

Effect of Health Education Program on Care Provided by Mothers to Their Children with Leukemia

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ABSTRACT

Leukemia is the most common childhood malignancy that starts in early blood forming cells found in the bone marrow. **Aim:** The aim of this study was to evaluate the effect of health education program on care provided by mothers to their children with leukemia. **Study Design:** A quasi-experimental design was used to conduct this study. **Setting:** This study was conducted at the Outpatient Clinic of 57357 Hospital. **Subjects:** A purposeful sample of 60 children and their mothers were selected. **Tools:** Three tools: 1) An Interviewing questionnaire to assess demographic characteristics for children with leukemia and their mothers, children health needs and problems, mothers' knowledge about leukemia. 2) An Observational checklist to assess mothers' practices. 3) Medical records for children's health status. **Results:** 73.3% of mothers had unsatisfactory knowledge about leukemia and its treatment, and 65% of them, their total practice about the care provided for their children with leukemia not done pre program while post program, it showed highly statistically significant improvement ($X^2 = 14.7368$ at $P < 0.0001$). Also, for around half of children with leukemia their physical, psychological, personal, and social health needs were not achieved and they had severe health problems related to side effects of chemotherapy pre program. **Conclusion:** The study concluded that there were statistically significant efficacy of the educational program on improving the mothers' knowledge and practices about the care provided to their children with leukemia. As well, a highly statistically significant achievement of total children's health needs post educational program but insignificantly related to reducing their health problems. **Recommendations:** The study recommended that periodic health education and training program for all mothers of children with leukemia to improve their knowledge and practices about the care provided to their children at outpatient clinic or after chemotherapeutic session.

Key words: Children with leukemia – side effects of chemotherapy – mothers' care provided educational program.

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Introduction:

Leukemia is a cancer that starts in early blood forming cells found in the bone marrow, the soft inner part of certain bones. Most often, leukemia is a cancer of the white blood cells, but some leukemias start in other

blood cell types (*American Cancer Society, 2016*).

Leukemia cells might reproduce quickly, and not die when they should. These cells build up in the bone marrow, crowding out normal cells. In most cases, the leukemia cells spill into the bloodstream fairly quickly. From there they can go to other parts of the

body such as the lymph nodes, spleen, liver, central nervous system (the brain and spinal cord), testicles, or other organs, where they can keep other cells in the body from doing their jobs (*Campana et al., 2014*).

The types of leukemia in children are often described as being either acute (fast growing) such as acute lymphocytic (lymphoblastic) leukemia (ALL), which is most common in children; about 3 out of 4 childhood leukemias are ALL; acute myelogenous leukemia (AML), and hybrid or mixed lineage leukemia which is a rare one. Chronic leukemias (slow growing) are much more common in adults than in children. They tend to grow more slowly than acute leukemias, but they are also harder to cure. Chronic leukemias can be divided into 2 types, such as; chronic myelogenous leukemia (CML), and chronic lymphocytic leukemia (CLL) (**National Cancer Institute, 2014**).

Globally, the incidence of childhood cancer was 160,000 new cases/ year among those less than 15 years of age and also, 90,000 deaths /year among those less than 15 years of age, accounts for approximately 80% of child hood leukemias. In this form of the disease, the lymphocyte cell line represents 90% of cases (*Ebra, 2010*). Around the world, the annual incidence is 1 in 60.000 peoples with 75% of patients less than 15 years old, but the AML and ALL have slight male predominance (*Bailey, 2009*). According to the report of the **National Cancer Institute, NCI (2010)** the annual incidence of leukemia in males is 8.1% and the females is 5.9%. The median age of patient is approximately 19.0 years.

The exact cause of most childhood leukemia is not known. There are a few known risk factors for childhood leukemia, as genetic risk factors such as inherited syndromes and inherited immune system problems. The risk is much higher among identical twins and environmental risk factors such as; exposure to radiation, chemotherapy,

and certain other chemicals (*Pearce et al., 2012*).

The symptoms of leukemia are often caused by problems in the child's bone marrow, which is where the leukemia begins. Symptoms from low red blood cell counts (anemia); are shown as tiredness, weakness, feeling cold, feeling dizzy, headaches, shortness of breath, and pale skin. Symptoms from low white blood cell counts; as infection and fever, and symptoms from low blood platelet counts; as easy bruising and bleeding, frequent or severe nose bleeds, and bleeding gums are present. Bone or joint pain due to the buildup of leukemia cells near the surface of the bone or inside the joint are felt. Swelling of the abdomen (belly) is due to enlargement of liver and spleen as well as, swollen lymph nodes. Also, losses of appetite and body weight are seen (*Margolin et al., 2011*).

The main treatment for children is chemotherapy, which is usually divided into 3 phases; induction, consolidation and maintenance. This treatment with anti-cancer drugs are given into a vein, into a muscle, into the cerebrospinal fluid (CSF), or taken as pills. Except that, when given into the CSF, the treatment of leukemia uses combinations of several chemo drugs. In general, treatment uses higher doses of chemo over a shorter period of time (usually less than a year) for AML, and lower doses of chemo over a longer period of time (usually 2 to 3 years) for ALL treatment. Chemotherapy may be given along with a stem cell transplant. Other treatments such as, targeted drugs, surgery, and radiation therapy may be used in special circumstances (**Suttorp & Millot, 2010; Schlegel et al., 2014; Rabin et al., 2015**).

