor as well as powerful blood detoxifying agent and celery juice is a source of folic acid, vitamin B1&6.
Aim of the Study: Was to identify the effect of the nutritional formula on fatigue among lung cancer patients at a University Hospital-Egypt.
Design: Time series longitudinal comparative study.
Research questions: **1-a-**What is the effect of the nutritional formula on fatigue among patients with advanced lung cancer before and after receiving chemotherapy?
1-b- Is there a difference between fatigue scores on the start of using the formula and at the end of rehydration period among patients with advanced cancer lung receiving chemotherapy?
2-a-Is there a relation between fatigue score prior and after taking the nutritional formula and the selected medical outcome (duration of illness, hemoglobin, WBCs)?
2-b-Is there a relation between fatigue score prior and after taking the nutritional formula and patients' age, metastasis occurrence and chemotherapy medication?
Sample: A convenient sample of thirty patients with advanced lung cancer receiving chemotherapy was collected over a year. Two tools were used to collect data; Demographic & Medical data assessment sheet and the Revised Piper Fatigue Scale (PFS-R[13]). Data were collected before receiving chemotherapy (on admission), one day after receiving chemotherapy (beginning of using the nutritional formula), after rehydration period (one week later), two weeks later & before discharge).
Results: Fatigue scores increased after receiving chemotherapy and began to decrease gradually after rehydration period, so there was a significant statistical difference between fatigue scores measured before and after the use of the nutritional formula. And there is a statistical significant difference over the four readings of fatigue scores reading and the selected medical responses (duration of illness Hgb 1st reading & 2nd reading, WBCs 1st reading), age.
Conclusion: The suggested nutritional formula helped in decreasing fatigue among lung cancer patients receiving chemotherapy.
Key words: Fatigue, cancer lung, chemotherapy, nutritional values (Carrots, celery, parsley).

Introduction:

Lung cancer was considered to be rare in the beginning of the 20th century but has now reached almost epidemic proportions (ABID, 2011). In 2008 it was the most commonly diagnosed cancer worldwide in males and the fourth among females, as well as the most leading cause of cancer death in males and the second among females (Jemal, Bray, Center, Ferlay, Ward & Forman, 2011 & ABID, 2011). Lung cancer accounts for 13% (1.6 million) of the total cases and 18% (1.4 million) of the deaths in 2008 (Salim, Jazieh and Moore, 2011) and it raised to three million per year by the year 2010 based on the GLOBOCAN, (2008) estimates. Global incidence of lung cancer is increasing at 0.5% per year (ABID, 2011 & American Cancer Society; 2011). Although the median overall incidence and mortality rates of lung cancer in the Arab world is one of the lowest in the world the forth coming prediction of estimated numbers of new lung cancer cases in the Arab world show

a gradual increase every year because of population growth, aging, increased smoking prevalence particularly in youth and women, as well as increased exposures to environmental pollutants in the region may play a critical role (Salim, Jazieh & Moore, 2011).

Regarding symptoms of cancer lung, many authors as; Abdel Qader in Ramadan (2012) & ABID (2011) & Alaa, etal, (2010) claimed that lung cancer is typically asymptomatic in its early stages of development, and even when symptoms appear, they are usually nonspecific. Consequently, American Cancer Society (2011) explained that symptoms of lung cancer are nonspecific as they may include persistent cough, sputum streaked with blood, chest pain, voice change, and recurrent pneumonia or bronchitis. Based on these facts Salim, Jazieh & Moore (2011) stated that the prognosis of lung cancer is very poor as the majority of lung cancer patients are diagnosed after the disease has progressed to a more advanced stage. The effect of smoking is a probable reason for poor survival among lung cancer patients. There is some evidence that smoking-related co-morbidities such as cardiovascular diseases or chronic obstructive pulmonary disease may have an additional negative impact on survival as well current or previous smoking reduces the effectiveness of radiotherapy or chemotherapy when treating lung cancer (ABID, 2011).

Fatigue is one of the most prevalent symptoms experienced by cancer patients (Cella, etal, 2001). Moreover, up to 90% of lung cancer patients experienced acute fatigue before and after cancer treatment (Hofman, Ryan, Figueroa-Moseley, Jean-Pierre & Morrow, 2007) and also later, in the terminal or survival phase of the illness (Collin, de Voge-Voogt, Visser & Van der Heide, 2008). This pervasiveness of fatigue in the cancer experience has suggested to coin the term “cancer-related fatigue” (CRF), as recommended by healthcare providers in 2003 for its systematic and accurate assessment (NCCN, 2009 & Piper, Borneman, Sun, Koczywas , Uman, Ferrell & James, 2008). Cancer-related fatigue (CRF) was defined by The National Comprehensive Cancer Network (NCCN) as: "a persistent, subjective sense of tiredness related to cancer or cancer treatment that interferes with usual functioning (American Cancer Society, 2003). Fatigue associated with cancer is not the kind that will disappear after taking a nap or get a good night's sleep, but tends to be more severe and ongoing (Morrow, 2005 ; Intercultural Cancer Counsel, 2008). Patients reported that CRF is more distressing and has a greater impact than other cancer-related symptoms such as pain, depression, and nausea (Morrow, 2007). The impact of fatigue is profound and affects the ability to work, walk short distances, be intimate and meet the families' needs. There is difficulty when performing even the simplest tasks such as cooking, cleaning, or taking a shower, making relatively simple decisions as well difficulty in concentrating. CRF also affects cancer treatment as it may compromise the timing or completion of treatment regimens either because fatigue is a dose-limiting, adverse effect or because it reduces the patient's willingness to adhere to treatment (Hofman, Ryan, Figueroa-Moseley, Jean-Pierre, & Morrow, 2007). Moreover, CRF is not predictable by tumor type, treatment, or stage of illness. Usually; it comes on suddenly, does not result from activity or exertion, and is not relieved by rest or sleep (Medicine, 2013). This impact is magnified by the increasing life expectancy of people with cancer and by the persistence of CRF for months—or even years—after the end of cancer treatment (Amen, 2010 & ICC 2008 & Morrow, 2007).

