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Malnutrition Problems among Different Types of Cancer Patients Treated by Chemotherapy

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Abstract: Malnutrition is a major complication in cancer patients and can be the first symptom to reveal the presence of the disease. The present study aimed to determine the extent of malnutrition among female cancer patients treated by chemotherapy in Makkah and Jeddah, Saudi Arabia. A purposive sample of 72 female cancer patients, aged 39 – 52 years, on chemotherapy over 3 month period were subjected to the study. The patients were selected from King Faisal Hospital in Jeddah and King Abdullah Medical City in Makkah Almokarama. Data were collected through an interview with patients using questionnaire for collecting anthropometric measurements, dietary assessment, and some side effects after chemotherapy treatment. Biochemical analysis was also conducted. The results showed that all cancer patients suffered from side effects such as nausea and vomiting after chemotherapy treatment. The percentage of total malnourished patients was higher than nourished patients and recorded 76.19 %, 88.24 % , 83.33 %, and 77.27 % in the breast and ovarian cancers, colon and rectum cancer, lung cancer, and hodgkin cancers and hodgkin's lymphoma, respectively. Malnutrition varied between weight loss, low hemoglobin, low serum protein, decreased serum minerals and impaired liver functions. All patients consumed calories and protein lower than patient requirements. Therefore, the present study recommended that all cancer patients need a good assessment and monitoring to prevent malnutrition and improve health care by using intervention techniques according to patients' status and laboratory results.

Key words: Cancer, chemotherapy, malnutrition. liver functions, minerals.

Introduction

Cancer is a global health problem all over the world that leads to illness and death. It is identified as abnormal growth of cells, which grows and multiplies very quickly in a short time and may spread to almost every tissue and organ of the body **(Da Silva *et al*., 2015)**. World Health Organization (WHO) estimated more than 14 million new cases of cancer and 8.2 million deaths were related to cancer in 2012 **(WHO, 2015)**. The number of new cases is expected to increase by about 70% over the next two decades. Cancers of prostate and breast are the most common cancers among males and females respectively (**Argile´s, 2005)**. The treatment of cancer is divided into four major forms, which are used alone or in combination with each other to remove or destroy cancer cells. These treatments include surgery, radiation, biotherapy and chemotherapy.

There is a close relationship between cancer and nutrition. Approximately 40 - 80% of cancer patients suffer from malnutrition, which is considered the biggest challenge facing them **(Barrera, 2002).** Malnutrition is defined as a status of imbalance of energy, protein and other nutrients, which can negatively affect tissue or body composition, function, and outcome **(Cutsem and Arends, 2005 ; Muscaritoli *et al*., 2010).** Malnutrition and weight loss is found in 75% of cancer patients at diagnosis stage. Both Malnutrition and weight loss is associated with an increase of morbidity and mortality, poor response to cancer treatment, decreased tolerance to anti-cancer therapy, high cost of clinical care and changes of life style **(Segura *et al*., 2005 ; Da Silva *et al*., 2015).** In general, the risk of malnutrition and its severity are affected by cancer type, site and spread of the tumor, stage of treatment, anticancer treatment and patient characteristics including age, gender and individual susceptibilities **(Argilés, 2005 ; Santarpia *et al*., 2011).** Moreover, cancer associated with malnutrition may lead to susceptibility to infections, reduction of wound healing, decrease of muscle function and skin abnormal **(Langer et al., 2001 ; Davies, 2005).** Chemotherapy treatment of cancer patients is known to cause negative nutritional balance such as decrease of nutrient intake, micronutrient deficiency and defect in immune response (**Langer *et al*., 2001 , Cutsem and Arends, 2005)**. These may be due to loss of appetite, change of taste and smell, nausea, vomiting, constipation and diarrhea associated with chemotherapy (**Grant and Kravits, 2000; Santarpia *et al*., 2011 ; Koom *et al*., 2012**). Chemotherapy can also cause abdominal cramping and bloating, and paralytic ileum malabsorption. Some anticancer drugs such as fluorouracil, adriamycin and methotrexate can cause gastrointestinal complications as mucositis and erosive lesions (**Mitchell, 1992)**.

