Relation between Nutritional Status and Feeding Problems of Children Suffering From Cancer Undergoing Chemo-Radiotherapy

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Abstract: Background: Children can get cancer in the same parts of the body as adults, but there are differences. Childhood cancers can occur suddenly, without early symptoms, and have a high rate of cure. The most common children's cancer is leukemia. Other cancers that affect children include brain tumors, lymphoma, and soft tissue sarcoma. Symptoms and treatment depend on the cancer type and how advanced it is. Treatment may include surgery, radiation and/or chemotherapy. **Aims**: The present study aimed to determine the relation between nutrition status and feeding problems of children suffering from cancer under going chemo-radio therapy. **Material and methods**: This study was conducted at in-patient of Oncology Institute Affiliated of The Ministry of Health and at pediatric Hematology and Oncology Department at Tanta University Hospital. Sixty children from previous sitting were included. Data were collected by using three tools: An interview sheet was developed, observation checklist, and nutritional status assessment. **Results:** this study revealed that, the age of children ranged from 3-15 years. As regards sex, it was observed that most of the studied children's were males (66.67%) while (33.33%) were females. the children's were received chemotherapy or radiotherapy had more than one type of feeding problems It was observed that, sixty-six percent of children's (66.67%) had feeding problems and increase this percentage to 83.33% after 3 months. the majority of children (93.33%) received chemotherapy and six percent received radiation during 3 months. **Conclusion and Recommendation**: from the present study it can be concluded that, Cancer patients were received chemotherapy or radiotherapy had a lot of feeding problems throughout the study period such as loss of appetite, nausea, vomiting, dryness of mouth, stomatities, difficulty in chewing and swallowing, and diminished in food taste. It recommended that, planning dietary regimens for these patients by using audiovisual materials, nurses should help the patients to identify side effects of radiation and chemotherapy and increase their self-care abilities.
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1. Introduction:

Cancer is the uncontrolled growth and spread of cells that can affect almost any part of the body. The growth often invades surrounding tissue and can metastasize to distant sites [(1)]. Cancer results when there a failure of the body to regulate cell production. Common sites of malignancy in children include the blood and bone marrow, bone, lymph node, brain, kidney and soft tissue[(2).]. The most common type of children cancer leukemia, lymphoma, medulloblasto osteosarcoma, Leukemia is the most common type of childhood cancer, accounting for a third of all cancer in children[(3)]Cancer is the second leading cause of death in children between the age of 3 and 15 years [(4).] In the united state, more than 16 out of every 100,000 children and teens in the U.S. were diagnosed with cancer and nearly 3 of every 100,000 died from the disease each year [(5, 6).]

The causes of childhood cancers are poorly identified. There is no one single cause for cancer. Scientists believe that it is the interaction of many factors together that produces cancer. The factors involved may be genetic, environmental or constitutional characteristics of the individual. [(7)]

A significant proportion of cancer can be managed by surgery, radiotherapy or chemotherapy, especially if are detected early [(8).] Chemotherapy is the use of drugs (neoplastic agent) to kill cancer cell. Different drug affect different stages of cell development, so combination of drugs known individually to be active against the specific disease is used chemotherapy may be given orally, intravenously, intramuscularly, subcutaneously or intrathecally. The most common side effect of chemotherapy is nausea, vomiting, alopecia, anorexia, malaise, bone marrow suppression and stomatitis among others that depend on mechanism of action with variable of severity. [(9)]

Radiation therapy is individually dosed for specific diseases according to patient's age and tumor

site and size. Radiation may be given palliative in low doses to prevent further growth of a tumor or curatively to eradicate disease. Side effects of radiotherapy include fatigue, nausea, vomiting, anorexia, mucositis, and skin reaction among others. [10,11]

Nutrition is an important factor influencing the child growth and development. The child must consume adequate nutrient for growth to continue. The child needs a regular supply of basic nutrition micro and macro nutrient such as protein, fat, carbohydrates and minerals, vitamins and water to form and maintain tissue and complete the reaction that sustain life within each cell. [10]

Adequate nutrition during cancer plays a decisive role in sever clinical outcome measures, such as treatment response, quality of life and cost of care. ([12]. It is based on the food requirements of humans for energy, growth, maintenance, and reproduction. Nutrients are chemical substances that body uses from the foods that are consumed .Cancer treatment can have profound effects on nutrition status. Chemotherapy, radio therapy, and surgery[13]

Feeding problems may interfere with oral intake a child's ability to ingest or tolerate certain forms. Poor nutritional status and weight loss can interfere with completion of cancer treatment, impair healing, increase risk of complication, and diminish quality of life .Mucosal ulceration, taste change [14], diarrhea, dysphasia, nausea and vomiting[15] altered fluid volume and impaired skin integrity[13] Anorexia and cachexia syndrome are common symptoms of feeding problems.[14]

Nutritional assessment must be done, based on data found on a physical examination, including observation of general condition from head to toes, the anthropometric measurement of height, weight, and skin fold thickness, dietary history and dietary intake measurement, and laboratory assessment such as hemoglobin, hematocrit, red blood cells, serum albumin, total lymphocyte count, sodium and potassium tests[16,17]. Laboratory tests are used as diagnosed or screening aids.[15]

The nurse is a vital member of the health team to give care for cancer patient. The effects of radio-chemo therapy on the nutritional status of cancer patient are a subject with which pediatric nurse must be deeply concerned [16]. She should aware of the risk of weight loss and

Malnutrition in cancer can occurs because of decreased dietary intake, nutrient losses, or un met elevated nutritional needs that are caused by the disease or its treatment.[17]

Pediatric nurses as well as dietitians have a challenging role in promoting adequate intake in cancer patients. The nurse's responsibility includes more than bringing and removing metal trays or recording food intake. They have to assess usual eating behavior, social and health information, to identify the areas of dietary needs and plan strategies to meet these needs, using the steps of nursing process [18]. Nurses take the responsibility for teaching the child and their mothers what they need to know in order to promote compliance with the cancer. Treatment regimens including necessary diet modification. [19]

Aim of the study

1-To assess the feeding problems and nutritional status of the children with cancer

2-To determine the relation between nutritional status and feeding-problems of children suffering from cancer under going chemo-radio therapy.

