Effect of Nutritional Guidelines on Parents' Knowledge, Practice and Children Outcomes Receiving Chemotherapy at Zagazig University

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Abstract: Cancers in children account for well under 2% of all cancer worldwide, but a much larger proportion of total life-years potentially lost to cancer. Leukemia is the most frequent childhood cancer. Central nervous system tumors are the most common group of solid tumors, and solid tumors overall are histologically much more diverse in children than in adults. In 2018 there will have been 200,000 newly diagnosed cases of childhood cancer worldwide. Multimodal treatments can have an additional adverse effect on nutritional status, so effective nursing strategies for children with cancer are critical to successful care and Parents are not only there to support their child physically or mentally, but they also offer such organizational help as meal preparation and administering treatment. **The aims of the current study was to** Identify the effect of nutritional education guidelines on parents' k., practice and children outcomes receiving chemotherapy. **Research Design:** A quasi-experimental study design (pre, post and follow up) was used to evaluate effect of nutritional education guidelines on parents' knowledge, practice and children outcomes receiving chemotherapy**. Settings:** The study was conducted in Pediatric Hematology and Oncology unit in pediatric hospital at Zagazig University Children Hospitals. three tools used; **first** a Structured Interview Questionnaire sheet to collect data about characteristics of studied children's parents and their knowledge and Practice. **the second** tool was Reported Brazilian Healthy Eating Index-Revised (BHEI-R): dietary assessment. **And Third** Physical Assessment Sheet to assess studied children's nutrition. **The study results** indicates statistically significant positive correlations between total mean score of parents' knowledge and their practices at pre (r= .674**), post (r= .506**), and follow (r= .576**) program phases, i.e. the higher the parents' knowledge score the higher their practices. indicates statistically significant positive correlations between total mean score of parents' practices and child's BHEI-R Score at pre (r= .173*), post (r= .667**), and follow (r= .425**) pr**. It can be concluded** that the guidelines had improved studied parents' knowledge and practice about cancer nutrition for children receiving chemotherapy . Therefore, **this study recommended that** Ongoing in services education guidelines must be designed and implemented at pediatric hematology and oncology clinic to improve parents' knowledge and practices on the basis of children nutrition and care of the body who receiving chemotherapy.

Key words: Guidelines- cancer- chemotherapy –Nutrional assessment

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Introduction: Childhood is a time when developmental changes are happening that can have profound and lasting consequences for a child's future. Children are backbone of a nation as on children‟ health and prosperity depend on the health of a nation. Children need the care, protection and guidance which are normally provided by parents or other caregivers, especially during the early years when they are most dependent. While their emerging abilities and capacities change the nature of this vulnerability from infancy through adolescence, their need for attention and guidance at each stage remains. Parents and communities have the primary responsibility for protecting and caring for children, and initiating them into culturally relevant skills, attitudes and ways of thinking that enable children to have powerful abilities in facing any crisis affect their life **(WHO, 2021).** Cancer a broad term that encompasses a wide range of diseases that affect region of body. Cancer defined the rapid growth of aberrant cells beyond normal borders, which subsequently infiltrate adjacent regions of the body and spread to organs, a process known as metastasizing. Metastases a leading cause cancer-related death. There numerous cancer treatment options **(WHO, 2020).** Cancers in children account for well under 2% of all cancer worldwide, but a much larger proportion of total life-years potentially lost to cancer. Leukemia is the most frequent childhood cancer. Central nervous system tumors are the most common group of solid tumors, and solid tumors overall are histologically much more diverse in children than in adults. In 2018 there will have been 200,000 newly diagnosed cases of childhood cancer worldwide **(Charles Stiller, 2022 & Bhakta et al, 2019).** There are more than 100 types of cancer. Types of cancer are usually named for the organs or tissues where the cancers form. For example, lung cancer starts in the lung, and brain cancer starts in the brain. Cancers also may be described by the type of cell that formed them, such as an epithelial cell or a squamous cell. There are common types of cancer in children **(Huges et al.,2017).**

Chow et al., (2020), state that advances in the treatment and supportive care of childhood cancer over the last decades have led to dramatic improvements in survival and quality of life for children suffering from leukemia's, lymphomas, and solid tumor malignancies. A milestone was the introduction of so-called “multidisciplinary teams,” consisting of health care professionals with expertise in specific areas of childhood cancer working together in an effort to provide the best care and treatment possible. During regular meetings, the multidisciplinary tumor board discusses treatment plans for newly diagnosed cancers in children, therapy options for patients currently undergoing treatment, and clinical scenarios or difficult cases requiring expert consensus or additional national tumor panel consultation(s) for their

management.Chemotherapy has been used for several decades to treat cancer in children and adults. It has become more effective and safer over time with better understanding of the pharmacokinetics and toxicity profile, dose-dense regimes, and improved supportive care. The general principles of chemotherapy, administration, mechanisms of action, and acute and late toxicities (**Children's Oncology Group, 2020**).