The cancer patients' needs of macro and micro nutrients are increased because of increasing the metabolic and physiological alterations even before starting anticancer treatment (**Fearon *et al*., 2006).** Patients with or at risk of malnutrition should receive the most appropriate nutritional support (oral supplements (enteral) or parenteral support and should be followed-up during the evolution of the disease **(Santarpia *et al*., 2011)**. Therefore this study aimed to determine the status of malnutrition among female cancer patients tre**ated** with chemotherapy according to different types of cancer.

Patients and Methods

A purposive sample of 72 female cancer patients, aged 39 – 52 years, on chemotherapy over 3 month period were subjected to the study. The study lasted from 1st January to 30 th June, 2014. Patients were selected from the outpatient section of King Faisal Hospital in Jeddah and inpatient section of King Abdullah Medical City in Makkah Almokarama. Patients were classified according to types of cancer as follow:

Type (1): Breast and ovarian cancer.
Type (2): Colon and rectum cancer.
Type (3): Lung cancer.
Type (4): Hodgkin cancer and Hodgkin's lymphoma.

Data was collected through an interview with patients using questionnaire for collecting anthropometric measurements, dietary assessment, and some side effects after chemotherapy treatment. Biochemical analysis was also conducted.

Methods

Anthropometric assessment

All patients were subjected to anthropometric assessment. Heights (in centimeter) and weights (in kilograms) were measured by height and weight scale **(Jelliffe, 1966)**. Body Mass Index (BMI) as an indicator of weight for height was calculated by the next equation [BMI= Weight (Kg) / Height in square meters (m^2)]. The categories of BMI were established by **WHO (2000).** Waist circumference (WC) was measured in centimeters at the midpoint between the bottom of the ribs and the top of iliac crest as described by **Yalcin *et al*., (2004)**. Hip circumference was measured at the largest posterior extension of the buttocks to determine waist hip ratio (WHR) **(Yalcin *et al*, 2004)**. Body composition was measured using Body Fat Analyzer (Model: Bodystat 1500).

Dietary assessment and requirements

Food intake was recorded for 3 days, including weekend day and the previous or next 2 days (Wednesday, Thursday, Friday or Friday, Saturday, Sunday). Patients were asked to give a detailed description of the food eaten using the brand name or to estimate the food amount

using home measurements (e.g. tea spoon, cup, etc.). These measurements were converted to the estimated amount of foods weight in grams, then the converted weight was analyzed by using food analysis program (**Food Processor, 2001**).

The energy requirement was calculated in cancer patients by the equation of **Harris and Benedict (1918)**. The total energy expenditure (TEE) are derived using the Harris-Benedict equation multiplied by an activity factor or a stress factor (**Long, 1984)**. The protein requirement was calculated according to **Bosaeus (2008).** The malnutrition classification related to protein energy malnutrition (PEM) was carried according to **Chowdhury *et al*., (2008)**

Biochemical analysis.

Red blood cells (RBCs), white blood cells (WBCs) and hemoglobin (Hb) were estimated by automated hematology analyzer (Sysmex, Kobe, Japan).

Levels of albumin**,** total protein, serum aminotransferase enzymes (AST & ALT) activities, alkaline phosphates (ALP), creatinine, and total bilirubin (T.B) were determined by (**Doumas *et al*., 1971)**, (**Henry, 1964)**, **(Reitman and Frankel, 1957)**, (**Belfield and Goldberg, 1971)**, (**Henry, 1974)** and (**Stroev and Makarova, 1989)** , respectively.

The method used to detect the concentration of Na , K and Ca was carried out by using atomic absorption spectrometry (AAS) technique equipped with burner (PyeUnicam, model 929. UK) as described by **Jorhem (2000).**

Statistical analysis

Results were analyzed using SPSS for Windows version 10.0 and expressed as Mean (M) ± standard deviation (SD). Analysis of variance among the types of cancer were analyzed by one-way ANOVA test, if significant differences were found; a Post-hoc analysis using Duncan's multiple range test was performed. Comparisons between none parametric values were performed using the chi square test. P.value of ≤ 0.05 was regarded as significant.