Chemotherapeutic agents are immunosuppressive and most have significant side effects, adverse effects, and potential toxic effects occurring at specific time frames after administration, for example, acute side effects may appear immediately after, to a few days after

administration of the agent, intermediate side effects occur within a few weeks after administration and long term effects may occur months to years after administration (*Dborah & Christine, 2011*).

Children with leukemia have physical, psychological, social issues that need to be addressed during and after treatment depending on their age and care of their disease. They might also have some problems with daily activities and school work, complications of leukemia disease and side effects of its treatment therapy.

Parents especially mothers are often responsible for the majority of care and support given to their children with leukemic. Therefore, it is essential that the mothers receive an adequate information about the leukemia disease, treatment plans and goals, possible side effects and care provided from health care professionals, follow up and care provided at home to achieve the child's physical, psychological, personal, and social needs (*Dean, 2011*).

Role of community health nurse is to help parents of children with leukemic to cope better when they have an understanding of what is happening to their children, based on their education literacy level, and interest, teaching program of mothers caring of children with leukemia should focus on information about disease, treatment protocol, a risk for infection and bleeding and specific side effects of chemotherapy and the care for their children (*Cortis & Laccy, 2010 & Hansen, 2010*).

Significance of the study

Leukemia is a malignant hematopoietic disease. It affects 34% from the total number of children all over the world. In Egypt, leukemia which affects 36.7% from 139.1 per thousands of the total number of children aged from 5-14 years occurs frequently in male than in female children after age of one year, the peak age of onset is between 2 and 6

years. In children, the two most common forms of leukemia are ALL, and AML (*Wong & Dockerty, 2010*).

In Egypt, ALL was the second malignancy after Hodgkin's disease with ratio 1:1.3 respectively; pediatric acute leukemia was reported to be 409 per year. (*Jamal et al., 2010*). According to the results of the National Population-Based Cancer Registry Program in Egypt the estimated numbers of lymphoid leukemia cases, from 2020, 2025, and 2050 were 1477, 1604, and 2431 cases respectively (*Amal et al., 2014*).

According to **James et al., (2011)**, the main role of community health nurses was to provide support system for the child and family throughout the course of maintenance therapy period, follow up at outpatient clinic and the care given at home through the education for family members regarding knowledge of the disease, its treatment and the psychological reaction of others, coordinator, liaison, and advocate of the family, along with other members of the health team, referrals family may be needed to social workers for information, including financial, health insurance, government support, housing and transportation as well as medical care and supplies.

Aim of study:

The aim of this study was to evaluate the effect of health education program on care provided by mothers to their children with leukemia through:

1. Assessing the mothers' knowledge and practices, regarding the care of their children with leukemia.
2. Assessing the health needs and problems of children with leukemia.
3. Developing and implementing an educational program about the care to be provided to children with leukemia
4. Evaluating the effect of the educational program on mothers' knowledge,

practices, and health needs and problems of their children with leukemia.

Research hypothesis:

The educational program will improve the mothers' knowledge and practices about the care to be provided to their children with leukemia as well as achieve their health needs and reduce their health problems.

Methodology:

Technical design:

A quasi-experimental design was used to conduct this study aiming to identify the health needs of children with leukemia and their mothers' knowledge and practices regarding care of leukemia.

Research setting:

The study was conducted in the outpatient clinic of 57357 Hospital which offers its services to a large sector in Egypt, for pediatric oncology medical and surgical methods of treatment.

Subjects:

A purposive sample of 60 children and their mothers were included in this study. All available cases were selected randomly with the following criteria: Children diagnosed with leukemia, their age ranged 6-12 years, both genders, under chemotherapy, in maintenance phase treatment, and agreed to participate in the study.

Tools of data collection: Three tools were used after reviewing related literature, for collecting the necessary data.

First tool: An interviewing questionnaire for children with leukemia with leukemia and their mothers was developed by the researchers, based on the relevant recent literature. It included the following parts:

Part I. Demographic characteristics of children, such as; age, gender, residence, scholastic grade, birth order, and duration of disease.

Part II. Socio-demographic characteristics of mothers regarding marital status, education level, working during care of the child, and family monthly income.

Part III. The health needs of children with leukemia. It included 21 closed ended questions about physical needs (nutrition, appetite, sleep and rest, mobility and exercise, personal hygiene, dressing, and going to school), psychological needs (sadness feeling, behavior, feeling of mistrust, feeling of unsafe, level of concentration, and remembering), and personal and social needs (care of family members, friendship, helping and arranging of own room, making shopping, practicing hobbies, and participating in school activities).

Scoring system: Each of the health needs items scored 2 marks for "No" response, 1 mark for "Sometimes" response and zero for "Yes" response.

Part IV. Health Problems of Children with Leukemia Chemotherapy Side Effects Worksheet: developed by the *American Cancer Society (2015)*. This part included 17 closed-ended questions by using three categories of Likert scale as mild, moderate, and severe. The items included were fever/chills, fatigue (feeling weak), nausea, vomiting, sore mouth, diarrhea, constipation, loss of appetite (Anorexia), pain or difficulty with swallowing, swelling (edema) in hands or feet, alopecia, allergic reaction, itching or rash, shortness of breath, cough, muscle or joint pain, and numbness or tingling in hands or feet.