Caring for children undergoing CT is perceived by the nurse as a complex work situation. The nurse perceived that providing a holistic care should be focused on the child, family, procedure and development of the nurse' profession. During the holistic care, nurses could give a sense of security to the child and the parents, which included individualization of information and preparation, working as a team and maintaining the balance among families involved. Thus, the nurse became committed with both positive and negative outcomes **(Chang et al.,2017).** Parents need to be involved in the child's treatment, as the nurse perceived that the parents‟ anxiety is reduced when parent knew what will happen. The nurse is meeting child and family early before CT began, when the nurse can observe, listen and put questions to the child and family that helping in improving care. The nurse perceived that responsibility for the technical aspects of the treatment and procedure to avoid the possibility of making errors. The nurse feels a need to be effective and to create a strategy for each child and family to give holistic care. The nurse perceived the need to know nurses' limitations, take greater responsibility and develop nurses' skills concerning the children's care (**Boztepe & Yıldız, 2017).** Nurse can educate the child and parents regarding the diagnostic workup as well as provide support to them through this uncertain time. The child and parents often have questions about testing, logistical concerns, next steps and when they can expect results to be in or treatment to start. Once the child has received a diagnosis of cancer, the navigator can develop a plan of care in conjunction with the oncologist or hematologist, which will help the child stay on course for treatment (**Blaseg et al., 2014).** Nutritional status affects immune response and the response to medical therapies. Healthcare providers assess child's nutritional status for many reasons: to identify child at risk of malnutrition for early intervention or referral before they become malnourished, to identify malnourished children for treatment malnourished who have longer hospital stays, slower recovery from infection and complications. So, it is very important to identify medical complications that affect the body's ability to digest food and utilize nutrients. In addition to, detect practices that can increase the risk of malnutrition and infection. Moreover, to establish appropriate nutrition care plans, to inform nutrition education and counseling **(Arpaci et al ,2018).**

Significance of the study: The frequency of undernourishment in children and adolescents with cancer is arbitrary. Reported prevalence of malnutrition in pediatric patients with cancer varies widely, ranging from 8% up to 60% depending on type of cancer, treatments; methods used to determine under nutrition, Malnutrition can lead to a reduced response to cancer treatment, increased side effects, and possibly reduced survival. Consequences of malnutrition in patients with cancer include increased risk of infections, poor wound healing, poor quality of life, and perhaps increased referral to tertiary care centers.

Aim of the study: This study aims to: Identify effect of nutritional guidelines on Parents' k., Practice and Children Outcomes Receiving Chemotherapy.

This aim will be fulfilled through the following objectives: 1-Assess the parents' knowledge regarding care provided to their children receiving chemotherapy. 2-Develop nutritional guidelines on Parents' knowldge and Children outcomes Receiving Chemotherapy. 3-Implement nutritional guidelines on Parents' knowldge and Children outcomes Receiving Chemotherapy.4-Evaluate the effect of nutritional guidelines on Parents' knowldge and Children outcomes Receiving Chemotherapy.

Research hypothesis: Parents' knowledge and children outcome about nutrition of their children receiving chemotherapy will be improved after implantation of the guidelines.

Subject and methodology: Research Design: A quasi-experimental study design (pre, post and follow up) was used to evaluate effect of nutritional education guidelines on parents' knowledge and children outcomes receiving chemotherapy. **Settings:** The study was conducted in Pediatric Hematology and Oncology unit in pediatric hospital at Zagazig University Children Hospitals. **Study Subjects: Two subjects were included in the study: Group I :** A convenient sample of all available parents of children (60) had cancer and receiving treatment in the study settings and agree to participate in the study .**Group II :** purpose sample of all children who had cancer with the following inclusion criteria : **a**) Age between 6-12 years of age. **b)** Hospitalized during treatment, **c**) Treated for cancer for at least 1 month. **D)** Able to take oral nutrition. E) Free from any chronic disease .

Tools for data collection: Three tools used for data collection:
Tool I : Structured Interview Questionnaire sheet: - Part A: Characteristics of the children and their parents, such as mothers age, mothers education , mothers job, marital status ,father age, father education, fathers job , income, residence and

crowding index , child age , gender , the number of siblings of the child , child order and academic years.