Results

Data in table (1) show an increase in the number of female cancer patients in type 4 compared with other cancer types. Patients were showed no significant differences between them in all types of cancer **(P>0.05)**. The percentage of cancer patients recorded in descending order as follows; in types 4, 1, 2 and 3 were 30.55 , 29.17, 23.61 and 16.67 %, respectively. The different trend was observed between cancers outpatients. The highest percentage of cancer outpatients was observed in type 1**,** followed by cancer types 4, 3 and 2 in descending order**,** which recorded 85.71, 77.27, 75.00 and 64.71 %, respectively. Comparison between cancer inpatients and cancer out

patients showed no significant differences (P>0.05) between them in all types of cancer. Data in the same table exhibit the various ages of cancer patients, the highest age was noticed significantly (P≤0.05) in type 2 followed by cancer types 3 ,1 and 4 in descending order and recorded 51.5, 46.6, 44.7 and 39.6 years respectively. At the same time, the age of cancer patients in types 1 and 3 showed no significant differences (P>0.05) between them.

Data in table (2) show different values of anthropometric measurements of cancer patients. The weight of type 2 recorded 60.41 Kg which was significantly lower (P ≤ 0.05**)** than other types of cancer, while the weight of type 3 and type 4 were nearly equal and no significant differences (P> 0.05) between them. The same trend was observed in the mean value of BMI. On the other hand, the mean values of waist and waist/hip ratio of type 2 of cancer were 0.937 ± 0.09 cm and 0.814 ± 0.01 respectively, which were significantly (P ≤ 0.05) lower than other types of cancer. The height, percentage of fat and lean mass showed no significant differences (P > 0.05) among different types of cancer. The highest value of total fat was noticed in type 3 which was significantly higher (P ≤ 0.05) compared with other cancer types, but cancer types 1 and 4 recorded the same mean value and showed no significant differences (P > 0.05) between them.

Data in table (3) show the distribution of cancer patients according to some side effects after chemotherapy treatment, it includes nausea, vomiting, mouth ulcer, difficult swallowing and food allergy. All these features showed no significant differences (P > 0.05) between patients in all types of cancer. In all cancer types, most of cancer patients suffered from nausea and vomiting for long time (a week) after chemotherapy dose except patients in cancer type 2 who suffered from nausea for short time (2 days) after the dose of chemotherapy. The majority of cancer patients did not complain from mouth ulcer**s**. This result was observed in cancer type 1 followed by type 4 and 3 which recorded 61.90, 59.09 and 58.33 %, respectively. From the previous table, the percentage of cancer patients suffering from difficulty in swallowing in type 2 of cancer (47.06 %) was higher than other types of cancer. According to the same table, the percentage of cancer patients with food allergy was less than patients who did not suffer from food allergy in all types of cancer. The most sensitive cancer patients to food allergy showed in cancer types 3 and 4 which recorded 33.33 and 27.27 %, respectively.

According to data in table (4), the energy intake by cancer patients showed a significant difference (P ≤ 0.05) among different types of cancer except patients in cancer types 1 and 3 which showed no significant difference (P > 0.05) between them. Patients in cancer type 4

consumed more foods and calories than other cancer types. On the same time, the energy intake by patients in cancer types 1 and 3 were nearly equal. The highest consumption of protein among cancer patients was significantly highest ($P \leq 0.05$) in cancer type 3 followed by cancer types 4, 2 and 1 which recorded 49.81, 44.9, 37.8 and 34.61 g, respectively. Generally, energy and protein intake were lower than patient requirements in all types of cancer.

Data in table (5) illustrate the distribution of cancer patients according to the grades of BMI and the grades of malnutrition (**WHO 2000, and Chowdhury *et al*., 2008)**. There are no significant ($P > 0.05$) differences between the grades of BMI and different types of cancer. It is clearly noticed that the number and percentage of underweight patients are higher than normal or obese patients in different types of cancer. There are two patients in cancer type 4 suffering from morbid obesity and no patients in cancer types 1, 2 and 3.

No significant differences ($P > 0.05$) were observed between cancer patients and different grades of malnutrition. Most of patients were suffering from mild malnutrition in all types of cancer. 83.33 % of cancer patients suffered from mild malnutrition in cancer type 3 while the percentage of mild malnutrition patients recorded above 70 % in other cancer types. Just three patients in cancer type 2 who suffered from moderate malnutrition and recorded 17.65 % of cancer patients.

Data in table (6) show the mean values of some hematological and biochemical parameters; Hb, WBCs and RBCs counts, liver functions and kidney functions. There are no significant differences ($P>0.05$) in the levels of Hb, WBCs and RBCs between different types of cancer. Generally, the levels of Hb and RBCs were lower than the normal range of healthy people while the level of and WBCs was in the normal range **(Ravel, 1994)**.