Hypothesis:

Children with cancer undergoing chemo-radiotherapy had physical signs of malnutrition and feeding problem. So there was a significant relation between nutritional status and feeding Problems of children suffering from cancer.

2. Materials and Method

Materials

Research design:

Aquasi experimental design was used in the study.

Setting:

The study was conducted at the following area:

1-Tanta Cancer Center (Pediatric Oncology Department)

2-Pediatric Hematology and Oncology Department at Tanta University Hospital.

Subjects:

Sixty children with cancer and their mothers or care givers who fulfilled the following criteria

1-Age ranged from 3-15 years

2-Both sexes

3-Starting chemo and /radiotherapy.

4-Free from any other diseases that affect the child's nutritional status, such as, Diabetes Mellitus, renal failure ,marasmus, parasitic infestation, malabsorption and anorexia.

Tools of data collection:

Three tools were used for data collection.

Tool I: Structured interview sheet was developed by researcher to collect the required data.

It consists of three parts:

Part 1-Socio demographic data

Part 2- Dietary profile for the child

Part 3 - Data related to child activity level

Tool II: Observational check list.

Tool III: Nutritional Assessment sheets:

It included three parts:

Part 1- Physical assessment sheet of cancer child which included: observation and question for general condition from head to toes.

Part 2- Anthropometric measurements sheet which includes:

Weight, height, body mass index, upper mid arm circumference and triceps skin fold thickness. Each of these measurements was taken according to the standard procedure recommended by Jelliffe [20,21]

1-Weight/ age were measured using a bathroom scale and recorded to the nearest tenth of a kilogram. It is used as indicator of the nutritional status for the children.

2-Height/ age was measured and was taken to the nearest 0.1 cm and then recorded.

The body mass index (BMI) was calculated as follows:

BMI = Weight in Kg ÷ (height in meter) ^{2}.

3 -Mid-arm_circumference was measured by placing the tape gently but firmly around the left upper arm while hanging freely and on its mid point. The measurement was recorded to the nearest 0.1cm.

4 -skin-fold thickness: Triceps skin-fold thickness was measured using Harpenden caliper.

Part 3- Laboratory investigation, such as complete blood picture

(Hemoglobin, hematocrit, white blood cells and red blood cells count), total serum protein, blood urea, sodium and potassium levels, the results was compared with normal range of the corresponding age group.

Methods

1-Permission was obtained to conduct this study from the Head of Tanta Cancer Center (Pediatric Oncology department) and Pediatric Hematology and Oncology department at Tanta University Hospital.

2- Each child with his/her mother or care giver was interviewed individually to obtain the required data about biosocial data, feeding habits and feeding problems). Socio demographic data of child such as, age, sex, birth order, parent's age, occupation, level of education, housing condition and family size and residence (urban-rural). Feeding habits of the child such as, their appetites, number of meals/ day, likes, dislikes, and snacks intake. Feeding problems such as, nausea, vomiting, loss of appetite, difficulty in chewing and swallowing food, dryness of the mouth and change of food taste.

3-Ethical consideration for privacy and confidentiality of the data and results were considered. The children and their mother were informed that they can withdraw from the study at any time.

4- Pilot study was carried out on a sample of 6 children and their mother's/ caregivers to test the clarity, reliability and applicability of the study tools development and pilot study were excluded.

5-Three tools were developed by the researcher after reviewing of the relevant literature.

6-Observation checklist was used to observe child while they ate and drank. It was divided in two sessions: each session was taken about 15 minute. Daily dietary intake to estimate the caloric intake by using 24 hours Recall method. The researcher through an interview applied it with the patient or their mother at the time of diagnosis and at each follow-up assessment. This tool was fulfilled by asking the patient about all types and amounts of intake through 24 hours by using open ended questions [22]. The researcher had to interview each patient for 7 successive days in order to obtain the usual dietary intake. Then, the foods intakes were analyzed according to food composition table of Academy of Scientific Research to determine the amount in each type of food intake along successive seven days [23]. Food and fluid intake per day according to the food exchange list [24] .The data was collected over a period of 7 months from October, 2011 to April, 2012.

Analysis of the daily dietary intake was done using local food compassion tables put out by the nutrition institute in Cairo. Analysis was done for energy intake, protein, calcium, iron, vitamin A and C. The adequacy of these nutrients was determined as a percentage of the recommended dietary allowances (RDA) for each group. The comparison was expressed as percent adequacy of the recommended nutritional intake by the estimated actual intake for different groups and sex. To get the percent adequacy of that nutrient:

-Children having less than 90% adequacy were considered less than adequate intake.

-Children having from 90% to 110% adequacy were considered adequate intake.

-Children having over 110% adequacy were considered more than adequate intake.

7-Each child was observed from head to toe to assess his or her nutritional status. Physical assessment sheet of cancer child, which included observation and question for general condition from head to toes includes hair, face, eyes, lips, gums, tongue, skin, any gastro intestinal tract problems, muscle skeletal system. In physical examination, the child may exhibit one or more of the following findings:

Dry, thin, sparse hair, loss of hair color. And alopecia; pale skin color and facial edema (moon face); pale eye membrane and dry eyes; pale and swollen lips; white coated or beefy red or swollen tongue; dry, rough skin, petechae and ecchymosis; flaccid, poor muscle tone, tender extremities, presence of edema or may be difficulty, in walking; swollen abdomen tachycardia, elevated blood pressure or may be hepato-splenomegaly.