Part B: Child's medical history such as, diagnosis, duration of illness in years , duration of treatment in months, number of hospital admission last years, number of days for hospital stay the last years, have a surgery, have a blood transfusion ,causes of blood transfusion and having symptoms .

Part C: Parents knowledge about cancer, definition, , At what age does cancer spread to children, types of cancers ,causes of the cancer, primary signs that appear on a child with cancer, complications of cancer in children, precautions that must be taken to protect the child undergoing chemotherapy at home, How to prepare your child before the chemotherapy, How do you deal with your child during and after the chemotherapy, ways to treat cancer and purpose of chemotherapy.

Scoring system for knowledge: All knowledge items were checked with a model key answer, where the complete correct response was scored (2) degrees, incomplete correct response was scored (1) degree and (0) for incorrect/don't know. The total knowledge Score was categorized into: **- Poor (< 60%) - Average (60% -<75) - Good (>75).**

Objectives of the guidelines: 1-Define childhood cancer its types, and clinical manifestations. 2-Know the predisposing factors of cancer ,investigations and treatment. 3-Recognize the definition of chemotherapy treatment and its side effects. 4-Learn instructions concerning the preparation of the child before, during and after chemotherapy. 5-Learn information for nutrion and food preparation ,during and after chemotherapy treatment.

Guidelines Contents : The **guidelines:** were included five sessions. These sessions was involved definition of childhood cancer, its types, clinical manifestations, predisposing factors, investigations and treatment. It also was covered instructions concerning the preparation of the child before, during, and after chemotherapy, side effects of chemotherapy , and dietary assessment and information about foods and preparations for food intake. The educational program was developed through four phases as follows:

1-Assessment phase: The educational training guidelines was constructed for the assessment of nutritional education guidelines on parents' knowledge and children outcomes receiving chemotherapy, The assessment was performed before the implementation of educational training guidelines by interviewing each parent individually to assess their knowledge.

2- Planning phase :Based on the results obtained from the interview questionnaire (from pilot and assessment phase) as well as reviewing the related literature the educational training guidelines was developed by the researcher. Detected needs, requirements and deficiencies were translated into aim and objectives of the educational

training guidelines, The contents of the educational training guidelines were selected on the basis of identified needs. Teaching methods were selected to suit teaching in small groups in a form of lectures, group discussion, demonstration and. booklets and handout that covered theoretical information. **3- Implementation phase** :The guideline protocol on children receiving chemotherapy was developed based on actual needs assessment and implemented for parent. The implementation phase was achieved through five sessions at a period of 5 weeks (one session / week). Each session started by a summary of the previous session and objectives of the current session. Motivation and reinforcement were used during sessions to encourage parent' participation in the study. Demonstration and re-demonstration were applied. Parents were divided into groups and each group consisted of 6 parents to acquire the related program content. Each parent was supplemented with a copy of guideline education. The time of sessions ranged from 25-30 minutes. Different methods of teaching were used such as; discussion, lecture, brain storming, role play, demonstration and re-demonstration for each group. Media utilized were guideline education guided by an educational booklet and power point which were constructed by the researcher after reviewing the related literature about the research problem. **Tool validity and reliability:** Tool's validity was tested through a jury of three experts 2was pediatric nursing. The experts reviewed the tool for its clarity, relevance, comprehensiveness, simplicity, and applicability. Minor modifications were done in form of questions order and the terms used in formulation of questions. This phase took a period of one month from the beginning to the end April 2020. **Reliability**: Knowledge reliability statistics Cronbach's alpha = 0.810, Practice reliability statistics Cronbach's alpha = 0.852 .**Ethical Considerations:** An official approval for conducting the study will be obtained from the responsible administrative personal at the study setting. A verbal consent will be obtained from patients for participation in the study. Ensuring complete privacy, total confidentiality of any obtained information will be ensured. Nature and aim of the study will be explained to each patient of participants. **A pilot study**: was carried out on 10% of the total sample size (6 parents). It tested the validity, clarity, applicability, and feasibility of the study tools and the estimated time needed to complete each tool (I &II).. Participants involved in the pilot study were not excluded from the study sample because Modifications were not done.

Field work: The process of data collection was carried out from the beginning of March 2020 through October 2020. The researcher interviewed the parents at pediatric hematology and oncology clinic at Zagazig university pediatric hospital, explained the aim of the study and took oral approval from parents participating in the study prior to data collection by rotation for two or three days weekly during morning shift, to collect data by using previously mentioned tool. The data was collected through two phases for assessment of parents . The first phase was done prior to conducting the

educational guideline to have base line of data and identify their actual educational need, while the second phase of assessment was done after conducting the educational guideline to evaluate the effect of education guideline of parents' performance regarding children receiving chemotherapy .The researcher interviewed each parents individually and explained the aim of the study and took their approval prior to data collection. Then, the researcher assessed parents' knowledge and observed their practice regarding nutrition children using the previous mentioned tools. The researcher observed parents practice during care of children.