According to the same table, the level of serum albumin in type 2 of cancer recorded 14 g/L which was significantly lower **($P \leq 0.05$)** than other types of cancer. The level of serum albumin in different types of cancer was lower than the normal range (**Tilkian *et al*., 1987)** . Total protein in serum was significantly higher **($P \leq 0.05$)** in cancer type 3 compared with other cancer types. The value of serum total protein of types 1 and 2 were nearly equal and no significant differences ($P > 0.05$) between them. The level of serum albumin and total protein in different types of cancer was lower than the normal range except in type cancer 3 (**Tilkian *et al*., 1987)** . Total bilirubin is a measure of both direct and indirect bilirubin and indicator of jaundice .All cancer types showed no significant differences ($P > 0.05$) between them in total bilirubin except cancer type 4 which recorded 13 µmol/L.

Values of all hepatic enzymes activities (ALT, AST and ALP) were higher compared with normal range which showed a significant difference ($P \leq 0.05$) between all cancer types except AST enzyme. Serum ALT enzyme showed no significant difference ($P > 0.05$) between cancer types 2 and 4 which recorded 62 U/L and 63.07 U/L respectively. Patients of cancer type 3 recorded 120.8 U/L in ALP enzyme which was significantly ($P \leq 0.05$) high between all cancer types.

Results in table (6) show no significant differences among different types of cancer in sodium, potassium and calcium. Cancer type 3 exhibited the highest level of sodium, potassium and calcium which recorded 134.1 mmol/L, 4.057 mmol/L and 8.314 mg/dL respectively.

The same trend was observed in serum creatinine which was not significantly different ($P>0.05$) between all types of cancer. The value of serum creatinine was lower than the normal range in all types of cancer (**Wallach, 1992)**.

Discussion

The majority of cancer patients suffer from malnutrition which is a common complication and can be the first manifestation to detect the presence of the disease. Even before starting anticancer treatment, patients can suffer from metabolic and physiological alterations that may increase needs of macro and micronutrients (**Fearon *et al*., 2006**). In addition, malnutrition can increase the incidence of postoperative complications, such as delayed wound healing, morbidity, and mortality (**Santarpia *et al*., 2011**).

All cancer patients suffer from nausea and vomiting but the duration of nausea and vomiting after chemotherapy treatment are different. Similar results were reported in other studies: For example **Warr (2008)** found that approximately one half of cancer patients suffered from nausea or vomiting during their disease either because of the cancer itself or cancer treatment. Also, **Hutton *et al*., (2007)** 86% of patients with cancer reported some degrees of subjective chemosensory abnormalities. Furthermore**, Wickham *et al*., (1999)** included 284 cancer patients; the most frequent chemosensory complaints were nausea, and vomiting.

The present study, most of cancer patients did not complain from mouth ulcer, difficulty in swallowing and food allergy. The highest percentage of rejection of foods was observed in cancer type 1. These results were in agreement with that reported by **Segura *et al*., (2005)** who evaluated 781 patients to determine individual nutritional status using the Scored Patient Generated-Subjective Global Assessment (Scored PGSGA) questionnaire and found that almost 17% and 9 % of

the cancer patients were suffering from problems of swallowing and mouth ulcer respectively.

Malnutrition is a common problem among patients with cancer, affecting up to 85% of patients with certain cancers **(Argilés, 2005)**. According to the grades of malnutrition, the percentage of total malnourished patients was higher than nourished patients in all types of cancer. Percentage of malnutrition in cancer type 2 was higher than other cancer types. Meanwhile **Kruizenga *et al*., (2003)** analyzed data of 7606 patients to determine the prevalence of disease related malnutrition in the Netherlands in all fields of medical care and found that 12 % of all patients appeared to be malnourished, 13 % were at risk of malnutrition and 75% were well nourished. In addition, the prevalence of malnutrition depended on tumor location, for example malnutrition is high in patients with intestinal cancer (47%) but low in other organs. Moreover, **Da silva *et al*., (2015)** studied the nutritional status of cancer patients, according to (PGSGA) and found that 66.2% of cancer patients had moderate malnutrition or risk of malnutrition and 20.8% severe malnutrition. In another study carried out by **Hill *et al*., (2011)** 75 % of patients lost weight throughout radiotherapy. Weight loss was significantly high in patients experiencing unplanned radiotherapy breaks and in patients not completing chemotherapy treatment.