8-Vital signs were measured for each child, where:

a-Temperature was taken axillary for 5 minutes.
b-Pulse: while patient in resting position, radial pulse was counted for one minute and recorded.
c-Respiration: Abdominal movements were observed in young children, and thoracic movements were observed in older children. Respiration was counted for one minute, and recorded.
D-Blood pressure was measured, and then recorded.
9-Nutritional status was assessed well evaluated on one session about 15 minute and measurement was recorded.
10-There are four anthropometric measurement used to assess the nutritional status (weight, height, upper mid arm circumference, triceps skin fold thickness). Each one was taken according to standard and compared with normal standard of corresponding Egyptian for age and sex.
1-Weight/ age (was measured using a bathroom scale and recorded to the nearest tenth of a kilogram) and was used as indicator of the nutritional status for the children classified as :
-Children having less than 90% of the standard weight/ age were considered underweight -
Children having 90-110 % of the standard weight/ age was considered normal.
-Children having over 110% of the standard weight / age were considered overweight.
2-Height/ age (was measured and was taken to the nearest 0,1 cm and then recorded) and was used as indicator of the nutritional status follows:
-Children having less than 90% of the standard height were considered stunted.
-Children having 90% -110%of the standard height were considered normal.
Children having over 110 % of the standard height were considered tall. (WHO1987).
3-Body mass Index: Accurate height and weight are required for calculation of BMI. It is calculated the same way as for adults (BMI=weight (Kg) / height^2 (m2), but then compared to typical values for other children of the same age. The BMI percentile allows the nurse to compare between children of the same sex and age.

Category	**BMI (children 2-20 years)**
Under weight	BMI for age and sex 5%
Normal weight	BMI for age and sex ≥ 5 to ≤85%
Risk for overweight	BMI for age and sex ≥ 85 to ≤95%
Overweight	BMI for age and sex ≥ 95 %

3 -Mid-arm circumference was measured by placing the tape gently but firmly around the left upper arm while hanging freely and on its mid point. The measurement was recorded to the nearest 0.1cm.
- Children having less than 90%of the standard were considered under normal
- Children having 90%-110% of the standard were considered normal.
- Children having over 110% of the standard were considered above normal
4 -Skin-fold thickness: Triceps skin-fold thickness was measured using Harpenden caliper.
- Children having less than 80%of the standard were considered under normal
- Children having 80%-110% of the standard were considered normal.
- Children having over 110% of the standard were considered above normal

B-Laboratory investigations was taken from each record after each interview which included complete blood picture (Hemoglobin, Hematocrit, white blood cells and red blood cells count), total serum protein, blood urea, sodium and potassium levels, the results was compared with normal levels of the corresponding age group.
11-The numbers of chemo -radiotherapy sessions were taken from patient's record according to diagnosis and management. The patient was interviewed in the department or clinic (out patient). Dietary data and child's nutritional assessment (physical assessment, vital sighs, laboratory investigational and anthropometric measurements) were retaken after completing the chemo, and/or radiotherapy, i.e., after 3 months.
Statistical analysis:

Statistical presentation and analysis of the present study was conducted, using the mean, standard deviation Chi-square by SPSS V17.
Chi-square the hypothesis that the row and column variables are independent, without indicating strength or direction of the relationship. Fisher's exact test and Yates' corrected chi-square are computed for 2x2 tables.

3. Results

Table (1): Represents the socio-demographic characteristics of the studied children. It was revealed that, the majority of the studied children (25%) were aged 11-13 years and (10%) of them were aged 9-11 years with a mean age 9.533±3.422 years. Most of the studied patients (25%) aged 11-13 years. Regarding sex, it was observed that most of the studied children's were males (66.67%) while (33.33%) of them were females. It was found that, 65% of the children's were either first or second born while 15% of them were third and 20% of them were forth or more.

Regarding educational level of children, the majority of the studied children (35%) were in primary school, while 21.7% of them were in nursery

school and 25% of them were in preparatory school, and 18.3% of them were in secondary school.

The majority of the families (48.33) consisted of 5 to 7 members, while 33.33% of them consisted of 3 to 5 members and 18.33% of them of the studied children were 7 to 9 member, with a mean 5.70±1.417. The majority of the families of the studied children were (81.67%) from rural area while (18.33%) of them were respectively from urban

Table (2): represents distribution of the studied children regarding their children's feeding pattern. It was found that, the highest proportion of children (43.33%) received 2 meals /day at initial contact and increased to receive 4 or more meals/ day (58.33%) after three months. The difference was statistically significant. The same table shows that (40%) of the studied children were consider the breakfast as the main meal for them at initial contact. After 3 months, the studied children (51.67%) were considering the breakfast as the main meal. The differences were not statistically significant. More than half of children (56.67%) were not ate snacks at initial contact. On the other hand, the majority of them (73.33%) ate snacks between meals after three months. The difference was statistically significant.

Table (3).represents distribution of the studied children's regarding type of snacks consumed by children. Regarding types of snacks, it was found that ,the majority of the children (63.33%, 68.33%, 50.00%, 66.67%) respectively ate bread, drank juice, ate meat, sweets while about one third of the children (33.33%,36.67%, 36.67%,35%) respectively ate fruits, fresh vegetables, drank milk and ate cheese, beans at initial contact. After 3 months, the majority of the studied children (70.00%, 56.67%) respectively drank juice and ate sweets and (30.00%, 33.33%, 46.67%, 38.33%, 21.67%, 30.00%) of them respectively ate fruits, fresh vegetables, bread, milk and cheese, meats, beans.