-Evaluation phase: During evaluation phase, the effect of the guideline education parents knowledge and practice toward children receiving chemotherapy was evaluated by using the same forms of tools used before the implementation for all parents . This was done immediately after the intervention and lasted 12 weeks (from the middle of May to middle of october 2020).

IV-Statistical design: The collected data was organized, coded, computerized, analyzed and tabulated by electronic computer and Statistical Package for Social Sciences (SPSS) version 20. The collected data was represented in term of number, percentage distribution, mean, standard deviation, relation coefficient Chi- square test and correlation. A significant level value was considered when $P > 0.05$ and $P \leq 0.00$.

RESULTs: According to the current study Part(1) Table (1) shows that, the mean age of the studied children was 8.30±1.97 year. Related to gender, 66.7% of them were male. Regarding to academic year, 70.0% of the studied children were from Kg to three grade. As for the number of child's siblings, 90.0% of children were having three or more siblings, while 46.7% of them were the second between their siblings, the mean age of the studied children's mother was 33.73±4.06 year, while the mean age of the studied children's father was 40.37±2.97 year. Regarding parents' education, 66.7% of the studied children' mother had secondary education, while 40.0% of the studied children' father had secondary education. Regarding to parents' job, 73.3% of the studied children' mother were housewife, while 60.0% of the studied children' father were employee. Related to children's parent income level, 85.0% of them were having insufficient income. As for residence, 80.0 % of the children's parent were from rural area. According to crowding index, 63.3% of them were more than two. **Table (2)** shows that, the leukemia was the most common type of cancer (30.0%), followed by bone cancer (25.0%) among the studied children. Regarding the duration of illness and treatment, the mean duration of illness was 2.30 ±1.18 years, while the mean duration of treatment was 27.60 months±14.2.As for number of hospital admissions last year, 73.3% of the studied children admitted to hospital one time while, 20.0% of them admitted to hospital two times . Concerning to number of days for hospital stay the last year, 73.3% of the studied children stayed at hospital from month to two months while, 20.0% of them stayed at hospital for more than two months . Also, all the children hadn't any surgery (100.0%).Related to blood transfusion, 56.7% of studied children had blood transfusion,

while 43.3% of them hadn't blood transfusion, and the main cause of blood transfusion was anemia (56.7%).also the table reveals that all the studied children had loss of appetite and tooth decay (100.0%), followed by dry mouth (96.7%), oral infection (93.3%), diarrhea and weight loss (90.0%), then nausea (73.3%). **Table (3)** shows that, all the studied children were depending on oral feeding (100.0%). Regarding the number of main meals per day, 63.3% of the studied children had two main meals per day, while 36.7% of them had three meals per day. As for regularity of meal times, all the studied children sometimes had their meals at a regular time (100.0%). Concerning to regularity of breakfast eating, all the studied children sometimes had their breakfast at a regular time (100.0%). Also, all the children hadn't any surgery (100.0%).Related to eating snacks between main meals, 83.3% of studied children were eating snacks between main meals, while 16.7% of them were eating snacks between main meals. Also the table reveals that all the studied children had never any special meals other than family meals, and hadn't like or hate eating certain food (100.0%), additionally all of them were eating with the family in front of the TV (100.0%).**Table (4)** reveals that before the program, 71.7 % of the studied children's parents had poor knowledge about cancer, chemotherapy and its nutrition, while after the program and at follow up stage this percentage decreased to be no one of them had poor knowledge about cancer, chemotherapy and its nutrition. Additionally, the table reveals that before the program only 3.3% of the studied children's parents had good knowledge about cancer, chemotherapy and its nutrition while after the program this percentage increased to be 70.0% of them had good knowledge about cancer, chemotherapy and its nutrition. These improvements were statistically significant ($p<0.001$).**Table (5)** indicates variations in all median and interquartile ranges of the Brazilian Healthy Eating Index-Revised components among the studied children throughout the study phases. The percentages were low concerning all components especially whole grain, milk, dairy milk, and calories from solid fat, and added sugar (0.1, 4.4, and 11.0 respectively). The post-program phase demonstrated a statistically significant improvements in all median and interquartile ranges of the Brazilian Healthy Eating Index-Revised components among the studied children ($p< 0.05$ &$p<0.001$). At the follow-up phase, the areas of significant improvements continued but with some slight declines in some of them. Concerning to total BHEI-R, before the program, total score of BHEI-R was 63.2 which increased to 84.8 at the post program phase, and increased to 85.4 at the follow-up phase. These improvements were statistically significant .Concerning the correlations between parents' knowledge and their practices Score pre, post, follow the program, **Table (6)** indicates statistically significant positive correlations between total mean score of parents' knowledge and their practices at pre (r= .674**), post (r= .506**), and follow (r= .576**) program phases, i.e. the higher the parents' knowledge score the higher their practices.