Cancer-related fatigue is a multi-factorial, multidimensional phenomenon which consists of physical, psychological, social, cognitive, and behavioral aspects (Servaes, Verhagen and Bleijenberg, 2002). The exact cause of cancer-related fatigue is unknown as it may be related to the disease itself (Gutstein, 2001) or its treatments including chemotherapy, radiotherapy, combination of both or biological therapy (Medicine, 2013). The pathogenesis of fatigue related to receiving chemotherapy involves its effects on the central nervous system, muscle energy metabolism, sleep or circadian rhythms (Parker, Bliwise, Ribeiro, et al., 2008), mediators of inflammation and stress (Cleeland, Bennett , Dantzer et al., 2003), immune activation (Collado-Hidalgo, Bower, Ganz et al., 2006 & Scott , McMillan , Brown et al, 2002) and hormonal changes related to effects on the hypothalamic–pituitary axis, premature menopause in women (Fan, Houe´ de´ -Tchen Yi et al. 2005), or androgen deprivation in men (Ryan, Carroll, Ryan et al. 2007). On the other hand, the National Comprehensive Cancer Network (NCCN) (2004) published the fact that seven factors are identified as frequently contributing to cancer-related fatigue: pain, emotional distress, sleep disturbance, anemia, nutritional deficiencies, deconditioning, and co-morbidities. Adding that, if none of these seven factors can be identified as being present, a comprehensive assessment is indicated, including a careful review of systems, evaluation of disease status, and review of current medications. Another study found that anemia and lack of sleep have both been strongly associated with onset of fatigue (Ahlberg, Ekman, Gaston-Johansson, & Mock, 2003). Older studies proved that fatigue is associated with the development of physical side effects of chemotherapy such as nausea, change in taste, mouth sores, chills, and vomiting (Jacobsen, Haan, Azzarello, Horton, Balducc & Lyman, 1999). On the

other hand, NCCN (2012) and Cancer Research UK (2012) claimed that cancer lung and other cancers that affect breathing are causes of fatigue.

Mock (2004) & Iop, Manfredi & Bonura (2004) stated that potentially useful treatments for cancer-related fatigue (CRF) can be classified into two main aspects pharmacological and non pharmacological. The pharmacologic interventions include erythropoietin for chemotherapy-induced anemia, correcting metabolic disorders; other cause-specific treatments such as antidepressants when depression is a cause of fatigue, and psycho- stimulants to help patients feel energized and less fatigued. Preliminary evidence from clinical trials of erythropoietin in anemic patients with nonmyeloid malignancies receiving chemotherapy indicates that increases in hemoglobin levels are reflected in improved energy and physical functioning, decreased fatigue, and increased quality of life. While, the non pharmacologic interventions for cancer-related fatigue include exercise and sleep therapy, behavioral therapy to modify sleep , and psychosocial support programs, cognitive therapy and coping strategies to reduce stress and conserve energy as well as nutritional support. These interventions were supported by Cancer Research UK (2012) and Carroll, Kohli , Mustian, et al (2007) also, mindfulness relaxation, and yoga were suggested by (Jean-ierre, Mustian, Kohli , et al. 2006).

World Cancer Research Fund (WCRF), (2007) issued a comprehensive report on the effects of foods and nutrients on the risk of cancer, based on systematic literature reviews commissioned from around the world, judged by 21 experts on nutrition and cancer. After careful adjustment for tobacco use history, the WCRF concluded there was an approximate 20% increased risk for incident lung cancer among those in the lowest quintile of fruit intake. These conclusions are consistent with the previously published conclusions of an expert panel convened by the American Cancer Society (ACS). The panel recommended to eat at least two servings of fruits containing vitamins specifically pro–vitamin A (antioxidant beta-carotene) each day would likely lead to reduced risk for lung cancer. They also reported that oral vitamin A & E supplementation might reduce risk of lung cancer and considered one of the main guidelines for better recovery of those patients as those vitamins are anticancer, antioxidants, but they claimed that vitamin A & E should be given through natural resources as parentral with smoking may precipitate cancer factors. Consequently many authors, nurse practitioners, oncology institutes proposed dietary guidelines and formulas aiming to improve the condition of patients with cancer treated with cytotoxic drugs. The highly recommended diet for those poor patients was that contain beta-carotenes. Formulas in the form of juices were recommended than steamed or completely cooked formulas. Apple, carrot, beetroots, celery, parsley, spinach were mentioned by many authors such as Coleman, (2012) and Evans, (2010), Eldridge, (2009) & Opptiz, (2008). The exact effect of the proposed formulas is not documented although many authors call them the energy juices and recommend it, thus this study was conducted to investigate the effect of natural formula on fatigue among patients with lung cancer who are treated with chemotherapy.

Significance of the study:

The researchers of the present study observed that many patients with cancer lung who are receiving chemotherapy in the inpatient floors of the Oncology and Nuclear Medicine unit at Kaser Al-Einy hospital refused to eat their meals either offered from hospital or from home. When interviewing those patients they reported that they found difficulties when eating any type of food because of dyspnea they claimed "either eat or breath", also they mentioned that the offered meals need chewing while they are easy fatigue. Adding that the unit offers to them caned beverage and juice which preferable to them to increase their energy, while the families of those patients (caregivers) were afraid that the patients' refusal of eating different food staff may lead to discontinuity of chemotherapeutic treatment plan. Those caregivers reported that some of their patients were ineligible for receiving chemotherapy and sessions were postponed. On the other hand, the researchers observed lately that fatigue is used as a medical diagnosis that indicates hospitalization among patients receiving chemotherapy, but there was no statistical support for that new termed medical diagnosis.

The National Cancer Institute (2010) reported that patients with lung cancer experienced fatigue because of the nutrition factor as fatigue often occurs when the body needs more energy than the amount being supplied from the patient's diet. In people with cancer, three major factors may be involved: a change in the body's ability to process food normally, an increased need by the body for energy (due to growth, infection, fever, or problems with breathing) and a decrease in the amount of food eaten (due to lack of appetite, nausea, vomiting, or intestinal obstruction) which ended up by anemia. Years of 2009 & 2010 were 177 & 154 respectively (Consensus of Oncology and Nuclear Medicine unit, Cairo University) of patients with lung cancer.

Many nursing studies documented the phenomenon of cancer related fatigue, such as the study which carried out by Abdel Raouf & Hashem (2005) who documented that fatigue was reported by 82% of the cancer patients as it's the second cancer problem priority for patients with different cancer lesion receiving chemotherapy, while few studies enclose some guidelines that might help in reducing that fatigue such as correction of anemia, practice exercises, proper sleep…etc. The researchers of the present study believed in two issues; the first is that nutritional plan is one of the major nurses' responsibilities even if the prognosis of the patients is poor and the second issue is; fatigue management is crucial role of the nurses to help patients to live with less pain, miniature discomfort and even to die with dignity.

Hopefully that this study will highlight the needs of those patients as well as help such poor patients with dietary guidelines helping to fight cancer treatment side effects. Also it is hoped that such study help in building the body of nursing knowledge, encourage nursing researchers to investigate other formula and find out helpful nutritious guidelines for patients with lung cancer and other cancer lesions.

Operational Definitions:

-Nutritional formula/(Energy Juice): Its ingredients are one small beetroot (the small ones are sweeter), two to three medium sized carrots and one stalk of celery. Patients take it twice daily. The (Energy Juice) ingredients were approved by Opptiz (2008). Also formula was approved by many authors as Presely (2011), Nelson (2010), Monson (2008), and Whitney-Chavez (2011)**.**

-Rehydration period/phase: The starting phase of giving the nutritional formula (Energy Juice) in addition to the recommended routine intravenous fluid based on the physician description which started after administering the chemotherapy for cancer lung patients.