The differences between all types of snacks were not statistically significant except meats. Children's were consumed more than one type of snacks.

Table (4): represent distribution of the studied children regarding changes in children's appetite. It was shown that the majority of the studied children (66.67%) had poor appetite at initial contact and after 3 months, 83.33% of the studied children had poor appetite. The differences were statistically significant. In same table showed that there was no change in appetite at the majority of them (85%) after 3 months. There was change in children's appetite after 3 months.

Table (5): represents distribution of the studied children's regarding feeding problems with chemo or radio therapy after 3 months. It was found that as regards chemotherapy , all children (100%) had loss of appetite and more than half of them (60.71%, 51.78%) respectively had nausea and vomiting and the rest of them complain of other problem while radiotherapy, all of children (100%) had loss of appetite and the majority of them had nausea , vomiting , and dryness of mouth (75.00%, 75.00%, 50.00%) respectively and the rest of them complain of stomatitis, difficulty in chewing, difficulty in swallowing, diminishing in food taste (25%, 25%, 25%, 25%) respectively.

Table (6): represents distribution of children regarding to chemo and or radiotherapy regimen, diagnosis, and management.

Regarding diagnosis, it was found that (46.67%, 23.33%, 11.67%, 11.67%, 6.67%) of the studied children respectively were diagnosed with leukemia, lymphoma, bone tumors, tumors of the nervous system, and the soft tissue tumors.

Table (7): Represents distribution of the studied Children regarding Their Adequacy of Dietary Intake from Energy, Protein, Calcium, Iron, Vitamin A and C. It was clear that, all of children's consumed less energy than RDA_s at initial contact and there was no change after 3 months.

A majority of children (96.67%) was consuming less protein than RDA and increased to 100% after 3 months. Statistically, there were no significant differences. Most of the children (66.67%) were consuming calcium less than RDA at initial contact and increased to 75% after 3 months. There were no significant differences.

The majority of children (75%) was consuming iron less than RDA at initial contact and increased to 81.67% after 3 months. There were no statistically significant differences. The majority of children (80%) was consuming vitamin A less than RDA at initial contact and increased to 83.33% after 3 months. There were no significant differences.

The majority of children (83.33%) was consuming vitamin C less than RDA at initial contact and increased to 90% after 3 months. There were no significant differences.

Table (8): represents the distribution of the studied children regarding their percent standard anthropometric measurement. It was found that more than one third (38.33%) were considered underweight (<90%) at initial contact. On the other hand, sixty percent (60%) were considered under weight after 3 months. There were no significant differences.

Concerning the height, the majority of children's (83.33%) were considered normal tall (90-110%) and (16.67%) of them were stunted (90%) at initial contact and after 3 months there was no change. There were no significant differences.

Concerning mid arm circumferences, more than half of children (56.67%) had normal mid arm circumference (90-110%), and 40% of them less

normal percent (90%) at initial contact. On the contrary, about two third of the studied children (63, 33%) were less normal (90%) and 33.33%of them were normal (90-110%) after 3 months. There were significant differences.

Concerning skin fold thickness, more than half of children (56.67%) had normal skin fold thickness (80-110%), and 40% of them were less normal (80%) at initial contact. On the contrary, about two third of children (61, 67) were less normal (80%) and 35% of them were normal (80=110%) after 3 months. There were no significant differences.

Table (9): represents distribution of the studied children's regarding their body mass index. It was noticed that about one third of children (35%) were under weight, while 65% of children's were normal weight at initial contact but after 3 months, more than half of children's (56.67%) were under weight while nearly half of children's (43.33%) were normal weight. The difference was statistically significant.

Table (10): represents the relations between mid arm circumference of the studied children and feeding problem during study period. There was no statistically significant relation between mid arm circumference of the studied children and feeding problem (nausea, vomiting, dryness of mouth) while there was statistically significant relation between mid arm circumference of the studied children and loss of appetite during study period.

Table (11): represents the relations between skin fold thickness of the studied children and feeding problem during study period. There was no statistically significant relation between skin fold thickness of the studied children and feeding problem (loss of appetite, nausea, dryness of mouth) while there was statistically significant relation between skin fold thickness of the studied children and vomiting during study period. As

Table (12): represents the relations between BMI of the studied children and feeding problem during study period. There was no statistically significant relation between BMI of the studied children and feeding problem (vomiting, dryness of mouth) while there was statistically significant relation between BMI of the studied children and feeding problem (loss of appetite, nausea) during study period. As

Table (13): represents distribution of the studied children regarding children's laboratory investigations. It was found that, the majority of the studied children (83.33%) were less than normal range of hemoglobin at initial contact and increased to (88.33%) after 3 months. There were no statistically significant differences.

The majority of the studied children (76.67%) was less than normal range of hematicrit at initial contact and increased to 88.33% after 3 month. There were no statistically significant differences. About two third of the children (60%) were less than normal range of serum protein at initial contact and increased to 78.33% after three months. There were significant differences.

The majority of children's (75%) were less than normal range of red blood cells count at initial contact and increased to (83%) after 3 months. the differences were not statistically significant . The majority of children's 76.67% was less than normal range of white blood cells count at initial contact and increased to 91.67% after 3 months. The differences were not statistically significant.

Table (1): percentage distribution of studied children regarding their Socio-demographic characteristics

Socio-demographic characteristics	No	%
Child age		
3-	7	11.67
5-	12	20.00
7-	6	10.00
9-	9	15.00
11-	15	25.00
13-15	11	18.33
Mean ± SD	9.533+3.422	
Educational level of the child		
Nursery school	13	21.7
primary school	21	35
preparatory school	15	25
secondary school	11	18.3
Sex		
Male	40	66.67
Female	20	33.33
Child Birth Order		
1st	21	35.00
2nd	18	30.00
3rd	9	15.00
4th or more	12	20.00
Family Size:		
3 ≤ 5	20	33.33
5 ≤ 7	29	48.33
7 ≤ 9	11	18.33
Mean ± SD	5.70±1.417	
Residence		
Rural	49	81.67
Urban	11	18.33

Table (2): Percentage distribution of the studied Children regarding their Feeding Pattern.