Table (1): Demographic characteristics of the studied children and parents (N=60)

Demographic characteristics	(n=60)	
	Frequency	Percent
Age group: /year		
6-8	38	63.3
9-12	22	36.7
Mean ± SD	**8.30±1.97**	
(Range)	**(6-12)**	
Gender:		
Male	40	66.7
Female	20	33.3
The number of siblings of the child:		
Two	6	10.0
Three or more	54	90.0
The child's order among his siblings:		
The second	28	46.7
The third	22	36.7
The last	10	16.6
Academic year		
Kg to three grade	42	70.0
Fourth to six grade	18	30.0
Demographic characteristics	**(n=60)**	
	Frequency	**Percent**
Mother's Age group: /year		
27 - 33	20	33.3
34 -40	40	66.7
Mean ± SD	**33.73±4.06**	
(Range)	**(27-40)**	
Mother's Education:		
Not read & write	2	3.3
Read & write	18	30.0
Intermediate (secondary)	40	66.7
Mother's job		
Work [employee- free work]	16	26.7
House wife	44	73.3

Mother's marital status		
Married	48	80.0
Divorced	5	8.3
Widower	7	11.7
Father 's Age group: /year		
35 - 40	32	53.4
41 - 45	28	46.6
Mean ± SD	**40.37±2.97**	
(Range)	**(35-45)**	
Father's Education:		
Read & write	10	16.7
Primary	26	43.3
Intermediate (secondary)	24	40.0
Father 's job		
Work [employee]	36	60.0
Free work [farmer-tradesmen-driver]	24	40.0
Income:		
Sufficient	9	15.0
Insufficient	51	85.0
Residence:		
Rural	48	80.0
Urban	12	20.0
Crowding index:		
<2	22	36.7
2+	38	63.3

Table (2): medical history of the studied children (N=60)

Medical history	(n=60)	
	Frequency	Percent
iagnosis:		
Leukemia	18	30.0
Neuroblastoma	13	21.7
ymphoma	14	23.3
one cancer	15	25.0
Duration of illness in years:		
6 months to 2 years	30	50.0
3 – 4 years	30	50.0

Mean ± SD (Range)	**2.30 years ±1.18 (6 months- 4 years)**	
Duration of treatment in months:		
6 months to 24 months	30	50.0
25 – 48 months	30	50.0
Mean ± SD (Range)	**27.60 months±14.2 (6 months- 48 months)**	
Number of hospital admissions last year		
No time	4	6.7
One time	44	73.3
Two times	12	20.0
Number of days for hospital stay the last year[n=56]		
Month to two month	44	73.3
More than two months	12	20.0
Have a surgery:		
No	60	100.0
Have a blood transfusion :		
	34	56.7
	26	43.3
Causes of blood transfusion :		
Anemia	34	56.7
Having symptoms@:		
Loss of Appetite	60	100.0
Nausea	44	73.3
Problems With Chewing	16	26.7
Oral Infections	56	93.3
Diarrhea	54	90.0
Tooth decay	60	100.0
Dry Mouth	58	96.7
Vomiting	34	56.7
Difficulty Swallowing	42	70.0
Indigestion	36	60.0
Constipation	10	16.7
Weight Loss	54	90.0

(@) More than one choice was allowed

Table (3): feeding habits of the studied children (N=60)

Feeding habits	(n=60)	
	Frequency	Percent
Feeding type: -Oral	60	100.0
Number of main meals per day :		
Two meals	38	63.3
Three meals	22	36.7
Regularity of meal times:		
Always	0	0.0
Sometimes	60	100.0
Never	0	0.0
Regularity of breakfast eating:		
Always	0	0.0
Sometimes	60	100.0
Never	0	0.0
Eating snacks between main meals		
Always	0	0.0
Sometimes	50	83.3
Never	10	16.7
Prepare special meals for child other than family meals		
ays	0	0.0
ietimes	0	0.0
	60	100.0
Like eating certain foods :		
Yes	0	0.0
No	60	100.0
Hate eating certain foods :		
Yes	0	0.0
No	60	100.0
Eat with the family :		
Yes	60	100.0
No	0	0.0
Eat in front of the TV :		
Yes	60	100.0
No	0	0.0