Part V. Mothers' knowledge about leukemia and its treatment as chemotherapy: This part included questions regarding, meaning of leukemia, the possible

etiological factors, types, signs and symptoms of acute leukemia, diagnostic measures, treatment of leukemia, chemotherapy treatment work, goal, routes, phases, its side effects may be expected, safety measures during and after administration, possibility of relapse, the leading causes of child relapse, common body sites of relapse, and prognosis of leukemia.

Scoring system: For each of the knowledge items, a correct response was scored "one", and an incorrect one "zero". The total score was 20 grades, for 20 items, which equals 100%. The mothers' knowledge was considered satisfactory if the percent score was 60% or more and unsatisfactory if the score was less than 60%.

Part VI. Mothers' care toward their children with leukemia: This part included questions regarding pattern of child feeding, protecting the incidence of oral inflammation, health care of the child during high temperature, protecting the incidence of bleeding, care during nasal bleeding, protecting the child from infection, preventing going to school in case of communicable disease, protecting the child skin from the effects of chemotherapy, protecting the incidence of inflammation around the rectum, care towards a child given chemotherapy at home, ways of keeping the chemotherapy at home, ways of disposing of the chemotherapy at home, care after giving medication by intramuscular or subcutaneous injection, administration of non-prescribed medication(s), encouraging adequate sleep of at least 8 hours each night, encouraging exercises, and encouraging social activities.

Second tool: Observation checklist: Modified from *Jakson(2010)*, it was used to assess mothers' practices regarding the care provided for their children with leukemia. Three procedures including measuring auxiliary temperature (10 items), skin care (8 items), and oral care using backing soda for their sick child (6 items)

Scoring system for practices: A scoring system for each of practice items reported to be done was scored "one", and not done "zero" scoring system for each of practice items observed to be done correctly was scored "one", and done incorrectly or not done "zero". The total practice scores was calculated by summing all these marks and converting them into percentages as the following: The total mothers' practices, was considered satisfactory if the percent score was 60% or more and unsatisfactory if less than 60%.

Third tool: Medical records of children with leukemia: They were used to assess health status of children, which included pulse rate, weight, height, body mass index (BMI), and laboratory investigations as; hemoglobin, platelet count, white blood cell count, serum creatinine, liver function .

Scoring system: The normal range of laboratory investigations according to traditional units of the sheet of *Clinical Laboratory Tests–Reference Values (2015)*

- The normal hemoglobin level (11.2-16.5 g/dL).
- The normal platelet count (3000-5800/mm³).
- The normal white blood cell count (3500-12,000/mm³).
- Normal serum creatinine level (0.6-1.2 mg/dL).
- Normal liver function (SGOT) (7- 40 mU/mL).

The equation to calculate BMI:

$$\text{BMI} = \text{Weight (kg)} / \text{height}^2 (\text{m}^2).$$

According to the recommendations of *Centers for Disease Control and Prevention (CDC) (2016)*, BMI categorization for

children and teens between age 2 and 20 is as follows:

- Underweight <5%.
- Normal weight 5% - 85%.
- Overweight 85- 95%.
- Obese > 95%.

Tools Validity and Reliability:

Content and face validity were performed by two professors of the Community Health Nursing Department of Faculty of Nursing and two professors from the Oncology Department and one professor from Pediatric Department, Faculty of Medicine. All experts were affiliated to Ain Shams University, Egypt, they reviewed the tools for content accuracy. The developed tools were tested for reliability on a sample of ten subjects. The reliability test of translated version was established by using the Cronbach alpha and Pearson correlation which showed good internal consistency construct validity (Cronbach alpha = 0.887).

Pilot study:

A pilot study was conducted on 10% of the study subjects 10 children and their mothers to test and evaluate the clarity, and applicability of the study tools and time required for completion of each study tool. Also the pilot study sample was excluded from the main study sample.

Administrative Design and Ethical Considerations:

Permission for conduction of the study was obtained by submission of an official letter issued from the Faculty of Nursing, Ain Shams University to the director of 57357 Hospital. It was necessary for the researchers to get the consent of the mothers of children with leukemia. So, strict confidentiality was ensured throughout the study process. The study subjects were assured that all data will

be used only for research purpose and used to improve their children's health.

Operational Design:

Field work:

After official permissions to carry out the study, the aim of the study was explained to the mothers. The study was carried out along 3 months started from beginning of July, 2015 to the end of September, 2015. The average time consumed to fill in the tools was 45 minutes. The previously mentioned settings were visited by the researchers two days/week (Mondays & Wednesdays) from 8.00 a.m. to 11.00 p.m. before starting the chemotherapy sessions.

Educational program development phases:

This educational program was conducted on four consecutive phases, assessing, developing, implementing and evaluating.

Phase 1: A pre-program assessment tool, using the previous interview questionnaire for data collection from the previous by mentioned setting. This phase aimed at assessing mothers' knowledge related to the care provided to their children with leukemia according to their health needs and problems.

Phase 2: Developing an educational program about the care provided for children with leukemia and mothers' meeting their health needs and problems.

The general objective of the program: was to improve mothers' knowledge, and enhance their practices related to the care provided to their children with leukemia and achieve their health needs as well as reduce their health problems.

The content of the educational program was based on needs assessment of children with leukemia and their mothers covering the following; meaning of leukemia, etiological factors, signs and symptoms, diagnostic measures, complications, investigations, treatment of leukemia, chemotherapy treatment, and the care included prevention of chemotherapy complications, possibility of relapse, prognosis of leukemia, follow up, management of diet, medications, prevention of infection and bleeding).