	Initial Contact (n=60)		After 3 Months (n=60)		Chi-square	
	No	%	No	%	X^2	*P*-value
Number of meals per day						
1	8	13.33	0	0.00	22.723	0.000*
2	26	43.33	16	26.67		
3	14	23.33	9	15.00		
4 or more	12	20.00	35	58.33		
Main meal						
Breakfast	24	40.00	31	51.67	1.701	0.637
Lunch	16	26.67	13	21.67		
Dinner	7	11.67	5	8.33		
No main meal	13	21.67	11	18.33		
Snacks						
Eating snacks	26	43.33	44	73.33	11.109	0.001*
Not eating snacks	34	56.67	16	26.67		

*significant at P<0.05

Table (3): Percentage distribution of the studied children regarding Type of Snacks Consumed by Children.

	Initial Contact (n=60)		After 3 Months (n=60)		chi-square	
	No	%	No	%	X^2	*P*-value
Fruits	20	33.33	18	30.00	0.154	0.695
Fresh Vegetables	22	36.67	20	33.33	0.147	0.702
Bread	38	63.33	28	46.67	3.367	0.067
Milk and Cheese	22	36.67	23	38.33	0.036	0.850
Juices	41	68.33	42	70.00	0.039	0.843
Meats	30	50.00	13	21.67	10.474	0.001*
Sweets	40	66.67	34	56.67	1.269	0.260
Beans	21	35.00	18	30.00	0.342	0.559

Significant at $p<0.05$*

Table (4): Percentage distribution of the studied children regarding children's appetite.

	Initial Contact (n=60)		After 3 Months (n=60)		chi-square	
	No	%	No	%	X^2	*P*-value
State of appetite						
Good appetite	20	33.33	10	16.67	4.444	0.035*
Poor appetite	40	66.67	50	83.33		
Change of Appetite						
Changed	zero	zero	0	0.00		
Not changed	zero	zero	51	85.00		
Get worse	zero	zero	9	15.00		

Significant at $p<0.05$*

Table (5): Percentage distribution of the studied children regarding feeding problems with chemo or radiotherapy after 3 months.

Type of Problems	Chemotherapy After 3Months (n=56)		Radiotherapy After 3 Months (n=4)	
	No	%	No	%
Loss of Appetite	56	100.0	4	100.0
Nausea	34	60.71	3	75.5
Vomiting	29	51.78	3	75.0
Dryness of mouth	10	17.85	2	50.0
Stomatitis	10	17.85	1	250
Difficulty in Chewing	10	17.85	1	25.0
Difficulty in Swallowing	9	16.07	1	25.0
Diminished in Food Taste	4	7.14	1	25.0

Table (6): Percentage distribution of the studied children regarding chemo and or radio therapy regimen, diagnosis, and management.

1-Type Of Diagnosis	n=60	%
Leukemia	28	46.67
Lymphoma	14	23.33
Bone Tumors	7	11.67
Tumors of the Nervous System	7	11.67
Soft Tissue Tumors	4	6.67
2-Mangment	n=60	%
Chemotherapy	56	93.33
Radiotherapy	4	6.67

Table (7): Percentage distribution of the studied children regarding their adequacy of dietary intake.

	Initial Contact (n=60)		After 3 Months (n=60)		Chi-square	
	No	%	No	%	X^2	*P*-value
Energy:						
Less than RDA_s	60	100.00	60	100.00	.	
Adequate	0	0.00	0	0.00		
More than RDA_s	0	0.00	0	0.00		
Protein:						
Less than RDA_s	58	96.67	60	100.00	2.034	0.154
Adequate	2	3.33	0	0.00		
More than RDA_s	0	0.00	0	0.00		
Calcium:						
Less than RDA_s	40	66.67	45	75.00	1.008	0.315
Adequate	20	33.33	15	25.00		
More than RDA_s	0	0.00	0	0.00		
Iron						
Less than RDA_s	45	75.00	49	81.67	0.786	0.375
Adequate	15	25.00	11	18.33		
More than RDA_s	0	0.00	0	0.00		
Vitamin A						
Less than RDA_s	48	80.00	50	83.33	0.223	0.637
Adequate	12	20.00	10	16.67		
More than RDA_s	0	0.00	0	0.00		
Vitamin C						
Less than RDA_s	50	83.33	54	90.00	1.154	0.283
Adequate	10	16.67	6	10.00		
More than RDA_s	0	0.00	0	0.00		

*significant at $P<0.05$

Table (8): Percentage distribution of the studied children regarding Their Percent Standard Anthropometric Measurement.

Anthropometric Measurement	Initial Contact (n=60)		After 3 Months (n=60)		Chi-square	
	No	%	No	%	X^2	*P*-value
Weight						
<90%	23	38.33	36	60.00	5.829	0.054
90-110%	35	58.33	22	36.67		
>110%	2	3.33	2	3.33		
Height						
<90%	10	16.67	10	16.67	0.000	1.000
90-110%	50	83.33	50	83.33		
>110%	0	0.00	0	0.00		
Mid arm Circumference						
<90%	24	40.00	38	63.33	6.791	0.034*
90-110%	34	56.67	20	33.33		
>110%	2	3.33	2	3.33		
Skin fold Thickness						
<80%	24	40.00	37	61.67	5.843	0.054
80-110%	34	56.67	21	35.00		
>110%	2	3.33	2	3.33		

Table (9): Percentage distribution of the studied children regarding Their Percent Standard of Body Mass Index.