Obesity is a form of malnutrition which is particularly common in patients with cancer (**Argile´s, 2005**). In the current study, the percentage of obesity in cancer types 1, 2, 3 and 4 was 19.05, 11.76, 25 and 31.82 %, respectively. This result was in agreement with findings reported by **Wolin *et al*., (2010)** who estimated that about 20% of all cancer patients were overweight. Obesity can lead to death with cancer. This result was confirmed by the study of **Calle *et al*., (2003)** who pointed to obesity as a reason of death; and responsible for 14 and 20% of cancer deaths in men and women respectively.

The energy and protein intake were lower than patients requirements in all types of cancer. This result is in agreement with many researchers data who reported that chemotherapy can cause anorexia, nausea, vomiting, early satiety, intestinal mucositis with dysphagia, diarrhea, hemorrhoids, anal fissures, and modifications in smell and taste senses **(Mitchell, 1992; Grant and Kravits, 2000**; **Santarpia *et al*., 2011 ; Koom *et al*., 2012)**. These symptoms may affect food choices, and lead to inadequate food intake and reduced quality of life **(Khalid *et al*., 2007)**. The same result was noticed by **Wallengren *et al*., (2005**) who reported a number of factors that may limit food intake of cancer patients such as nausea, early satiety, vomiting and food aversions, caused by the cancer itself or by cancer treatment. Also, **Sánchez-Lara *et al*., (2010)** studied the relationship between energy requirement and

consumption of nutrients with chemosensory changes in cancer patients under chemotherapy. Cases with sweet (DT) showed significant lower daily energy (1586 vs. 2043 kcal), proteins (54 vs. 81.4 g/day), carbohydrates (192 vs. 246 g/day compared to cases without sweet DT alteration. The same result was noticed for bitter (RT) which had significantly lower calorie (1493 vs. 2124 kcal), protein (52 vs. 83 g/day), and carbohydrates (182 vs. 254 g/day).

The mean value of (Hb) and (RBCs) in different types of cancer were lower than the normal range (**Ravel, 1994**). Patients with cancer receiving platinum-based chemotherapy are more susceptible to a decrease of red blood cells and hemoglobin through destruction and/or the inability of the bone marrow to produce stimulating hormone erythropoietin which is essential for the production of red blood cells (**Repetto *et al*., 2006).** Iron deficiency anemia leads to pallor, patients feel severely tired and weak, and may even become short of breath. European Organization for Research and Treatment of Cancer (EORTC) recommend that erythropoiesis-stimulating agent (ESA) therapy should be begining at hemoglobin levels of 9–11 g/dL based on the severity of symptoms to improve quality of life and prevent the need for red blood cell transfusion **(Bokemeyer *et al*., 2004)**.

The reduction observed in both serum albumin and total protein compared with the normal range is another indicator for liver injury or prevalence of malnutrition among cancer patients after chemotherapy treatment. Lowering of serum total protein and albumin values could be explained on the basis of generalized protein deficiency leading to impaired or reduced synthesis of protein because of inadequate intake of dietary protein and liver injury (**Chowdhury *et al*., 2008**). Different results were reported by **Gupta and Lis (2010)** who made a systematic search of the literature using the MEDLINE database (January 1995 through June 2010) to identify epidemiologic studies on the relationship between serum albumin and cancer survival. They found the positive relationship between low or high level of albumin level and poor or better survival among different cancer patients respectively.

Using chemotherapy agents as a treatment of cancer patients may cause a defect of liver functions and an increase risk of hepatotoxicity. In the current study the level of liver functions such as AST, ALT, and ALP are high and this appeared significantly among different types of cancer except AST. The intensity of liver injury depends on the kind of chemotherapy drug and when it is single drug or combined with another one. Asparaginase, nitrosureas, antimetabolites, cisplatin are famous types of chemotherapy drugs that cause liver damage especially in high doses and for long time (**King and Perry, 2001**).