Table (4): Total children's parents knowledge about cancer and its nutrition pre, post and following the program (N=60)

Total children's parents knowledge	Pre		Post		Follow up		(p-value)#
	No	%	No	%	No	%	
Poor knowledge	43	71.7	0	0.0	0	0.0	.000**[1]
Fair knowledge	15	25.0	18	30.0	22	36.7	.000**[2]
Good knowledge	2	3.3	42	70.0	38	63.3	.000** [3]
Paired t-test							
Total mean knowledge score	4.53±1.3		9.83±2.8		9.21±1.6		.000**1 .000**[2] .000** [3]

*#: X2 Test *: Significant **: Highly significant P1: Pre versus Post P2: Pre versus Follow up P3: Post versus Follow up*

Table (5): Median and interquartile ranges of the Brazilian Healthy Eating Index-Revised components among the studied children throughout the study phases (N=60).

Elements	Pre (n=60)		Post (n=60)		Follow up (n=60)		p-value#
	M.	IQR	Median	IQR	M.	IQR	
Total grains (0-5)	3.6	3.0;4.6	4.5	3.3;5.0	4.4	3.2;5.0	.033*
Whole grains (0-5)	0.1	0.0;0.3	1.3	0.3;1.8	1.4	0.3;1.9	.000**
Total vegetables and legumes (0-5)	3.2	1.7;3.7	4.3	2.8;5.0	4.6	3.1;5.0	.03*
DGOV and legumes (0-5)	3.6	1.8;4.1	4.6	3.1;5.0	4.6	3.1;5.0	.02*
Total fruits (0-5)	3.1	1.6;3.6	4.2	2.9;5.0	4.4	3.0;5.0	.012*
Whole fruits (0-5)	3.4	1.4;3.8	4.5	2.8;5.0	4.5	2.8;5.0	< 0.01**
Meat, eggs and legumes (0-10)	7.8	5.9;8.9	9.5	5.9;10.0	9.3	5.9;9.8	.000**
Milk and dairy (0-10)	4.4	3.0;6.0	6.2	3.8;8.9	6.8	4.1;9.4	.04*

Oils (0-10)	8.2	7.9;9.8	10	8.8;10.0	10	8.8;10.0	**< 0.01****
Saturated fat (0-10)	6.9	2.2;8.6	7.7	3.9;9.9	7.9	4.1;9.9	**< 0.01****
Sodium (0-10)	7.9	7.5;9.3	9.9	8.4;10.0	9.9	8.4;10.0	**.032***
SoFAAS (0-20)	11.0	7.9;18.2	18.1	13.0;20.0	17.6	13.0;19.7	**.000****
BHEI-R total score (0-100)	63.2	43.9;80.9	84.8	59;95.6	85.4	59.8;95.7	**.000****

*SoFAAS: calories from solid fat, alcohol, and added sugar. # Wilcoxon Test *: Significant **: Highly significant.*

Table (6): Correlation between parents' knowledge and their practices Score

R: Pearson's correlation coefficient (**) statistically significant at p<0.01

practices Score	Total score of knowledge	
	r	P
Pre- program	.674**	.000
Post- program	.506**	.000
Follow- program	.576**	.000

Discussion: The nutrition management of children with cancer was an important aspect of their multidisciplinary care plan and medical management. The focus of this management had traditionally been on the prevention of under nutrition. Without nutrition therapy, up to 50% of pediatric cancer patients were likely to become malnourished. Nutrition therapy in children with cancer tends to focus on weight and growth-based outcomes whereby the maintenance of normal growth and development was the primary goal of nutrition interventions **(Cohen et al., 2021).** Regarding characteristics of the form and treatment, the present study results indicated that, all of the children were undergoing chemotherapy treatment. This was unique because it was effective for systemic cancers that cannot be managed by surgery or radiation. Also, the mean age of the studied children was 8.30±1.97 years old. This may be related to the most common age of cancer' onset in children was the school age. These results was in accordance with **Kızmazoğlu et al., (2019)** who conduct study about "Assessment of Health-related Quality of Life in Pediatric Acute Lymphoblastic Leukemia Survivors: Perceptions of Children, Siblings, and Parents" and found that 70% of children receive chemotherapy. In the same line, **Boshagh et al., (2022)** who conduct study about ''Effect of Family-Centered Empowerment Model on Knowledge and Caring