Phase 3: Implementation of the program:

Implementation of the educational program was carried out at the outpatient clinic in 57357 Hospital. At the beginning of the first session, an orientation to the program and its purpose was presented. Each session started with a summary about what had been given through the previous sessions and the objectives of the new topics, taking into consideration the use of simple language to suite the level of mothers.

The theoretical part of the program was presented in two sessions, in the form of lectures/discussions followed by the practical part, which consisted of two subsequent reinforcement sessions in the form of demonstration and redemonstration by using a doll, 2 days/week (Mondays & Wednesdays), from 10.00 a.m. to 2.00 p.m.). Time of each session ranged between 30 to 45 minutes, using effective media of conveying information as, laptop, posters, and power point presentation. An illustrated booklet was developed by the researcher for mothers as a reference after program implementation. The study was carried out within three months from beginning of July, 2015 to the end of September, 2015, based on the program implementation.

Mothers caring for children with leukemia were divided into 5 groups, and each group consisted of (4-5) approximately. The educational program was conducted at the suitable time for them according to their availability, before starting of the chemotherapy sessions, during follow up assessment. Sometimes, the session was held for one or more clients. To insure that they were exposed to the same learning experience, they received the same educational program content and used the same teaching strategies. Direct reinforcement was in the form of a copy of the educational program booklet offered to mothers.

Phase 4: Evaluation phase:

The evaluation phase was done immediately post implementation of the educational program by comparing changes in mothers' knowledge, and practice score, but the health needs and problems of children with leukemia were evaluated after three months in order to identify differences, similarities and areas of improvement as well as clinical defects.

Statistical Design:

The calculated data were analyzed and tabulated using appropriate statistical test as "Chi square" for number and percentage distribution, by using the Statistical Package for Social Science (SPSS), version 20 to determine if there are statistically significant relations. Chi-square (X^2) and P- value= less than 0.05 was considered significant and less than 0.001 was considered as highly significant.

Results:

Table (1): Distribution of studied sample of children with leukemia according to demographic characteristics (n = 60).

Item	No	%
Age (years)		
6-	30	50.0
8-	13	21.7
10-12	17	28.3
Mean ± SD	8.04±2.31)	
Gender:		
Male	44	73.3
Female	16	26.7
Residence:		
Urban	23	38.3
Rural	37	61.7
Scholastic grade:		
Kinder garden 1-2	4	6.7
Primary 1-3	33	55.0
Primary 4-6	23	38.3
Birth order:		
First	25	41.6
Second	12	20.0
Third	4	6.7
Fourth +	19	31.7
Duration of disease		
< 1 year	5	8.3
≥ 1 year	55	91.7

Table (1): This table shows that half of studied children (50.0%), their age ranged from 6- <8 years, less than three quarter (73.3%) were male, more than three fifth (61.7%) reside rural areas. Regarding scholastic grade, more than half (55.0%) of them are in primary grade (1-3), and 41.6% of them, their birth order was the first. Also the table demonstrates that, most of the children (91.7%) suffered from the disease for more than one year.

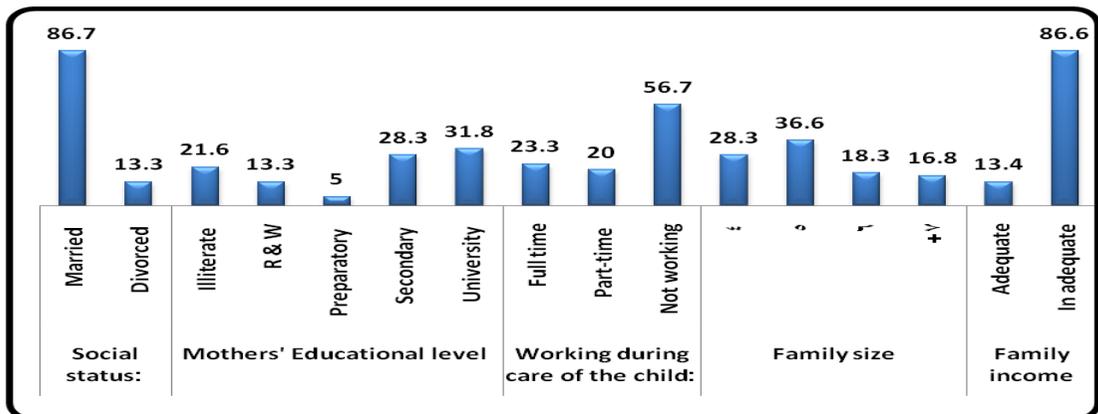


Fig (1): Percentage distribution of socio demographic characteristics of mothers (n=60).

Figure (1): illustrates that the majority of mothers (86.7%) were married, and 31.8% had university education. About mothers' work, more than half of them (56.7%) weren't working, and the majority of them (86.6%) have inadequate family income.

Table (2): Distribution of mothers' knowledge about leukemia and its treatment chemotherapy pre/post program (n=60).