-Selected medical responses: Hemoglobin (Hgb), white blood cells (WBCs) & duration of illness.

Aim of the study:

The aim of this study was to identify the effect of the nutritional formula on fatigue among lung cancer patients at a University Hospital-Egypt.

Research questions:

1-a-What is the effect of the nutritional formula on fatigue among patients with advanced cancer lung before and after receiving chemotherapy?
1-b- Is there a difference between fatigue scores on the start of using the formula and at the end of rehydration period (before discharge from hospital) among patients with advanced cancer lung receiving chemotherapy?

2-a-Is there a relation between fatigue score prior and after taking the nutritional formula and the selected medical outcome (duration of illness, hemoglobin, WBCs)?
2-b-Is there a relation between fatigue score prior and after taking the nutritional formula and patients' age, metastasis occurrence and chemotherapy medication?

2. Subjects & Method:

Design:

Time series longitudinal comparative study was utilized in this study.

Setting:

The study was conducted at the inpatient floors in the Oncology and Nuclear Medicine unit at Kasr Al-Einy hospital-Cairo University-Egypt. The inpatients floors are two which contain 50 beds for adults and 14 for children. Patients with advanced lung cancer always receive their chemotherapy at the inpatient department as their protocol of care include receiving either platinol or Fluorouracil; administration of oxygen in addition. Many of those patients stay for two weeks or more as they mostly experienced anemia, severe fatigue, recurrent vomiting, severe diarrhea & fluid and electrolytes imbalance until those problems subside then discharged till the date of the following session of chemotherapy according to their protocol of treatment.

Sample:

A total of 34 adult male and female patients with confirmed diagnosis of advanced lung cancer receiving chemotherapeutic agents intravenously in the Oncology and Nuclear Medicine inpatient unit at kaser El Einy hospital Cairo university. Data collection was over one year (from October 2010 to September 2011) constituted the study subjects. 4 patients were excluded during the different phases of the study because of metastasis to the brain and inability to come to the hospital. In addition patients who discontinued receiving chemotherapy more than once; so finally 30 patients continued till the end of the study. The 30 patients' age ranged between 20-64 years old.

Exclusion criteria were patients on mechanical ventilator as they have special total parental therapy, patients who dislike the formula taste as well as patients with other health problem that may provoke fatigue, patients with brain metastasis.

Tools:

Data of this study was collected by using the following tools: Demographic & Medical Assessment Sheet and the Revised Piper Fatigue Scale (PFS-R[13]).

1- Demographic & Medical Background Assessment Data Sheet: was developed by the researchers based on review of literature, it included three parts: the first part includes demographic data; age, gender, occupation and residence; the second part includes data related to medical background namely; patients' diagnosis (primary/ metastasis), duration of illness, name of chemotherapeutic agent, cycle number and session number. The third part includes data related to administration of chemotherapy intravenously and the date of obtaining these data. It includes blood picture results (hemoglobin and white blood cells count), presence of vomiting and diarrhea.

2- Revised Piper Fatigue Scale (PFS-R[13]): is a multidimensional instrument useful in fatigue assessment originating from a prior longer version of the scale (Dittner, Wessely & Brown, 2004) & (Piper, Dibble, Dodd, Weiss, Slaughter & Paul 1998). The scale consists of 22 items supplemented by 5 additional open-ended questions related to the temporal dimension of fatigue, its perceived cause, effect, relief, and additional symptoms not included in the scoring but are recommended to be kept on the scale as these items furnish rich, qualitative data. A principal component factor analysis groups the 22 items into 4 reliable and correlated dimensions: behavioral/ severity (6 items from2 to 7), relating to the severity and degree of disruption in activity of daily living; affective meaning (5 items from 8 to 12), relating to the emotional meaning attributed to fatigue; sensory (5 items from 13 to 17), relating to the physical symptoms; and cognitive / mood (6 items from 18 to 23), relating to mental and mood states. Scaling is based on a 0-10 range; total and subscale mean scores are derived from summing individual items and dividing by the number of items in the subscale/total scale to maintain the 0-10 scaling. Scoring system: To calculate the total fatigue score, add the 22- item scores together and divide by 22 in order to keep the score on the same numeric "0" to "10" scale. Severity Codes: 0=None; 1-3=Mild; 4-6=Moderate; 7-10= Severe. All the twenty two items=220, or by using the logic rule (1-3=Less than 73 Mild fatigue, 4-6= 73- to less than 146 Moderate fatigue, 7-10= 146-220 Severe fatigue). Other total scores calculation which divided the patients' feeling into good and bad. Patients who have score less than 110 consider (feeling good). While patients who have score 110 up to 220 consider (feeling bad). Piper, Dibble, Dodd, Weiss, Slaughter & Paul (1998).

The PFS-R13 demonstrated strong internal consistency reliability and construct validity (Clark, Ashford, Burt, Aycock and Kimble, 2006 & Annunziata, Muzzatti, Mella, Narciso, Giacalone, Fratino & Tirelli, 2010). Piper Fatigue Scale scores reliability was with (r = 0.80); high internal consistency (alpha= 0.98) and strong test-retest agreement (intraclass correlation coefficient = 0.98). (Strohschein , Kelly, Clarke, Westbury, Shuaib , Chan , 2003) The tool takes seven to ten minutes to be filled. This tool was translated into Arabic and tested for validity by Abo Daif (2004) on the study of correlates of fatigue among patients with chronic airway limitations.

The Nutritional formula (Energy Juice):

Components: one small beetroot (the small ones are sweeter), two to three medium sized carrots and one stalk of celery. Formula was suggested by Opptiz (2008). Also ingredients was approved by many authors as Presely (2011), Nelson (2010), and Monson (2008), and other authors such as Whitney-Chavez (2011) who mentioned that beetroot, carrot and celery are low in calories and contain no fat or cholesterol, also another

benefit was mentioned by Juice Therapy, This formula overcomes both kidney and liver problems and called as (Energy Juice).

Preparation:
Juice together in the order given; stir the juice to mix the flavors.

Amount:

Patients were advised to take it twice daily on an empty stomach. Vegetable juice is very perishable so it is best to drink all of the prepared juice immediately. To store the juice: Put juice in a glass jars with an airtight lid and fill it to the very top. There should be a minimum amount of air in the jar as the oxygen in air will oxidize and damage the juice. Wrap the jar with aluminum foil to block out all light. Light damages the juice. Store it in the refrigerator until about 30 minutes prior to drinking, as vegetable juice should be consumed at room temperature. The juice can be stored for up to 24 hours with only moderate nutritional decline (Opptiz, 2008).