Performance of Mothers of Children with Leukemia: A Randomized Clinical Trial'' and found that the mean age was 7.41 ± 2.82 years old. Concerning to gender of the studied children, the present study demonstrated that, two thirds of the studied children were males and less than half of the children were ranked as the second within their families. Gender differences were not fully understood but probably reflect differences in exposure to environmental risk factors and hormones, as well as complex interactions between these influences. Gender differences in immune function and response may also play a role in increasing cancer rate in male than female. This results was in agreement with **El malla *et al., (2017)*** who conduct study in Egypt about "Advances in Pediatric Oncology- a Five-Year Nation-Wide Survival follow-up at Children's Cancer Hospital in Egypt" and mentioned that more than half of studied children were male and disagreed with **Obaid, (2018)** who conduct a study about "Mothers' Knowledge Concerning Leukemic Children Undergoing Chemotherapy Treatment In Oncology Units At Baghdad City" and mentioned that 50% half of studied children were male. The current study results evident that that the mean age of the studied mothers and fathers were 33.73±4.06 and 40.37±2.97 years old respectively. Also, two thirds and two fifth of the studied mothers and fathers completed secondary education. More than two third of mothers were housewives. The level of education was a key element in understanding and updating information that reflect positively on care provided for the sick child. These results paralleled with **Arpaci et al., (2018)** who conduct study in India about "Assessment of nutritional problems in pediatric patients with cancer and the information needs of their parents: a parental perspective and stated that the mean age of the studied mothers were 36.46±6.17 year and the mean age of the studied fathers were 39.95±5.73year. In contrast with an Egyptian study conducted by **Hassan and Ibrahim (2018)** to determine the effect of supportive nursing intervention on the burden and coping strategies of 60 mothers of children with cancer and found that more than one third (38.3%) of studied mothers have had a technical education, and majority (80%) of them were housewives.The current study results revealed that, majority of the studied parents were lived in rural area. This result could be related to the Zagazig pediatric Oncology clinic serving children with various types of cancers in Sharkia governorate and surrounding rural and semi-urban areas. In the same context, the **United Nations Educational, Scientific, and Cultural Organization (2017)** documented that the rural population was 57% of the total population worldwide. Similarly, **Egypt Demographics Profile (2020)** reported that the rural community was 57 % of the total residents, and the rate of urbanization was 1.68 % annual rate of change.The current study result demonstrated that the majority of the studied parents had insufficient income. This could be due to the diagnosis of cancer had an impact on family financial status and inadequate income was a major constraint to good nutrition.

This finding was congruent with **Ahmed, (2019)** who conduct a study in Egypt about "Effects of empowering families on improving quality of life for children with chronic diseases" and found that more than two thirds of the studied families had not enough income. Regarding the child's medical history, more than one third of the studied children were diagnosed with Leukemia. This might be due to the Leukemia was the most common cancer incidence in children. This finding was supported with expanding recent literature by the **American Cancer Society (2020)** demonstrated that leukemia is the most significant common in early childhood. In addition to the finding of **Kaur et al., (2017)** who conduct a study about "Assess the Effectiveness of Structured Teaching Program on Knowledge Regarding Home Management of Side Effects of Chemotherapy among Parents" and found that most of children diagnosed with Leukemia. In contrast with the finding of **Sajeev et al., (2017)** who stated that 48.2% of children diagnosed with solid tumors.The present study results showed that more than two thirds of the studied children admitted to hospital one time and stayed from month to two months last year. This might be due to the different investigations and treatment. This finding was incompatible with **Shabeen et al., (2017)** who conduct a study about "Mothers' Knowledge about the Nutrition of Their Children with Leukemia" and found that more than one quarter of the studied children were previously hospitalized for 1 < 7 days.The current study results showed that all of children complained from loss of appetite and tooth decay. Also, the majority of them complained from dry Mouth, oral infection, diarrhea and weight loss. These finding could be explained by all of these symptoms were considered the most common side effects associated with chemotherapy in children. These finding were consistent with **Atay, (2011)** who conducted a study in Turkey about "Symptom characteristics and clustering in children and adolescents undergoing or being off cancer chemotherapy" and found that all children had loss of appetite. In contrast to **Hasan et al., (2020)** who conducted a study in Egypt about "Knowledge and Performance of Mothers Having Children with Cancer Undergoing Chemotherapy" and found that less than one quarter of them had fever. Concerning feeding habits of the studied children, the current study showed that all children depending on oral feeding and majority of them were eating snacks between main meals. These finding incongruent with previous studied carried out in Australia by **Cohen et al., (2021)** about "Poor Diet Quality in Children with Cancer During Treatment" who found that only 23% of them depending on oral supplement. Also, these finding agreed with **Bensouda et al., (2020)** who conducted a study in Casablanca about "Assessment of oral health-related quality of life among children with acute leukemia" and found that nearly two thirds of them took snacks less than 2 times a day between meals.The current study revealed that all of the studied children hadn't like or hates eating certain food. This due to negatively impact of chemotherapy on children's feeding practices. This finding was