Items	Pre Program				Post Program				X ²	P-value
	Correct Knowledge		Incorrect Knowledge		Correct Knowledge		Incorrect Knowledge			
	No	%	No	%	No	%	No	%		
Meaning of acute leukemia	27	45.0	33	55.0	47	78.3	13	21.7	14.1011	0.0002 (HS)
Possible etiological factors of leukemia	21	35.0	39	65.0	41	68.3	19	31.7	13.3482	0.0003 (HS)
Types of leukemia	24	40.0	36	60.0	45	75.0	15	25.0	15.0384	0.0001 (HS)
Signs and symptoms of acute leukemia.	38	63.3	22	36.7	55	91.7	5	8.3	13.8112	0.0002 (HS)
Diagnostic measures of leukemia	36	60.0	24	40.0	49	81.7	11	18.3	6.8168	0.009(HS)
Treatment of leukemia:					53	88.3	7	11.7	15.65	0.2077 (NS)
• Chemotherapy	37	61.7	23	38.3	51	85.0	9	15.0		
• Radiation Therapy	34	56.7	26	43.3	48	80.0	12	20.0		
• Biological Therapy	35	58.3	25	41.7	43	71.7	17	28.3		
• Surgery	31	51.7	29	48.3	39	65.0	21	35.0		
• Stem Cell Transplantation	29	48.3	31	51.7						
Chemotherapy treatment	29	48.3	31	51.7	36	60.0	24	40.0	44.731	0.00008 (HS)
• Work	39	65.0	21	35.0	51	88.0	7	11.7		
• Goal	43	71.7	17	28.3	53	90.0	6	10.0		
• Routs	44	73.3	16	26.7	54	93.3	4	6.7		
• Phases	45	75.0	15	25.0	56					
• Expected side effects	35	58.3	25	41.7	48	80.0	12	20.0		
• Safety measures during and after administration										
Possibility of relapse	36	60.0	24	40.0	49	81.7	11	18.3	6.8168	0.009 (HS)
Leading causes of child relapse	27	45.0	33	55.0	46	76.7	14	23.3	12.6261	0.0004 (HS)
Common body sites of relapse	40	66.7	20	33.3	51	85.0	9	15.0	5.5021	0.019 (S)
Prognosis of leukemia	42	70.0	18	30.0	53	88.0	7	11.6	6.1137	0.0134 (S)

Table (2): indicates that there were highly statistically significant improvements in all knowledge about leukemia such as, the meaning of acute leukemia, its possible etiological factors of leukemia, its types, signs and symptoms of acute leukemia, and its diagnostic measures as pre program, they represents, 45%, 35%, 40%, 63.3%, and 60% respectively, while post program they were 78.3%, 68.3%, 75%, 91.7%, and 81.7%) respectively. Regarding to the mothers' knowledge about chemotherapy treatment, there was a highly statistically significant difference between pre and post program ($P < 0.01$). Also the table explains that three fifth of mothers (60%) answered correctly about the possibility of disease relapse pre program and significantly improved post program to be 81.7% of them. Two thirds of mothers (66.7%) knew the common body sites of relapse pre program and became 85% post program with significant difference pre/post program ($P < 0.05$).



Figure (2): Distribution of mothers' total knowledge about leukemia pre/post program (n=60).

Figure (2) illustrates that there were less than three quarter of mothers had unsatisfactory knowledge pre program and there was a highly statistically significant improvement of their total knowledge about leukemia and the care provided to their children with leukemia post program ($\chi^2 = 41.3968$ at $P < 0.0001$).

Table (3): Mothers' practices toward the care provided to their children with (no= 60).

Items	Pre Program				Post Program				X ²	P-value
	Done		Not done		Done		Not done			
	No	%	No	%	No	%	No	%		
Keeping child feeding in good pattern	19	31.7	41	68.3	47	78.3	13	21.7	26.3973	< 0.0001 (HS)
Protecting the incidence of oral inflammation	4	6.7	56	93.3	39	65.0	21	35.0	44.3975	< 0.0001 (HS)
Health care of the child during high temperature 38.5°C (measuring auxiliary temperature)	6	10.0	54	90.0	35	58.3	25	41.7	31.1578	< 0.0001 (HS)
Protecting the incidence of bleeding	14	23.3	46	76.7	42	70.0	18	30.0	24.8765	< 0.0001 (HS)
Care during nasal bleeding	6	10.0	54	90.0	38	63.3	22	36.7	36.7464	< 0.0001 (HS)
Protecting the child from infection	24	40.0	36	60.0	49	81.7	11	18.3	21.8595	< 0.0001 (HS)
Preventing going to school in case of communicable disease	39	65.0	21	35.0	54	90.0	6	10.0	10.7527	0.001 (S)
Protecting the child skin from the effects of chemotherapy	10	16.7	50	83.3	36	60.0	24	40.0	23.8308	< 0.0001 (HS)
Protecting the incidence of inflammation around the rectum	16	26.7	44	73.3	45	75.0	15	25.0	28.0411	< 0.0001 (HS)
Care towards the child to give chemotherapy at home	7	11.7	53	88.3	29	48.3	31	51.7	19.2063	< 0.0001 (HS)
Ways to keep the chemotherapy at home	9	15.0	51	85.0	34	56.7	26	43.3	22.6518	< 0.0001 (HS)
Ways to dispose the chemotherapy at home	8	13.3	52	86.7	36	60.0	24	40.0	28.134	< 0.0001 (HS)
Care after giving medication by intramuscular or subcutaneous injection	27	45.0	33	55.0	51	85.0	9	15.0	21.0989	< 0.0001 (HS)
Medication(s) not be given to the child if not prescribed	39	65.0	21	35.0	53	88.3	7	11.7	9.1304	0.0025 (S)
Encourage adequate sleep of at least 8 hours each night.	38	63.3	22	36.7	44	73.3	16	26.7	1.3864	0.239 (NS)
Encourage exercises	11	18.3	49	81.7	29	48.3	31	51.7	12.15	0.0005 (HS)
Encourage social activities	17	28.3	43	71.7	35	58.3	25	41.7	10.9955	0.0009 (HS)