Benefits of the formula ingredients (Energy Juice):

Beetroots: The best way to enjoy the nutritional value of beets is by drinking freshly extracted raw beet juice. The juice of raw beetroot contains a host of health benefits, and is classed as a**" super food"** in today's nutritional jargon (Evans, 2010 & Coleman, 2012)**.** The more important benefits of beet juice are: **1) Antioxidants** as it can help reduce the oxidation of LDL cholesterol which could lead to damaged artery walls and ultimately heart attacks and strokes. Help in lower hypertension. **2) Anti-carcinogenic** as the deep red color of beetroot comes from betacyanin which prevents from cancer specially cancer colon. 3**) Vitamins source** as beetroots are a good source of folic acid and vitamin C. It also contains small amounts of vitamins B1, B2, B3, and vitamin A in the form of beta-carotene. Consequently increase the oxygen-carrying ability of the blood by up to 400 per cent. 4) **Rich in minerals** such as calcium, magnesium, phosphorus, potassium, and sodium. Also, smaller amounts of iron, zinc, copper, manganese, and selenium. 5) Provide small amounts of all the **amino acids**. 6) Contain **Silica which help in** perfect utilization of calcium in the body and is also required for healthy skin, hair, nails and bones. 7) Provide **calories** as one (5cm) beetroot contains 35 calories. 8) **detoxifies the liver** as it encourages liver cleansing, improves liver functioning. (Evans, 2010 & Agro, 2008).

Carrot: Carrot juice is known as a miracle juice. Of the many vitamins in the carrot juice the most important is Vitamin A and next is Vitamin E. It is present in three chemical forms – alpha, beta and gamma to co-pherrol which are collectively known as Vitamin E. complex. Carrots contain the cartenoid alpha carotene, beta-carotene and potent antioxidants. Recent studies published in the "Antioxidant Miracle," indicate that alpha carotene is a more potent cancer preventative and fighter than even beta-carotene. Carrots contain one of the few cartenoids with pro Vitamin A activity, which means that the body converts the beta-carotene into Vitamin A as needed. In addition, carrots contain calcium pectate, a source of soluble fiber, Vitamin B-complex, C, D, E and K, iron, calcium and phosphorous and manganese (Connell, 2011). According to the "Antioxidant Miracle," carrot juice provides powerful antioxidants that support health and the immune system. The advantages of having carrot juice was summarized by Oppitz (2008) the nurse working in Itasca Naturopathic Clinic as follow: eliminates toxins, aids digestion, improves and maintains bone and teeth, improves muscle tone, helps prevent infections of respiratory organs, reduces ulcerous and cancerous conditions, helps protect the nervous system, increases vitality, and restores normal responsiveness to adrenal glands. Moreover, carrot can be used to treat the following: anemia**,** cancer, acidosis, atherosclerosis, upper respiratory congestion, emphysema, constipation**,** inflammations (its anti-inflammatory effect greatly helps reduce arthritis, rheumatism, gout and other inflammations), high cholesterol, boosting the immune system by increasing the production and performance of white blood cells and building resistant to various kinds of infections and reducing water retention (Carrot juice, 2013).

Celery Juice: Celery juice is very low in calories and has no fat, although it is high in vitamin C and vitamin A. Celery juice is also high in dietary fiber and a good source of folic acid, potassium, vitamin B-1 and vitamin B-6. Although celery juice contains a higher level of sodium than other vegetables juices at 115 milligrams per serving, the sodium is generally offset by the high levels of potassium. Celery juice has a phytochemical compound known as coumarins which may help treat cancer, prevent migraines and lower blood pressure. (Nutritional-Value, 2013).

Ethical consideration:

Permission to conduct the proposed study was obtained from the head of Oncology and Nuclear Medicine unit. Prior to the initial interview, the researchers introduced themselves to patients who met the inclusion criteria; each potential patient was fully informed with the purpose and nature of the study, and then an informed consent was taken from participants who accept to participate in the study. The researchers emphasized that participation in the study is entirely voluntary and withdrawal from the study doesn't affect care provided; anonymity and confidentiality were assured through coding the data.

Pilot Study:

Once permission was granted to proceed with the proposed study, a pilot study was carried out on 5 patients to test the feasibility and clarity of the used tools as well the accessibility of the formula; no tool modifications was needed. The sample included in the pilot study was excluded from the final study sample.

Procedure:

This study was conducted through two phases preparatory and implementation phase.

Preparatory phase:

During this phase, approval of Oncology and Nuclear Medicine unit professors about using the formula was carried out after discussion of its components, benefits, methods of preparation and preservation. The Demographic & Medical Background Assessment Data Sheet was constructed after extensive review of literature and discussion of chemotherapy protocols among patients with advanced lung cancer with the responsible physicians and nurses at the Oncology and Nuclear Medicine unit. Also the nutritious formula/Energy Juice (two medium carrots, one medium beet roots and one root of parsley) make all juice to maintain its nutritive value was tested for price and facility to performance. Pilot study was carried out on five patients by using (Demographic & Medical Background Assessment Data Sheet and the Revised Piper Fatigue Scale (PFS- R^{13}) tools as well the nutritional formula/Energy Juice.

Implementation phase:

The patients meeting the inclusion criteria were approached individually after admission, the purpose and nature of the study, procedures and tools were explained; a written consent was taken from the patients who accept to share in the study. Data were collected during the whole academic year (October 2010 to September 2011). The routine of admission to receive chemotherapy at the Oncology and Nuclear Medicine unit is to take blood sample to check hemoglobin, white blood cells count, PT & PTT; if the results are within normal range the patient is enrolled to administer chemotherapy at the afternoon shift, consequently the patients recruited in the present study were interviewed using the Revised Piper Fatigue Scale (**PFS-R^{13}**).
The Assessment Data Sheet (Demographic and Medical Background) were obtained from patients' file and from a member of his/her relative, while the data related to administration of chemotherapy intravenously were obtained (WBcs, Hbg) just before receiving the chemotherapy session to prove if the patient was eligible for starting the session. This data was recorded as baseline assessment, followed by structured interview through which **the first reading** as a baseline of fatigue by using the Revised Piper Fatigue Scale (**PFS-R^{13}**) which was carried out by the researchers. Then the patients received the chemotherapy at the afternoon shift. And the researchers explained to the patients the nature of the formula and how to take it (twice daily on a merely empty stomach).

Knowing that the rehydration phase (increase intravenous fluid and enhance oral fluid) begins after chemotherapy administration which takes from five to seven days according to patients' condition; researchers advised the participants to avoid taking the ordinary oral beverage/caned juice and replaced it by the recommended Energy Juice. A week later and during the morning shift/afternoon shift, the first follow-up (**second reading**); data were collected by using the **PFS-R^{13}**); Two weeks later the second follow up (**third reading**) was obtained by using the **PFS-R^{13}**). Finally within three to four weeks later patients are usually discharged so the third follow up (**Forth/ reading**) was carried out (the medical background data were re-obtained as well the fatigue level using **PFS-R^{13}**. Over the study period; patients and their caregivers were contact with the researches face to face and by the cell phone to communicate at any time in order to reassure them and to ensure the using of the formula as well to check the presence of any symptoms/problems.