Standard Body mass index(Kg/m2)	Initial Contact (n=60)		After 3 Months (n=60)		Chi-square	
	No	%	No	%	X^2	*P*-value
Underweight <18.5	21	35.00	34	56.67	5.673	0.017
Normal 18.5-24.9	39	65.00	26	43.33		
Overweight 22.5-29.5	0	0.00	0	0.00		

*Significant at P<0.05

Table (10): Relation between Mid arm circumference of the studied children and feeding problem.

		Mid arm circumference								Chi-square	
		<90		90-110		>110		Total			
		N	%	N	%	N	%	N	%	X^2	*P*-value
Loss of Appetite	Yes	23	38.33	15	25.00	2	3.33	40	66.67	17.967	<0.001*
	No	1	1.67	19	31.67	0	0.00	20	33.33		
Nausea	Yes	6	10.00	3	5.00	1	1.67	10	16.67	4.306	0.116
	No	18	30.00	31	51.67	1	1.67	50	83.33		
Vomiting	Yes	7	11.67	1	1.67	0	0.00	8	13.33	8.692	0.130
	No	17	28.33	33	55.00	2	3.33	52	86.67		
Dryness of mouth	Yes	4	6.67	1	1.67	1	1.67	6	10.00	6.623	0.036
	No	20	33.33	33	55.00	1	1.67	54	90.00		

*significant at *P*<0.05

Table (11): Relation between skin fold thickness of the studied children and feeding problem.

		Skin fold thickness								Chi-square	
		<80		80-110		>110		Total			
		N	%	N	%	N	%	N	%	X^2	*P*-value
Loss of Appetite	Yes	20	33.33	18	30.00	2	3.33	40	66.67	6.882	0.032
	No	4	6.67	16	26.67	0	0.00	20	33.33		
Nausea	Yes	7	11.67	2	3.33	1	1.67	10	16.67	7.147	0.028
	No	17	28.33	32	53.33	1	1.67	50	83.33		
Vomiting	Yes	8	13.33	0	0.00	0	0.00	8	13.33	13.846	0.001*
	No	16	26.67	34	56.67	2	3.33	52	86.67		
Dryness of mouth	Yes	5	8.33	1	1.67	0	0.00	6	10.00	5.234	0.073
	No	19	31.67	33	55.00	2	3.33	54	90.00		

*significant at *P*<0.05

Table (12): Relation between BMI of the studied children and feeding problem.

		BMI								Chi-square	
		Underweight		Normal		Overweight		Total			
		N	%	N	%	N	%	N	%	X^2	*P*-value
Loss of Appetite	Yes	20	33.33	20	33.33	0	0.00	40	66.67	9.973	0.001*
	No	1	1.67	19	31.67	0	0.00	20	33.33		
Nausea	Yes	10	16.67	0	0.00	0	0.00	10	16.67	15.125	0.001*
	No	14	23.33	36	60.00	0	0.00	50	83.33		
Vomiting	Yes	6	10.00	2	3.33	0	0.00	8	13.33	3.179	0.074
	No	18	30.00	34	56.67	0	0.00	52	86.67		
Dryness of mouth	Yes	5	8.33	1	1.67	0	0.00	6	10.00	3.403	0.065
	No	19	31.67	35	58.33	0	0.00	54	90.00		

*significant at *P*<0.05

Table (13): Percentage distribution of the studied Children regarding their Laboratory Investigations

Laboratory Investigations	Initial Contact (n=60)		After 3 Months (n=60)		Chi-square	
	No	%	No	%	X^2	*P*-value
Hemoglobin(gm/dI)						
Below normal	50	83.33	53	88.33	0.617	0.432
Within normal	10	16.67	7	11.67		
Hematicrit(%):						
Below normal	46	76.67	53	88.33	2.828	0.093
Within normal	14	23.33	7	11.67		
Serum Protein(gm/dI)						
Below normal	36	60.00	47	78.33	8.264	0.016*
Within normal	18	30.00	13	21.67		
Above normal	6	10.00	0	0.00		
RBCs(million/mm3)						
Below normal	45	75.00	50	83.33	1.263	0.532
Within normal	12	20.00	8	13.33		
Above normal	3	5.00	2	3.33		
WBCs(cells/mm3)						
Below normal	46	76.67	55	91.67	5.075	0.079
Within normal	8	13.33	3	5.00		
Above normal	6	10.00	2	3.33		

*Significant at $P<0.05$

4. Discussion

Cancer incidence increases with age and most cases were adults at the middle age or older. More than 8 millions US residents living today have a history of cancer. Of these, 5 million were diagnosed more than 5 years ago. For children aged 3 through 15, cancer causes more deaths in the United States than any other diseases [25, 26, 27]

Gharbiah population-based cancer registry (2000-2002) which reported that the childhood cancer represented 4.4% of all incidence cancer. The projected number of new cases is estimated 12.400 per year in the United State, with an estimated 2300 deaths per year. [28,29]

For children in all pediatric age group, leukemia is the most frequent type of cancer, followed by lymphoma. In the present study, it was observed that leukemia is the common type of cancer (46.67%) followed by lymphomas (23.33%). the age of cancer patient at present study ranged from 3 to 15 years with the mean age 9.533±3.422 years. This agreement with Zebeida *et al.* (2002), reported that the age of cancer patients ranged from 3 to 15 with the mean age was 9.02±3.84 years. [29-31]

The finding of the current study showed that, more than half of patients were males. This is in agreement with the statistical report of the National Cancer Institute in the United States for children under 15 years of ages, reported that males were affected more by cancer than females (ratio of 1.2:1) [32] and this varies with the type of cancer. Zebeida *et al.* (2002); also reported that more than half of patients were males. [31]

Occupation may affect exposure rates to occupational carcinogens. Low incomes have poorer prognosis from cancer than those whose incomes are above the median [33]. In the present study families of nearly half of the studied children (48.33%) consisted of 5 to 7 members. This can be clarified by that the large family size may be associated with over crowded houses and low socio-economic condition which predispose to infection. This is supported with Zebeida *et al.* (2002), that reported nearly half of the studied children their families consisted of 5 to 7 members. [31]

Breakfast was the main meal among these patients throughout the study period besides lunch (Table 2). Mahan *et al.* (2008) reported that cancer patients complain of decreased ability to eat as the day progresses (the morning being the time for eating) since the appetite is usually better in the morning [34].