Table (3): explains the difference in mothers' practices about the care provided to their children with leukemia pre and post program. As they didn't do all appropriate care for their children with leukemia pre-test, but after the implementation of the educational program, their practices level improved. As well, there were highly statistically significant improvements in all

items related to mothers' practices about care provided to the children with leukemia ($p < 0.0001$). while there were just significant statistically difference related to medication(s) not to be given to their children if not prescribed ($P < 0.05$) but, however an insignificant statistical difference was found related to encouraging adequate sleep of at least 8 hour each night ($P > 0.05$).

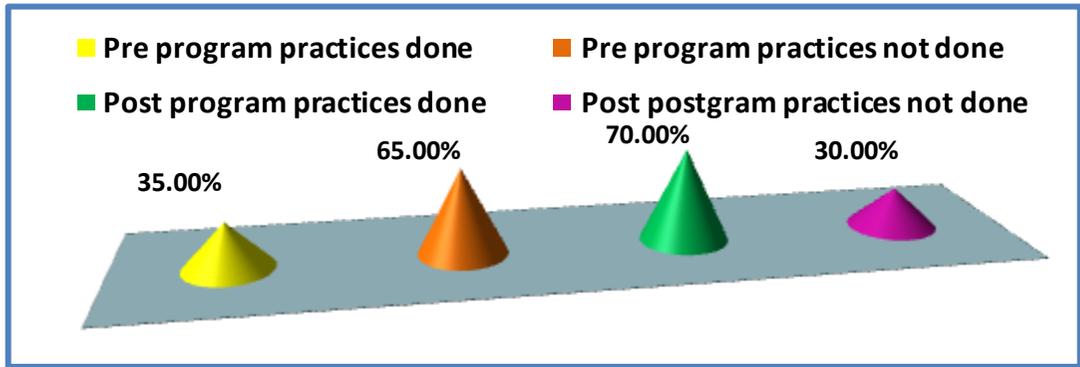


Figure (3): Distribution of mothers' total practice about the care provided to their children with leukemia pre/post program (n=60).

Figure (3) illustrates that slightly less than two third of mothers (65.0%), their total practice about the care provided for their children with leukemia not done pre program while post program, it showed highly statistically significant improvement ($X^2 = 14.7368$ at $P < 0.0001$).

Table (4): Percentage distribution of health needs for children with leukemia pre/post program (n=60).

Health needs	Pre Program			Post Program			X ²	P.Value
	No	Sometimes	Yes	No	Sometimes	Yes		
Physical needs*	41.7	3.3	55.0	43.3	48.3	8.3	44.167	< 0.0001
Psychological needs*	40.0	1.7	58.3	45.0	50.0	5.0	54.253	< 0.0001
Personal and social needs*	35.0	0.0	65.0	36.7	56.7	6.7	62.512	< 0.0001
Total health needs	$X^2 = 163.368, P < 0.0001.$							

* Items are not mutually exclusive

Table (4): presents that more than half (55%) of children with leukemia need to achieve their physical needs pre program, while it was highly significantly improved post program to 48.3% of them sometimes achieved. Regarding to psychological needs, there was highly statistically significant improvement post implementation of educational program ($P < 0.0001$). Also, the table indicates that no one of children with leukemia reported that, they sometimes achieve the personal

and social needs pre program and had been achieved post program by more than half (56.7%) with highly statistically significant achievement of their total health needs post educational program ($X^2 = 163.368$ at $P < 0.0001$)

Table (5): Percentage distribution of health problems of children with leukemia according to side effects of chemotherapy (n=60).

Items	Pre Program			Post Program			X ²	P. value
	Mild	Moderate	Severe	Mild	Moderate	Severe		
	%	%	%	%	%	%		
Fever/Chills	26.7	18.3	55.0	51.7	31.7	16.7	19.223	0.00007 (HS)
Fatigue (feeling weak)	43.3	6.7	50.0	45.0	31.7	23.3	15.62	0.0004 (HS)
Nausea	36.7	18.3	45.0	51.7	18.3	30.0	3.328	0.1894 (NS)
Vomiting	23.3	11.7	65.0	51.7	25.0	23.3	21.124	0.00003 (HS)
Sore mouth	20.0	13.3	66.7	63.3	23.3	13.3	36.49	0.0001 (HS)
Diarrhea	51.7	15.0	35.0	75.0	18.3	6.7	14.332	0.0008 (HS)
Constipation	41.6	26.7	31.7	43.3	31.7	25.0	0.747	0.68832 (NS)
Loss of appetite (anorexia)	13.3	15.0	71.7	16.7	23.3	60.0	0.926	0.62939 (NS)
Pain or difficulty with swallowing	16.7	8.3	75.0	63.3	23.3	13.3	46.427	0.0000 (HS)
Swelling (edema) in hands or feet	10.0	20.0	70.0	23.3	31.7	45.0	8.042	0.01793 (S)
Alopecia	3.3	1.7	95.0	5.0	3.3	91.7	0.569	0.75239 (NS)
Allergic reaction	31.7	20.0	48.3	33.3	25.0	41.7	0.655	0.72072 (NS)
Itching or rash	36.7	16.7	46.6	38.3	25.0	36.7	1.742	0.41853 (NS)
Shortness of breath	41.7	10.0	48.3	51.7	8.3	40.0	1.205	0.54744 (NS)
Cough	11.7	6.7	81.6	25.0	15.0	60.0	6.82	0.03304 (S)
Muscle or joint pain	38.3	21.7	40.0	43.3	21.7	35.0	0.384	0.82530 (NS)
Numbness or tingling in hands or feet	16.7	25.0	58.3	35.0	36.7	28.3	11.458	0.00325 (S)