inconsistent with **Carvalho et al., (2022)** who conducted the study in Brazil about "Diagnostic accuracy of clinical indicators of Imbalanced nutrition in pediatric patients submitted to chemotherapy" and found that only 13.8 % of them had insufficient interest in food. The present study finding demonstrated the importance of proper dietary habits in preventing the problem of malnutrition among cancer children. According to **Jackson etal., (2016)** it was crucial to ensure that mothers understand several fundamental concepts elaborate in caring for a child with cancer within the first days after diagnosis and after discharge following the initial hospital admission, so parents know how and when to seek care at the hospital. On the contrary, the current study results demonstrated that more than two third of them had poor knowledge level regarding cancer, chemotherapy and its nutrition before program. The inadequate mothers' knowledge may exacerbate familial stress and negatively affect their children's clinical outcomes. Adverse events associated with insufficient education may include unexpected medical problems. This finding was in the same line with **Akl et al., (2016)** who studied ''Assessment Knowledge and Reported Practice of Mothers having Children with Cancer and Undergoing Chemotherapy'' and demonstrated that all mothers had an unsatisfactory level of knowledge regarding childhood cancer and chemotherapy. In contrast, this finding was incongruent with **Saeed et al., (2019)** who studied the "effectiveness of a structured teaching program on enhancing mothers' knowledge about childcare for children with cancer blood in India" and revealed that 38.5% of the mothers had inadequate knowledge, and 34.86% of mothers had moderate knowledge levels before program. Moreover, the present study result illustrated that that more than two third and more than half of the studied parents had a significant good knowledge level after program and at the follow up stage respectively. This could be due to the nutritional guidelines had a positive effect on the improvement of parents' knowledge. This finding was supported with de **la Maza etal.,** (2015) who studied '' Impact of an educational program for parents of children with cancer on the increased knowledge of their children's disease and the decrease in anxiety'' and revealed that the knowledge level of parents of children with cancer increased significantly after they viewed an educational program about cancer. Similarly, this finding agreed with **Nova etal.,(2019)**, who conducted a study about The effect of multimedia-based nutrition education on parents' knowledge and body weight change in leukemia children and showed that there was a significant improvement in the parents' knowledge level after the multimedia-based education. In the current study, there was a statistical significant improvements in all Median and inter quartile ranges of the Brazilian Healthy Eating Index-Revised (BHEI-R) components among the studied children especially total vegetables & Whole fruits, whole grain, milk & meat after program and at the follow up stage. This finding was in harmony with **Cohen et al., (2021)** who found that there was a statistical significant

improvements in the mean Intake of Food Groups as a total percentage of serves recommended by the Australian Dietary Guidelines especially total vegetables, Whole fruits, whole grain, milk, and Meat. The consumption of fruit and vegetables has a protective effect on risk of obesity and some types of cancer and also, the intake of milk and meat is essential, not only because of the protein value but also because it provides calcium and iron. Concerning the correlations between total parents' knowledge and total practices Scores pre, post, and follow up the program, the current study mentioned that there was a statistical significant positive correlations. So, it could be concluded that mothers' knowledge had an impact on their practices. This result was supported with **EL-Sawy et al., (2013)** who found that there was a statistical significant positive correlation between total caregivers' knowledge and total practice scores (r=0.39,p=0.00). **Conclusion :**Based on the results of the current study, it could be concluded that the nutritional education guidelines had a profound effect on improving on parents' knowledge, practice and children outcomes receiving chemotherapy as there was a statistical difference throughout the guidelines phases.

In the light of the findings of the current study, the following recommendations are suggested:--Ongoing in services education guidelines must be designed and implemented at pediatric hematology and oncology clinic to improve parents' knowledge and practices on the basis of children nutrition and care of the body who receiving chemotherapy -Update the parents' knowledge and practice guidlines regarding nutrional assessment to prevent malnutrition during chemotherapy . -Guideline standards of care must be available in the clinic for parents, to help them to improve their care that introduced to their children -using of innovative methods of health education in teaching all information about cancer and treatment as well as nutrtional assessment methods to promote children's health. -Each parent should develop standard procedures for preparation of child for chemotherapy **.Recommendations for further researches:**-Further studies should be conducted to replicate the study on a larger sample of parents for generalization of results.

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