Additionally, cancer patients suffered from electrolyte disturbance especially in sodium and calcium which recorded lower values than the normal range while potassium value was low but is still in the normal range. The same results were noticed by **Raytis and Lew (2014)** who studied the effect of hyperthermic intraperitoneal chemotherapy (HIPEC) on electrolyte changes. Patients were divided into groups and received one of three chemotherapy agents: oxaliplatin in D5W, mitomycin C in NS or doxorubicin /cisplatin in peritoneal dialysate. Patients who received oxaliplatin chemotherapy agent suffered from hyponatremia more than patients who received mitomycin C or doxorubicin /cisplatin. Whereas hypocalcaemia appeared in patients who were injected with doxorubicin /cisplatin agent. These results are in agreement with that of other researchers as **Rueth *et al*., (2011).**

Conclusion

Malnutrition is considered a major problem in cancer patients in Makkah and Jeddah. The percentage of total malnourished patients was higher than nourished patients in all studied cases of cancer. Calorie and protein intake were reduced in all patients. Malnutrition led to weight loss, reduction of hemoglobin, total protein, and creatinine, disturbed liver functions and minerals in serum. It is recommended that all cancer patients need a good monitoring and assessment to prevent malnutrition and improve nutrition status**.**

Table (1): Study subjects characteristics.

Patients	**Types of cancer**								**Chi ^{2}**	**P. value**
	Type (1) N=21		**Type (2) N=17**		**Type (3) N=12**		**Type (4) N=22**			
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**		
Gender										
Female (N=72)	21	29.17	17	23.61	12	16.67	22	30.55	5.508	0.083
Staying										
In	3	14.29	6	35.29	3	25.00	5	22.73	2.321	0.508
Out	18	85.71	11	64.71	9	75.00	17	77.27		
*Age (years)	44.7 ^{b} ± 7.8		51.5 ^{a} ± 6.75		46.6 ^{b} ± 9.4		39.6 ^{c} ± 7.63			0.040

*** M ± SD**

Table (2): Anthropometric measurements of cancer patients

Parameters	Types of cancer				P. value
	Type (1) N=21	Type (2) N=17	Type (3) N=12	Type (4) N=22	
	M ± SD	M ± SD	M ± SD	M ± SD	
Weight (Kg)	67.65 [b] ± 19.1	60.41 [c] ± 19.1	75.43 [a] ± 19.6	74.37 [a] ± 18.7	0.043
Height (cm)	160.3 [a] ± 8.56	167.2 [a] ± 9.90	165.4 [a] ± 5.06	164.1 [a] ± 5.70	0.087
BMI (Kg/cm^2)	26.32 [b] ± 7.10	21.60 [c] ± 5.41	27.57 [a] ± 7.80	27.62 [a] ± 6.12	0.047
Waist (cm)	99.23 [b] ± 26.5	93.00 [c] ± 23.3	106.1 [a] ± 18.9	100.3 [b] ± 15.7	0.046
Hip (cm)	106.8 [b] ± 30.3	114.2 [a] ± 24.7	113.2 [a] ± 19.6	108.4 [b] ± 18.9	0.861
Waist / hip ratio	0.929 [a] ± 0.08	0.814 [b] ± 0.01	0.937 [a] ± 0.09	0.925 [a] ± 0.02	0.048
Fat (Kg)	32.00 [b] ± 7.10	22.59 [c] ± 9.29	36.01 [a] ± 7.95	30.55 [b] ± 5.35	0.047
Fat (%)	40.76 [a] ± 9.75	33.06 [a] ± 12.0	37.37 [a] ± 9.65	38.80 [a] ± 7.90	0.423
Lean (Kg)	36.10 [a] ± 7.86	40.62 [a] ± 11.7	38.24 [a] ± 2.82	44.90 [a] ± 11.5	0.138

Means in the same row with different letters are significantly different ($p < 0.05$) among types of cancer.

Table (3): Distribution of cancer patients according to some side effects after chemotherapy treatment

Parameters	Types of cancer								Chi ^{2}	P .value
	Type (1) N=21		Type (2) N=17		Type (3) N=12		Type (4) N=22			
	N	%	N	%	N	%	N	%		
Nausea										
Two days	6	28.57	8	47.06	3	25.00	9	40.91	4.628	0.592
One week	12	57.14	5	29.41	7	58.33	11	50.00		
Two weeks	3	14.29	4	23.53	2	16.67	2	9.09		
Vomiting										
Two days	6	28.57	7	41.18	2	16.67	9	40.91	8.975	0.175
One week	13	61.90	4	23.53	7	58.33	10	45.45		
Two weeks	2	9.52	6	35.29	3	25.00	3	13.64		
Mouth ulcer										
Yes	8	38.10	9	52.94	5	41.67	9	40.91	0.939	0.816
No	13	61.90	8	47.06	7	58.33	13	59.09		
Difficult of swallow										
Yes	5	23.81	8	47.06	4	33.33	6	27.27	2.657	0.448
No	16	76.19	9	52.94	8	66.67	16	72.73		
Food allergy										
Yes	2	9.52	2	11.76	4	33.33	6	27.27	4.298	0.231
No	19	90.48	15	88.24	8	66.67	16	72.73		