Statistical Analysis:

The collected data were coded and tabulated by using a personal computer. Statistical package for social science (SPSS) version 16 was used. Descriptive and Inferential statistics were used to answer research questions. Percentage distribution, mean and standard deviation were calculated. In this study t-test was used to compare means between fatigue scores, complete blood picture results on admission and prior to discharge, and the Pearson correlation coefficients for various factors which may affect fatigue as; age, hemoglobin results, white blood count. Correlations were done to find the relation between fatigue scores & blood test results (hemoglobin, WBCs) patient' age, duration of illness and metastasis. Statistical significance was considered at p-value 0.001.

3. Results:

Findings of this study will be presented in three main sections: **I)** Description of the study subjects' characteristics (socio-demographic and medical related data). **II)** Differences between fatigue scores on admission and prior to discharge. **III)** Correlation between fatigue scores and (selected medical responses, patients' age, metastasis occurrence and medication).

I) Description of study subjects' characteristics:

The recruited patients in this study were 24 males and 6 females with definite diagnosis of advanced lung cancer and treated with chemotherapeutic drugs (Fluorouracil or platinol). **(Table: 1)** showed that the majority of the male developed cancer as a primary lesion (83.3%) while female patients developed cancer lung as a metastasis from cancer breast. The age of the patients ranged between 20 and 64 years old with mean equal 39.43 $\pm$ 12.95, there was approximate equal distribution of patients in relation to age categories. While the duration of illness ranged between 6 months and 4 years. Almost two thirds of the patients were receiving Fluorouracil (5-FU) (66.7%) and the patients were distributed between the chemotherapeutic cycles in an equal manner.

II) Differences between fatigue scores on admission and prior to discharge:

As regards the comparison of the four total fatigue readings, **(table: 2-1)** showed that the least total fatigue score was observed before administration of chemotherapy (on admission) and the worse fatigue score was directly after receiving the chemotherapy in the 1st follow up with 100% was feeling bad; the total fatigue score prior receiving chemotherapy was about two thirds (63.3%) of the respondents were less than 110 which means feeling good, (0%) in the 1st follow up and again it started to be good with (43.3%) of patients in the 2nd follow up and increased to be (53.3%) before patient discharge; with mean$\pm$SD= 109.77$\pm$58.39, 166.03$\pm$43.18, 137.03$\pm$48.05 & 116.47$\pm$52.85 respectively. In relation to fatigue dimensions **(table: 2-2)** showed that on admission the patients were approximately distributed equally over the mild, moderate and severe levels however it started to be vary over the follow up readings in relation to the behavioral/severity, affective, sensory and cognitive dimensions. Moreover the fatigue scores improved by the last reading among all the fatigue dimensions when comparing it with the 1st follow up after receiving the chemotherapy. On the other hand, **(table 2-3)** showed that the highest mean of differences was between the 2nd and the 3rd reading= 14.63. And **(table 2-4)** showed that there was a perfect statistical significant correlation between the 1st, 2nd, 3rd, 4th total fatigue score readings & fatigue dimensions; as all correlations are higher than 0.85 within each fatigue dimension and over the four fatigue scale readings.

III) Correlation between fatigue scores and (selected medical responses, patients' age, metastasis occurrence and Medication):

(Table: 3-1): Regarding the correlation between the total fatigue scores among the patients with selected medical responses (Hgb, WBCs, duration of illness), patients' age there was a statistical significant difference of the total fatigue scores over the four readings except the 1st reading of WBCs and total fatigue scores as it was -0.15. However the strongest correlation found with the patients' age specially before patients' discharge (4th reading)=0.83. **(Table: 3-2**) showed moderate correlation between patents' age & (Hgb, WBCs) levels specially before patients discharge as it was -0.65, -0.67 for Hgb & WBCs respectively. While **(table: 3-3)** represented the mean of difference between metastasis occurrence, chemotherapy administration (platinol/5-FU) & different total fatigue score four readings which showed difference with only metastasis & 1st, 2nd,3rd,4th

readings= 3.55, 3.34, 3.89, 4.46 respectively. Moreover **(table: 4)** showed that 10% in the 4th reading experienced fatigue for weeks comparing to 13.3% in the 1st, 2nd,3rd readings. The frequency of factors which caused fatigue over the four readings represented that it was 3.3%, 10% & 83.30% exposure to pollution & smoking, activity of daily living (ADL) & receiving chemotherapy respectively. Factors which relieving fatigue represented that nothing relieving fatigue were the highest frequency with 56.6% in the 1st reading while it was increased to be 73.3% in the 2nd reading. But it was being reduced as 60% & 76.7% in the 3rd & in the 4th reading respectively claimed that the given nutritional formula (energy juice) helped them to relieve their fatigue level. Moreover 93.2% at the 1st & 4th readings described fatigue as feeling tiredness. Regarding experienced any other symptoms; 36.6% in the 4th reading reported that they had regular bowel movements comparing to 3.3% only on the 2nd reading; while patients who were suffering from shortness of breath was decreased to be 60% in the 4th reading comparing to the 2nd reading which was up to 83.3%.

I) Description of the study subjects' characteristics (socio-demographic & medical related data).

Table 1- Characteristics of the patients recruited in the study: (n=30).

Characteristics	**Number**	**Percentage**
Gender		
Male	24	80%
Female	6	20**%**
Age Mean±SD = 39.43 ± 12.95		
20-	9	30%
30-	8	26.7%
40-	7	23.3%
50-64	6	20%
Duration of illness		
< 1 year	9	30%
1year>2years	10	33.3%
2 year>3years	3	10%
3 year≥4years	8	26.7%
Cancer type		
Primary	25	83.3%
Secondary	5	16.7%
Chemotherapeutic agent		
Fluorouracil (5-FU)	20	66.7%
Platinol	10	33.3%
Chemotherapy cycle		
1st	9	30%
2nd	9	30%
3rd	6	20%
4th	6	20%

II) Differences between fatigue scores on admission and prior to discharge.

Table 2.1: Total fatigue scores levels among lung cancer patients' receiving chemotherapy on admission, 1st, 2nd and 3rd follow up; by using the Revised Piper Fatigue Scale (PFS-R[13]): (n=30).