In the present study, the number of children eating more than four meals per day after 3 months where the snacks given between meals were increased throughout the study period although their dietary intake was lower than requirements (Table 3). The dietary intake was mainly juices, milk and cheese which contain high calories and protein. These findings are congruent with many authors who cited that ways to increase calories include substituting cream for milk; adding tofu (high in protein) to most meals; serving full-fat yogurt and ice cream and

cooking with butter; putting sugar on cereal; and making high-calorie snacks.[35,36]

The side effects of chemo and/or radiotherapy on gastro intestinal tract are anorexia, nausea, vomiting, stomatities, esophagitis and diarrhea. The results of the present study revealed that the majority of studied children reported nausea and vomiting. This finding was congruent with Moors *et al.* (1998) [37] who mentioned that nearly all chemotherapeutic agents as well as radiation therapy have gastro-intestinal toxicity, causing nausea and vomiting . Nausea and vomiting may also result from the stimulation of chemo-receptors in the brain. Gralla *et al.* (1992) stated that anti emetics are most effective when they are started the night before chemotherapy and continued at 6 hours intervals. [38]

Anorexia is directly related to nausea and vomiting caused by chemotherapy and radiotherapy [39-41] .This was observed in current study where the highest percentage of patients reported loss of appetite at initial contact and after three months. Anorexia in cancer patients is due to stress hormones, which depress insulin production. Stress hormones also increase production pf lactic acid in the blood that can lead to nausea [42]. Other causes, which might cause anorexia, are psychological changes such as depression, grief or anxiety resulting from the disease or its treatment. Presence of pain, fever and severe infecting also decrease appetite [39]. This is in the same line with Langstein *et al.* (1991) and Tisdole (1993) mention that anorexia represent highest incidence as a problem affecting nutritional intake in 15%-25% of all cancer patients at diagnosis and it may occur as a side effect of treatments. [43, 44]

Stomatitis and mucosal injury are common consequence of many chemotherapeutic agents at usual doses [45]. In the current study, stomatitis was noted in 17.85% of children after three months of chemo- therapy. This problem may be due to rapid cell turnover in the alimentary tract caused by chemotherapy leading to stomatitis and oral ulceration and 25% of children who received radiotherapy after three months [46]. This problem may be due to direct effect of radiation by causing local tissue changes, decreased cell renewal, fibrosis of salivary glands and damage to taste buds .

Alteration in taste sensation was reported by 25% of children who received radiation and 7.14% of children who received chemotherapy after three months (Table 6). Donaldson *et al.* (2003) added that alteration in taste sensation deteriorates rapidly, often within the first two weeks of therapy [32].

Nutritional problems arise from the effect of radiation therapy on the ability to eat and swallow lead to weight loss [47] . This was observed in the present finding as forty percent of our patients among who received radiation therapy had difficulty in chewing and swallowing more than those received chemotherapy.

Mahan *et al.* (2008) stated that radiotherapy affects intestinal function with nausea, vomiting and diarrhea frequently result from and may persist throughout therapy, resulting in weight loss. [34]

Malnutrition affect on cancer treatment, quality of life, and self image of children. This is in the same line with Grant (1994), and Bozzettif (1998) who mentioned that malnutrition not affect only morbidity and mortality but also can lead to lower quality of life and a change in self-image. Also increased hospital stay, unplanned hospitalization, readmission, and greater incidence of complication. [48,49]

Diminished protein intake in studied patients may be due to alteration in taste and smell sensation experienced by cancer patients. This may be a result of sample characteristics, where most children were mainly of low socio-economic class, their parents were illiterate, just read and write, non working mothers with large family size (Table1). All factors interfere with proper choice of food and the inadequate unbalanced diet can be the cause of weight loss [39]. The percent of macronutrient intake change (protein, fat, carbohydrate) increase the risk of weight loss in patient with cancer. Also the finding shows a significant weight loss and a significant decrease intake of energy and protein at initial contact and after 3 month. This is in the same line with Ravasco (2003) in the study of role of disease and diet in affecting nutritional deterioration in cancer patient, he approved that nutritional status and patients nutritional deterioration was relate to energy intake, protein intake. Moreover he mentions that decreased energy intake tends to be proportional to decreased protein intake. [50]

Malnutrition among cancer patients is caused by combination of reduction in energy intake due to decreases in food intake and altered metabolism as apart of the inflammatory and immune response [21]. Therefore, optimizing nutritional intake is advocated as apart of routine management of cancer. It is a necessity that the nutritional status of cancer patients should be monitored continuously. Several studies reported that patients with cancer were malnourished but, their nutritional status improved with successful chemotherapy [31]. Protein and calorie decreased throughout the study period. This is in the same line with Simko *et al.* (1995), Whitneye *et al.* (1998) mention that, malnutrition especially that resulting from inadequate intake of calories and protein. [51, 52]