Table (4): Mean energy and protein intakes of different types of cancer patients

Parameters		Types of cancer				
		Type (1) N=21	**Type (2) N=17**	**Type (3) N=12**	**Type (4) N=22**	**P. value**
		M ± SD	**M ± SD**	**M ± SD**	**M ± SD**	
Energy (Kcal)	Intake	1018^{b} ± 16.7	920.7^{c} ± 13.2	1022.8^{b} ± 19.8	1108.7^{a} ± 20.8	
	Required	1720 ± 15.3	1780 ± 16.9	1850 ±17.62	1900 ± 19.2	
Protein (g)	Intake	34.61^{d} ± 3.04	37.80^{c} ± 2.12	49.81^{a} ± 2.075	44.9^{b} ± 1.08	
	Required	70.00 ± 6.46	77.00 ± 5.90	75.00 ± 8.01	70.00 ± 6.32	

Means in the same row with different letters are significantly different ($p < 0.05$) among types of cancer.

Table (5): Percent distribution of types of cancer patients according to BMI and malnutrition.

Parameters	Types of cancer									
	Type (1) N=21		**Type (2) N=17**		**Type (3) N=12**		**Type (4) N=22**		**Chi ^{2}**	**P. value**
	N	%	N	%	N	%	N	%		
Grades of BMI										
Underweight	10	47.62	9	52.94	7	58.33	8	36.36	7.304	0.606
Normal	7	33.33	6	35.29	2	16.67	7	31.82		
Obese	4	19.05	2	11.76	3	25.00	5	22.73		
Morbid obese	-	-	-	-	-	-	2	9.09		
Grades of Malnutrition										
Nourished	5	23.81	2	11.76	2	16.67	5	22.73	10.750	0.096
Mild malnutrition	16	76.19	12	70.59	10	83.33	17	77.27		
Moderate malnutrition	-	-	3	17.65	-	-	-	-		

Table (6) : Mean ± SD of biochemical analysis of cancer patients after chemotherapy treatment.

Parameters	Types of cancer				P. value
	Type (1) N=21	Type (2) N=17	Type (3) N=12	Type (4) N=22	
	M ± SD	M ± SD	M ± SD	M ± SD	
***Blood count**					
[1]Hb (g/dL)	11.68 [a] ± 1.25	10.83 [a] ± 1.62	11.00 [a] ± 1.47	11.83 [a] ± 1.21	0.561
[2]WBCs (x10^3 / mm^3)	7.621 [a] ± 2.60	6.031 [a] ± 1.75	6.041 [a] ± 2.42	6.957 [a] ± 2.44	0.322
[3]RBCs (x10^6 / mm^3)	3.807 [a] ± 0.81	3.805 [a] ± 0.75	3. 810 [a] ± 1.56	3.802 [a] ± 0.77	0.953
***Liver functions**					
Albumin (g/L)	19.73 [c] ± 2.36	14.00 [d] ± 3.56	29.09 [a] ± 4.15	22.34 [b] ± 1.14	0.048
Total protein (g/L)	53.92 [c] ± 4.49	52.62 [c] ± 3.72	64.71 [a] ± 5.28	57.14 [b] ± 4.52	0.024
Total bilirubin (µmol/L)	9.171 [b] ± 2.57	10.18 [b] ± 2.23	10.428 [b] ± 3.54	13.00 [a] ± 3.39	0.037
[4]ALT (U/L)	55.23 [b] ± 2.64	62.00 [a] ± 3.58	49.00 [c] ± 2.59	63.07 [a] ± 2.67	0.041
[5]AST (U/L)	42.98 [a] ± 2.57	44.73 [a] ± 2.33	44.00 [a] ± 2.73	43.86 [a] ± 2.66	0.715
[6]ALP (U/L)	95.15 [d] ± 2.55	109.64 [b] ± 5.95	120.8 [a] ± 11.3	102.72 [c] ± 5.37	0.033
***Kidney functions**					
Creatinine (mg/dL)	0.590 [a] ± 0.066	0.586 [a] ± 0.069	0.591 [a] ± 0.071	0.581 [a] ± 0.061	0.394
***Minerals**					
Sodium (mmol/L)	133.7 [a] ± 2.77	132.1 [a] ± 3.65	134.1 [a] ± 4.38	131.2 [a] ± 3.17	0.156
Calcium (mg/dL)	8.171 [a] ± 0.34	8.021 [a] ± 0.23	8.314 [a] ± 0.86	8.236 [a] ± 0.43	0.947
Potassium (mmol/L)	4.011 [a] ± 0.43	3.900 [a] ± 0.54	4.057 [a] ± 0.22	3.951 [a] ± 0.37	0.883