Total fatigue scores levels	On admission Mean±SD 109.77±58.39		1st Follow up A week later Mean+SD 166.03±43.18		2nd Follow up Two weeks later Mean+SD 137.03±48.05		3rd Follow up Before discharge Mean+SD 116.47±52.85	
	N	%	N	%	N	%	N	%
0 - >110 *feeling good*	19	63.3%	0	0%	13	43.3%	16	53.3%
110 - ≥ 220 *feeling bad*	11	36.7%	30	100%	17	56.7%	14	46.7%

Table 2-2: Distributions of Piper fatigue scale dimensions on admission, 1st, 2nd and 3rd follow up readings (PFS-R[13]): (n=30).

Revised Piper Fatigue Scale Dimensions	On admission Baselnie		1st Follow up A week later		2nd Follow up Two weeks later		3rd Follow up Before discharge	
	N	%	N	%	N	%	N	%
Behavioral/ Severity								
-None (0)	0	0%	0	0%	0	0%	0	0%
-Mild (1-3)	17	56.7%	4	13.3%	10	33.3%	11	36.7%
-Moderate (4-6)	2	6.6%	12	40%	10	33.3%	17	56.7%
-Severe (7-10)	11	36.7%	14	46.7%	10	33.3%	2	6.6%
Total	**30**	**100**	30	**100**	**30**	**100%**	**30**	**100**
Affective								
-None (0)	0	0%	0	0%	0	0v	0	0%
-Mild (1-3)	9	30%	0	0%	0	0%	6	20%
-Moderate (4-6)	10	33.3%	8	26.7%	13	43.3%	11	36.7%
-Severe (7-10)	11	36.7%	22	73.3%	17	56.7%	13	43.3%
Total	**30**	**100**	**30**	**100**	**30**	**100**	**30**	**100**
Sensory								
-None (0)	0	0%	0	0%	0	0%	0	0%
-Mild (1-3)	8	26.%7	0	0%	0	0%	8	26.7%
-Moderate (4-6)	12	40%	9	30%	13	43.3%	13	43.3%
-Severe (7-10)	10	33.3%	21	70%	17	56.7%	9	30%
Total	**30**	**100**	**30**	**100**	**30**	**100**	**30**	**100**
Cognitive/ Mood								
-None (0)	0	0%	0	0%	0	0%	0	0%
-Mild (1-3)	10	33.3%	0	0%	3	10%	8	26.7%
-Moderate (4-6)	11	36.7%	13	43.3%	17	56.7%	14	46.6%
-Severe (7-10)	9	30%	17	56.7%	10	33.3%	8	26.7%
Total	**30**	**100**	**30**	**100**	**30**	**100**	**30**	**100**

Table 2-3: Mean of difference among patients fatigue scale on 1st (on admission), 2nd, 3rd and 4th readings (PFS-R13): (n=30).

Total sheet score	1st & 2nd reading	2nd& 3rd reading	3rd & 4th reading	1st & 4th reading
t-test results	-8.41*	14.63*	7.28*	-1.22

Sig=0.001*

Table 2-4: Correlation of fatigue dimensions & the total Piper Fatigue scale (PFS-R13) readings on dimension (1st) reading , one week later (2nd) reading, two weeks later (3rd) reading and before discharge (4th) reading: (n=30).

The four (dimensions) fatigue sub-scale readings	1st total Piper scale reading On admission	2nd total Piper scale reading A week later	3rd total Piper scale reading Two weeks later	4th total Piper scale reading Before discharge
Behavior/Severity:				
-1st reading	0.98*			
-2nd reading		0.99*		
-3rd reading			0.98*	
-4th reading				0.89*
Affective:				
-1st reading	0.96*			
-2nd reading		0.96*		
-3rd reading			0.98*	
-4th reading				0.92*
Sensory:				
-1st reading	0.99*			
-2nd reading		0.96*		
-3rd reading			0.98*	
-4th reading				0.93*
Cognitive/Mood:				
-1st reading	0.96*			
-2nd reading		0.97*		
-3rd reading			0.96*	
-4th reading				0.89*

Sig=0.001*

III) Correlation between fatigue scores and (selected medical responses, patients' age, metastasis presentation and Medication).

Table 3-1: Correlation between total scores on on 1st (on admission), 2nd 3rd and 4th readings of the Revised Piper Fatigue Scale (PFS-R13) and selected medical responses: (n=30).

Total Fatigue scores	Age	duration of illness	Hb 1st reading On admission	Hb 2nd reading Before discharge	WBCs 1st reading On admission	WBCs 2nd reading Before discharge
1st reading	0.60*	0.56*	-0.36*	------	-0.15	------
2nd reading	0.80*	0.47*	------	------	------	------
3rd reading	0.82*	0.51*	------	------	------	------
4th reading	0.83*	0.60*	------	-0.63*	------	-0.50*

Sig=0.001*

Table 3-2: Correlation between patients' age & (hemoglobin, WBCs): (n=30).

Selected medical responses		Age
-Hemoglobin	(On admission)	-0.61*
-Hemoglobin	(Before discharge)	-0.65*
-WBCs	(On admission)	-0.52*
-WBCs	(Before discharge)	-0.67*

Sig=0.001*

Table 3-3: Mean of difference of (metastasis, chemotherapy medications) & total fatigue score: (n=30).

Total Fatigue scores	Metastasis (yes/No) Independent t-test	Chemotherapy medication (Platinol/5-FU) Independent t-test
1st reading (On admission)	3.55*	0.40
2nd reading (A week later)	3.34*	0.58
3rd reading (Two weeks later)	3.89*	0.73
4th reading (Before discharge)	4.46*	1.03

Sig=0.001*

Table 4: Distribution of the patients' responses to additional qualitative items of fatigue Piper scale (PFS-R[13]): (n=30) .