In relation to anthropometric measurement, the finding of the current study showed a significant decrease in the body weight, mid arm circumference, skin fold thickness, and body mass index that was

observed at initial contact and after 3 month. This is in the same line with Nour *et al.* (2003) who indicated decreasing of this parameter among the subjects of both control and experimental groups [57]. Also she concluded that, adequate nutrition is an important aspect to minimize weight loss and shorten hospital stay. Also Hemeda (2001) in the study of nutritional needs of the mechanically ventilated patients revealed the same result. [58]

Gronder *et al.* (1996) mentioned that body weight is one of the most important measurements in assessing nutritional status and used to predict energy expenditure [59]. While Pafu and Rombeau (2000) and Pingleton (2001) stated that although body weight is a simple measure with important prognostic value but abnormalities in water storage and body composition in critically ill patients are edematous. So the measured weight does not reflect the real body cell mass. [60,61]

In the present findings, it can be seen that 61.66% of children didn't have weight loss at initial contact, this indicates that theses patients are still not affected by the disease or the chemo and/or radiotherapy, as they didn't start radio or chemotherapy yet and the highest percent of patients had average normal weight and normal physical appearance (normal hair, face, eyes, skin,….ect) and normal vital signs.

The results of the present study indicated that more than half of children (60%, 63.33%, 56.67%, 61.67%) had weight loss, mid-arm circumference , body mass index and skin fold thickness below normal standard respectively after three months of treatment .This finding is congruent with Marzouk *et al.* 1993), who studied the nutritional status of 30 children with acute leukemia below the age of 12 years where the results revealed that there was a significant lower weight/height ratio in these patients and mid-arm circumference.[20]

The loss of body weight and mid-arm circumference may be due to decreased nutrient intake where protein and calories of children in this study were below the normal requirement This is supported with Abdel-Kader *et al.* (1996), that reported the findings of a study in Egypt which included 70 pediatric cancer patients (48 males and 22 females), there age ranged from 4-10 years. The results of that study showed a decrease in protein and caloric intake by the end of the three months period. Also, the patients had low intake of vitamins A, C and calcium. [62]

In the present study, the percent of loss body weight was in 38.33% of children at initial contact, 60% after three months .This can be attributed to the short period of data collection and to children's feeding pattern. Chemo-radiotherapy contributes to nutrient alteration in the cancer patients by reducing food intake, decreasing absorption and altering metabolism [63], causing weight loss. So, increased need for balanced food, nourishing high protein diets even more than they used to have before disease and treatment [64]. This is in the same line with Kirby *et al.* (1998), Shike & Albrecht (1996) and Stratton *et al.* (2003). They reported that the estimated prevalence rates of malnutrition vary according to tumor site, tumor size, type, and stage, age of child, and cancer type of cancer treatment used. Stratton (2003) showed that the effect of tumor type on nutritional state, indicating that the prevalence of malnutrition in colorectal cancer is ranged from 30%-60%. [65-68]

As regard to laboratory investigation that, the finding of the present study showed that a significant decrease of hemoglobin at initial contact and after 3 month. Hemoglobin reflects oxygen-carrying power of blood. When its level is reduced, oxygenation is reduced with a tissue rapier is altered resulting in delayed healing. The amounts of hemoglobin in blood primarily depend on the number of blood cells and to lesser extent on the amount of hemoglobin on each red blood cell [70].A decline of hemoglobin value in this study may have many factors including blood loss during surgery, and throughout the disease process, suppression of red blood cell production by cancer therapy as radiotherapy or chemotherapy, nutritional deficiency, infection and pharmacological agent. This is in the same line with Sheren *et al.*. [71]

In the same study, there was a significant decline in the serum protein at initial contact and after 3 months. This is in the same line with Nour (2003). There was a significant decrease in sodium and potassium during study period. This is in the same line with Sheren *et al.* [71]. In addition the result of the present study were consistent with Hemeda (1999) and Nour *et al.* (2003) who showed that the laboratory indicators value decreases in control group in the post graft from the admission[57,58]

Conclusion

Cancer is a major medical problem. Childhood cancer is the second leading cause of death in children ages 5 to 14 years. For children in all pediatric age group, leukemia is the most frequent type of cancer, followed by lymphoma. Socioeconomic status is associated with a variety of factors, including host factors immune and nutritional status/function that influence cancer development and response to treatment.

Cancer patients who received chemotherapy or radiotherapy had many feeding problems throughout the study period such as loss of appetite, nausea, vomiting, and dryness of mouth, stomatities, difficulty in chewing and swallowing, and diminishing in food

taste. There was change in the nutritional status observed throughout the study period. This change was indicated by weight loss, reduction body mass index, reduction mid arm circumference and reduction skin fold thickness.

Recommendations

I. Recommendations Related to Hospital Authorities:

1- In service training programs should be held with nurses working in the radiation and oncology department which include lesson about cancer and side effects of cancer.

2- Planning dietary regimens for these patients by using audiovisual materials like pictures, photos and films.

3- Financial support for family if necessary.

4- Making notes or charts for nutritional programs.

5- Periodic meeting between physician, nurse and dietitian to discuss nutritional problems of cancer child undergoing radio and/ or chemotherapy.

II. **Recommendations Concerning the Nurses:**

1- Patients nutritional problems should be solved on individual bases. In services training and education is necessary for all nurses' work in this aspect.

2- Time scheduling for patients in the out patients clinic to reduce their waiting hours.

3- Nurses should give the patients effective teaching about the disease and lines of treatment. Nurses should help the patients to identify side effects of radiation and chemotherapy and increase their self-care abilities.

III. **Recommendations concerning the patients:**

1- Developing a dietary program for patients undergoing chemo and/or radiotherapy

2- Simple booklets should be given to the patient or one of the families with simple explanation of his disease, treatment, Side effects and the role of the patient in minimizing them.

3- Establishing a nutritional information center or a nurse specialist in the clinic to assess the nutritional status of these patients and to guide them in relation to their dietary needs.

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