Table (5): reveals that, more than half of children with leukemia (55%) suffered from severe fever/chills and more than two third of them (65%, 66%, and 75%) respectively, complained of severe vomiting, sore mouth, and pain or difficulty with swallowing respectively pre program. Also the table represents that, the majority of children with leukemia (95%, and 81%) respectively, were suffered from severe alopecia and cough respectively pre program. There were highly statistically significant enhancements of health problems of children with leukemia according to side effects of

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chemotherapy post implementation of educational program ($P < 0.0001$) regarding fever/Chills, fatigue (feeling weak), sore mouth, diarrhea, vomiting, and pain or difficulty with swallowing.

Table (6): Distribution of health status of children with leukemia according to medical records (n=60).

Items	Preprogram		Post program		X ²	P. value
	No	%	No	%		
Pulse rate/minutes						
Normal	57	95	58	96.7	0.1059	0.7449 (NS)
Abnormal	3	5	2	3.3		
Body mass index (BMI)						
Under weight	52	86.7	48	80	0.96	0.3272 (NS)
Normal weight	8	13.3	12	20		
Over weight	0	0.0	0	0.0		
Obese	0	0.0	0	0.0		
Hemoglobin						
Normal (11-15gm)	9	15	14	23.3	1.3447	0.2462 (NS)
Abnormal	51	85	46	76.7		
Platelet count						
Normal (150-400gm) 10 ³ /cmm	35	58.3	40	66.7	0.8889	0.3458 (NS)
Abnormal	25	41.7	20	33.3		
White blood cell count						
Normal (4-11gm) 10 ³ /cmm	23	38.3	28	46.7	0.8525	0.3558 (NS)
Abnormal	37	61.7	32	53.3		
Creatinine						
Normal (0.6-1.2 mg/dL)	60	100	60	100	0	1 (NS)
Abnormal	0	0.0	0	0.0		
Liver function						
Normal (7-40 IU/L)	13	21.7	11	18.3	0.2083	0.6481 (NS)
Abnormal	47	78.3	49	81.7		

Table (6): demonstrates that most of children with leukemia (95. 96.7%) had normal pulse rate pre/post program respectively. Regarding body mass index

(BMI) the majority of them (86.7%, 80%) were under weight pre/post program respectively. The majority (85%) of children with leukemia had abnormal hemoglobin pre program and 23.3% of them were normal post program. Also the table detects that the

children with leukemia had abnormal platelet count, white blood cell count, and liver function pre the program (41.7%, 61.7%, and 78.3% respectively), while post program they were 33.3%, 53.3%, and 81.7% respectively, with insignificant association pre/post the educational program for all items of health status for children with leukemia ($P > 0.05$).

Discussion

Leukemia is the most common malignancy of children with a prevalence of 129 in one million, and the second cause of death among children aged 5 to 14 years. Acute lymphoblastic leukemia (ALL) is the most common type of this disease accounting for 75% of all leukemias and 30% of all malignancies in childhood (Marcdante *et al.*, 2011). Increased knowledge of the parents specially mothers who are the first family caregivers for their children with leukemia about health needs and problems has an important effect on family support so that mothers can provide optimal care to improve the health status of children (Novrianda & Khairina, 2015).

Concerning the children with leukemia's demographic characteristics, the current study mentioned that half of the children their age ranged from 6- < 8 years, and less than three quarters of them were males (Table 1). These findings were supported by El-Attar (2009), who mentioned that leukemia is the most common type of childhood cancer and accounts for about 80% of all cases of childhood cancer, the highest incidence in children is between the age from 1-10 years and maintenance phase therapy ranged between 3-12 years old. The present result also agreed with Khalil *et al.*, (2013), who mentioned that, about two thirds of the children with leukemia with leukemia under study were male.

Regarding the residence, the current study findings revealed that, slightly more than three fifth of the studied children live in

rural areas, and their scholastic grade, in primary grade (1-3) is for more than half of them and also slightly more than two fifth of them their birth order was the first, these results are congruent with those of Mourad (2012) who mentioned that in his research about parents' home care for their children receiving chemotherapy, the high incidence of leukemia occurs in the first child in the family, and found that less than two thirds of them come from rural areas.

The current result revealed that the majority of mothers of children with leukemia were married (Figure 1) this result was in agreement with that of El-Sawy *et al.*, (2013), who found that the majority of the caregivers were married, and the in same line with results reported by Hasan, *et al.* (2011), who found that, the majority of the family caregivers were married and have other children and responsible about whole family.

Related to the mothers' educational level, this result displayed that less than one third of them had university education, more than half of them weren't working, and the majority of them had inadequate family income, (Figure 1). These results disagreed with El-Sawy *et al.*, (2013), who found that more than quarter of the family caregivers was unable to read and write. However, they agreed with Mahmoud and Abd Elaziz (2015), about the effect of psycho-educational training program for parents having child with leukemia on their experience and psychological wellbeing, who found that most of parents have inadequate income.