Piper scale Additional Qualitative Items	On admission (Baseline) 1st reading		A week later 2nd reading		Two weeks later 3rd reading		On discharge 4th reading	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**
How long have you been feeling fatigue								
-Not feeling fatigue	0	0%	0	0%	0	0%	0	0%
-Minutes	12	40.0%	0	0%	4	13.3%	10	33.3%
-Hours	8	26.7%	7	23.3%	10	33.3%	10	33.3%
-Days	4	13.3%	13	43.3%	10	33.3%	5	16.7%
-Weeks	4	13.3%	4	13.3%	4	13.3%	3	10.0%
-Months	2	6.7%	6	20.0%	2	6.7%	2	6.7%
Total score	**30**	**100%**	**30**	**100%**	**30**	**100%**	**30**	**100%**
The most directly contributing to or causing respondents fatigue								
-Receiving chemotherapy								
-Exposure to pollutants	25	83.3%	25	83.3%	25	83.3%	25	83.3%
-Activity of daily living	1	3.3%	1	3.3%	1	3.3%	1	3.3%
-Smoking	3	10.0%	3	10.0%	3	10.0%	3	10.0%
Total score	1	3.3%	1	3.3%	1	3.3%	1	3.3%
	30	**100%**	**30**	**100%**	**30**	**100%**	**30**	**100%**
The best thing you have found to relieve your fatigue								
-Increase sleeping hours	13	43.3%	4	13.13%	4	13.3%	3	10%
-Nothing	17	56.7%	18	73.3%	1	3.3%	0	0%
-O2 administration	0	0%	4	13.3%	15	23.3%	4	13.3%
-Nutrition formula	0	0%	4	13.3%	20	60%	23	76.7%
Total score	**30**	**100%**	**30**	**100%**	**30**	**100%**	**30**	**100%**
Descriptions of fatigue added by the respondents								
-Tiredness	28	93.2%	1	3.3%	14	46%	28	93.2%
-Unable to do muscular effort	2	6.8%	1	3.3%	4	13.3%	0	0%
-Unable to go out of bed	0	0%	15	50%	4	13.3%	1	3.3%
-Unable to chew	0	0%	0	0%	4	13.3%	1	3.3%
-Unable to sleep	0	0%	10	33.3%	4	13.3%	0	0%
Total score	**30**	**100%**	**30**	**100%**	**30**	**100%**	**30**	**100%**
Are you experiencing any other symptoms right now								
-Regular bowel movement	0	0%	1	3.3%	10	33.3%	11	36.6%
-Abdominal distension	0	0%	4	13.3%	1	3.3%	1	3.3%
-Shortness of breath	30	100%	25	83.3%	19	63.3%	18	60%
Total score	**30**	**100%**	**30**	**100%**	**30**	**100%**	**30**	**100%**

Discussion:

This research presents findings related to the effect of nutritional formula (Energy Juice) on fatigue among patients with advanced lung cancer receiving chemotherapy only. Patients with co-morbid diseases were excluded from the study in order to control their possible impact on fatigue.
In relation to the **1st research question(s);** results of this research showed that the study subjects' characteristics go in accordance with the incidence of the disease as the majority of the patients were male, ex. smokers, their working were workers, drivers, farmers and teachers, and they were suffering from primary lesion of cancer lung. On the other hand the minority of the sample were female, housewives and developed cancer lung as secondary metastasis; after cancer breast. More than one third of the sample was from Gizza-Egypt. The age of the respondents ranged between 20-64 years with mean of 39.43 ± 12.95 years as well as there was nearly approximate equal distribution of patients in relation to age categories and the higher distribution of male patients was among the younger age group i.e. between 20 up to 50 years old and the female age was at the age of 60 up to 64. This results contradicts the findings of Youlden, Cramb and Baade (2008) who found that cancer lung rarely occurs before the age of 50 years, after which incidence rates increase with age to peak at 70-79 years for males and females.

In relation to the duration of illness, Most of the sample (almost two third) suffered from lung cancer illness between 2 months up to 24 months; while the rest exceeded the 24 months up to 48 months. The majority of the sample was suffering from primary cancer. Two third of the sample was undertaken flurouracil (5-FU) treatment and was either between first or second chemotherapy cycle. This finding goes with Alaa; etal (2010) who observed that none of the patients exceeded five years survival. He stated that the majority of patients with lung cancer are diagnosed at a late stage and, 15% survive 5 years. Second, risk paradigms are changing, from smoking only to occupational, environmental or home carcinogens to the risk associated with premalignant airway changes. Third, advances in early diagnostic options have the potential to discover lung carcinoma while still in a preinvasive stage, minimally invasive stage or as small peripheral nodules. Moreover this study found that all the patients recruited in the study experienced fatigue with different levels which congruent with Cancer Research UK (2012) which revealed that one hundred percent of the patient experienced fatigue for patient with lung cancer. And they added that chemotherapy was the main treatment for small cell lung cancer as it can help to shrink or slow the growth of locally advanced or metastatic NSCLC. It can also help to control symptoms for some people. The drug of choice to treat cancer lung based on their study was cisplatin.

Fatigue is a near universal problem that affects approximately three quarters or more of the people and it is the most common side effect of cancer experience. Fatigue affects more than half of the people on most days, and it affects their daily lives (ICC 2008). On the other hand, Morrow (2007) clarified that fatigue has both subjective and objective components and may involve dysfunctions in physical symptoms (physical weakness or tiredness), mood (depression), motivation (lack of initiative or motivation), cognition (impairment of cognitive function), and social functions (reduced ability to sustain social relationships). Cancer-related fatigue is the most common side effect of cancer and cancer treatment. Research suggests that anywhere between 70% and 100% of cancer patients getting treatment have fatigue. And about 30% to 50% of cancer survivors have said that their fatigue lasts for months or even years after they finish treatment (American Cancer Society,2012). Moreover fatigue often begins before the cancer is diagnosed, typically increases during the course of cancer treatment, and then declines somewhat but persists at a higher than baseline rate after treatment is completed (Andrews, Morrow GR,Roscoe et al. In: Arms, Meinir, Higginson; 2004).

In the current study it was observed that fatigue increased after receiving chemotherapy (2nd reading) than on admission. So chemotherapy defiantly induced more fatigue among the recruited patients. Table (2-1) Shows that among fatigue score it was observed that the best result was prior taking the chemotherapy as almost two third of the sample was feeling good as they was only suffering from cancer pain (if it is existed) as some of them has no pain, however once the chemotherapy cycle started patients fatigue experience increased; as all of them there feeling was bad based on the (1st follow up) 2nd reading; inspite of starting taking the nutritious formula. But effect of the formula detected from the third reading through the forth reading as patients' fatigue experience improved gradually, even many of those patients reported that they can do their activity of daily living better than before and even constipation problem which they had before has been solved. Moran, (2011) reported that fatigue often occurs due to less than optimal dietary habits, and patient can help fight fatigue with root vegetables. She added that Carrots are the most popular and widely available root vegetable which fight fatigue. Moreover Beetroot are rich in vitamins A, B1, B2, B6, folic acid B12 and C. Some of their many mineral properties are folic acid, potassium, calcium, sodium, magnesium, iron, phosphorus and many antioxidants. The pigment betacyanin, which is responsible for the beet's deep, red-magenta color is also a

powerful antioxidant. Moreover Frenszi, 2011 mentioned that mix carrots with beet roots are effective as non-pharmacological management for cancer patient treatment.