Means in the same row with different letters are significantly different ($p < 0.05$) among types of cancer.

*Normal values: [1] Hemoglobin (Hb) 12 – 16 g/dL, [2] White blood cells (WBCs) 4 – 11 x10^3 / mm^3 , [3] Red blood cells (RBCs) 4 – 5.5 x10^6 / mm^3, Albumin 12- 16 g/L, Total protein 60 - 80 g/L, Total bilirubin 3 – 17 µmol/L, [4] Alanineamino transferase (ALT) up to 45 U/L, [5] Aspartate aminotransferase (AST) up to 40 U/L, [6] Alkaline phosphates (ALP) 20 – 90 U/L, Creatinine 0.7 - 1.3 mg/dL, Sodium 137 - 145 mmol/L, Calcium 8.6 - 10.2 mg/dL, Potassium 3.5 - 5.1 mmol/L.

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مشاكل سوء التغذية بين مرضى السرطان المعالجين بالعلاج الكيماوي

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يعد سوء التغذية من أكثر المشكلات شيوعا بين مرضى السرطان حيث يمكن اعتباره العرض الأول عند حدوث الاصابه بالمرض حتى قبل بدء العلاج من مرض السرطان نفسه . لذلك تهدف الدراسة الحالية إلى تحديد مدى انتشار سوء التغذية بين مرضى السرطان السيدات في مدينتي مكة المكرمة وجدة, المملكة العربية السعودية. تم اختيار ٧٢ مريضة بالسرطان تتراوح اعمارهن بين ٣٩ – ٥٢ عاما وقد تلقوا علاجا كيميائيا لمدة ثلاثة اشهر. تم اختيار عينة البحث من مستشفى الملك فيصل بجدة و مدينة الملك عبد الله الطبية بمكة المكرمة. تم جمع البيانات من المرضى عن طريق المقابلة الشخصية باستخدام الاستبيان للحصول على معلومات عن بعض القياسات الانثروبومترية ,التقييم التغذوى , بعض الاعراض الجانبية عقب العلاج الكيماوى وكذلك بعض الاختبارات الكيموحيوية .وكان من أهم النتائج المتحصل عليها أن جميع أفراد عينة البحث قد عانوا من القيء والغثيان عقب الحقن الكيماوي. كما كانت نسبة المرضى المصابين بسوء التغذية أكبر من المرضى غير المصابين بسوء التغذية حيث بلغت نسبتهم ٧٦.١٩ %, ٨٨.٢٤ %, ٨٣.٣٣ %, ٧٧.٢٧ % فى مرضى سرطان الثدى والمبايض , مرضى سرطان القولون والمستقيم , مرضى سرطان الرئة واخيرا مرضى سرطان هودجكن و الغدد الليمفاوية على الترتيب. وقد أدت الإصابة بسوء التغذية إلى انخفاض الوزن , انخفاض في نسبة كل من الهيموجلوبين , البروتين الكلى , وانخفاض وظائف الكبد والأملاح المعدنية بسيرم الدم . كما لوحظ ان جميع المرضى قد استهلكوا سعرات حرارية وبروتين بدرجة اقل من متطلباتهم الغذائية. وكان من أهم توصيات الدراسة زيادة الاهتمام بتقييم ومراقبة مرضى السرطان لمنع حدوث سوء التغذية وتحسين الرعاية الصحية لهم باستخدام التدخل التغذوى طبقا لحالة المريض وتحليلاته المعملية.

الكلمات الكشافة: السرطان , العلاج الكيماوي , سوء التغذية , وظائف الكبد , الأملاح المعدنية.