Moreover the (table: 2-2) showed that on admission the patients were approximately distributed equally over the mild, moderate and severe levels except the behavioral dimension; however it started to be vary starting from the 1st follow up reading; specially the affective & the sensory dimension as most of the sample deviated to the severe level in both mentioned dimensions; while it started to be almost distributed in a balance way over the four dimensions in the last reading. Inspite that none of the recruited sample has zero reading over the fatigue rating scales (0 to 10); which reflected that all of them were suffering from fatigue over the four readings in different distributions but it was noticed that severity of fatigue over the four dimensions was reduced by the last reading in other word this was after taking the nutritional formula almost over 3/4 weeks. In addition the researchers found that the highest mean of difference was observed between the second and the third total PFS score (table 2-3) which gave explanation that improvement of fatigue generally takes time until the nutritional formula (Energy juice) antioxidants has an effect on the fatigue improvement and a strong correlation was observed between all four fatigue dimensions (behavior/severity, affective, sensory, cognitive) and the total PFS scale score (table 2-4) which gave an indicator that each dimension played a vital role in the overall patient fatigue degree. The researchers added that obviously if controlling of any fatigue dimensions achieved; this would cause strong positive impact on the overall fatigue score/outcome in general.

Accordingly the researchers can be answered by (yes) there was a difference between higher scores of fatigue score after receiving chemotherapy & lower fatigue score after administration of the nutritional formula (Energy Juice). Despite the availability of some treatment options and a great deal of ongoing research, fatigue is nevertheless often viewed by clinical staff, caregivers, and the patients themselves as an inevitable consequence of cancer and cancer treatment. (Stone, Richardson, Ream et al.; 2000). Adding calories by doubling or tripling fruit intake among lung cancer survivors using this same type of intervention might offer important extra benefits in maintaining body weight and improving well-being as the possible effects on lung cancer prognosis are being assessed. (BYERS, 2008): Cisplatin/platinol side effects; was found that the most common problems experienced during cisplatin therapy and overdosage include nephrotoxicity, electrolyte disturbances, myelo suppression, neurotoxicity, anaphylactic reactions, and ototoxicity. Side effects with cisplatin include: fatigue: - this is the most common cisplatin side effect and can last several weeks or months after treatment are completed. Some people experience shortness of breath. Nausea from cisplatin can be severe; however anti-nausea medicines can significantly reduce this cisplatin side effect. Kidney damage can occur with cisplatin treatment. The best way to reduce the side effects of cisplatin is to vitamin E (Sahelian) expert in nutrition and dietary supplement. And this research finding congruent with the current research finding (table: 4) as the majority of the studied sample experienced shortness of breath in the 2nd reading but it was improved gradually to be almost reduced to two third only of the sample before patients' discharge and after taking the (energy juice) for almost one month twice daily.

In relation to the **2nd research question(s);** Regarding the selected medical responses; it was found that generally in the first hemoglobin measurement comparing to the last measurement was either between below normal or on border normal (7-11) g/dl, and this expected because of chemotherapy side effects as well as excessive vomiting and malnutrition, this finding supported by European Cancer Anaemia Survey (ECAS), as a study conducted across 24 nations in Europe, reported that about 83% of patients who received chemotherapy demonstrated anemia [defined as a hemoglobin (Hb) < 12.0 g/dL] (Barrett-Lee et al., 2006). Moreover Anemia often increases symptoms such as fatigue, weakness, and dyspnea; thus, it may worsen quality of life and performance status in cancer patients (Bremberg, Brandberg, Hising, Friesland, & Eksborg, 2007; Kosmidis & Krzakowski, 2005). While the researchers found that WBCs remains within normal regarding the two measurements (on admission & before discharge) and this gave an indicator that the health team may be concerned more about the immunity indicator rather than any other indicators and WBCs might take more time to be affected than Hgb. On the other hand the researchers claimed that the nutritional formula might play a vital role in maintaining patients' immunity. A research conducted by Komorizono, Kohara, Oketani, Maeda & Shibathou (2003) which aimed to evaluate the efficacy and adverse events of systemic combined chemotherapy with low dose of 5-fluorouracil, the study revealed a contrary result as patients' complicated by leukocytopenia.

Moreover, factors affecting fatigue result, table (3-3) was observed that patients with no metastasis their fatigue score was better whereas there was no difference between patients who were undertaking flurouracil or platinol treatment regarding fatigue score. On the other hand in relation of taking the nutritious formula it was found that duration of illness and also different ages affect the fatigue score as one third of the sample ranged

between 20 to 30 years old that might explain that there was a relation between the fatigue score and patients age as much as age increased the fatigue scores becomes bad. Vertuani, Silvia; Angusti, Angela; Manfredini, Stefano (2004) revealed that the action of one antioxidant may depend on the proper function of other members of the antioxidant system. The amount of protection provided by any one antioxidant will also depend on its concentration, its reactivity towards the particular reactive oxygen species being considered, and the status of the antioxidants with which it interacts, so age could play a role to specify the antioxidant food amount for patients.

The following finding was expected as there was a correlation between Hgb, WBCs and patients age as cells formation/replacement became slower as much as human became older so aged patients might need more attention and even boost the nutritious formula to get more improvement. Tables (3-1 & 3-2) highlighted the effect of the nutritional formula (Energy Juice) on the selected medical responses (Hemoglobin & WBCs) as correlations in relation to fatigue scores improved gradually and it was clear at the last Hgb reading (before patients discharge) & total fatigue score. Researchers claimed the improvement of fatigue as a result of antioxidants formula in the nutritional formula (Energy Juice) which played a gradual vital role on the improvement of hemoglobin level as antioxidant cleaning up the blood from harmful circulated substances and gives chance to hemoglobin cells production to be healthy; specially for those patients who were suffering from cancer lung which duplicate the negative fatigue impact as in addition to chemotherapy side effects on hemoglobin formation; the cancer lung played a role to interfere against gas exchange process. Moreover the researchers found a relation between patients' age who undertaken chemotherapy and (PFS-R13) total score result specially the reading before patients discharge which showed a perfect correlation which reflected that; inspite (PFS-R13) score affected by patients' age but it showed improvement resulted of using the energy juice twice daily over a month. Parallel finding was noticed regarding correlation between the (PFS-R13) total score readings and duration of illness which validate the positive effect of the nutritional juice specially before patients discharge.

On the other hand WBCs was within normal range from the beginning of the research which helped the body to control and get rid of the microorganisms and harmful circulated substances and compacted fatigue much better. In addition (table 4) and based on coding of the qualitative finding the researchers reported that one third of the sample reported that their fatigue feeling generally reduced to be only few minutes comparing to the second reading. Moreover majority of the patients claimed that factor which directly contributing or causing respondents fatigue was receiving chemotherapy. And they added that the best thing they have found to relieve their fatigue was the nutritional formula (Energy Juice) as almost most of them reported that. And the majority of them over the four readings described fatigue as tiredness. To conclude the nutritional formula (Energy Juice) had an observable positive effect on the improvement of fatigue for patient with lung cancer receiving chemotherapy but medical responses as (WBCs, Hg…etc) need more attention and further studies in relation to the nutritional formula & cancer lung.

Conclusion:

Patients with lung cancer experienced fatigue with different levels. Chemotherapeutic agents increase fatigue severity. Nutritional formula (Energy Juice) decrease fatigue scores among patient with cancer lung receiving chemotherapy.

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