Regarding knowledge of mothers about leukemia and its treatment as chemotherapy, the present study result showed that there were highly statistically significant differences between pre and post program of mothers' knowledge about the meaning of leukemia, the possible etiological factors, types, signs and symptoms of acute leukemia, diagnostic measures, treatment of leukemia; chemotherapy treatment work, goal, rout,

phases, expected side effects, safety measures during and after administration; possibility of relapse, the leading causes of child relapse, common body sites of relapse, and prognosis of leukemia (*Table 2*). As well these results presented that there were highly statistically significant improvement in total mothers' knowledge post implementation of the educational program (*Figure 2*). This result was in the same line with *Mahmoud and Abd Elaziz (2015)*, who found that there were statistically significant relations between parents' knowledge regarding leukemic disease characteristics, diagnosis, symptoms, treatment, and side effects of chemotherapy before and after intervention. As well, these findings were consistent with those of the study of *Hashemi and Shokrpour (2010)*, about the impact of education regarding the needs of pediatric leukemia patients' siblings on the parents' knowledge and practices, which indicated that parent education leads to better understanding of leukemia, chemotherapy and their side effects, as well as the negative impact of this disease on children's quality of life.

As regards mothers' practices related to care provided for their children with leukemia, this study results revealed that there were highly statistically significant differences between pre and post program of mothers practice related to the care provided to their children with leukemia such as; pattern of child feeding, sleep and rest, protecting the incidence of chemotherapy side effects such as oral inflammation, high temperature, bleeding, care during nasal bleeding, protecting the child from infection, skin from the effects of chemotherapy, care towards the child to give chemotherapy at home, care after giving medication by intramuscular or subcutaneous injection, administration of non prescribed medication(s). Encouraging adequate sleep of at least 8 hours each night, encouraging exercises, and encouraging social activities are other practices required from mothers (*Table 3*). As well, the present study revealed that there was a highly statistically significant

improvement in the total mothers' practices about the care provided to the children with leukemia (*figure 3*).

These results agreed with *Gelesson et al., (2014) and Novrianda, &Khairina (2015)* who stated that, an educational intervention of parents about leukemia management and efforts to overcome the side effects, nutrition and support system has been able to improve the quality of life of children with leukemia significantly.

Related to the health needs of children with leukemia the present study findings indicated that there were highly statistically significantly achievements post program in their total physical, psychological, personal and social health needs (*Table 4*). These results reflected the positive impact of the educational program on the achievement and improvement of the children's health needs.

The current study result presents that more than half of children with leukemia had severe fever pre program, which decreased to less than one fifth post program with highly statistically significant difference. As regards fatigue, half of children had severe fatigue pre program while decreased post program to less than one quarter, the severe vomiting is decreased from slightly less than two third pre program to less than one quarter post program. These results agreed with *Minton et al. (2013), and Wang et al. (2014)*, who mentioned that, fatigue is the most common persistent side effect of cancer treatment (chemotherapy).

In the present study regarding to the severe pain or difficulty with swallowing it also decreased from severe for three quarter pre program to moderate in less than one quarter post program with highly statistically significant improvement pre/post program (*Table 5*). This result is congruent with *Cavaletti and Marmiroli (2010)*, who stated that patients with cancer may experience pain at the time of diagnosis, during active treatment with chemotherapy, or after

treatment has ended, some chemotherapy drugs can cause weakness, numbness, and pain, most often in the hands and feet.

Concerning alopecia the present study result revealed that the most of children had severe case as a result of chemotherapy, with statistically insignificant difference between pre and post program. This agreed with **Bower (2014,**)who mentioned that some chemotherapy drugs can cause hair loss on all parts of the body, whereas hair loss resulting from radiation is limited to the specific area of treatment.

The present study revealed that most of children with leukemia had normal pulse rate pre/post program, while regarding BMI the majority of them were under weight pre/post program. The majority of those had abnormal hemoglobin pre program and less than one quarter of them were normal post program. Also, the result detected that slightly more than two fifth children with leukemia had abnormal platelet count, white blood cell count, and liver function witch slightly enhanced post program but with insignificant differences pre/post the educational program for all items of health status for children with leukemia ($P > 0.05$) (**Table 6**). This result is in agreement with that of **Khalil et al., (2013)**, who found that about two-thirds of children under their study had abnormal BMI.

From the researchers' opinion, increased mothers' knowledge about the health problems and needs of children with leukemia had an important effect on mothers' practices toward care provided to their children and therefore enhance health status for them, there by triggering a significant improvement in the health needs and reducing problems of children. Furthermore, other studies have shown that educational interventions have an impact on the quality of life of children with leukemia

Conclusion

According to the hypothesis and objectives of this study, it can be concluded that there was a statistically significant efficacy of the educational program on improving the mothers' knowledge and practices about the care provided to their children with leukemia as well as a highly statistically significant achievement of total children's health needs post educational program but insignificantly related to reducing children health problems.

Recommendations:

Based on the finding of the present study, the following recommendations were suggested:

- Periodic health education and training programs for all mothers caring of children with leukemia with leukemia to improve their knowledge and practices about the care provided to their children at outpatient clinic or after chemotherapeutic session.
- More research is proposed to assess other care providers' knowledge of chemotherapy and radiotherapy side effects and their management at home.
- Further researches to study nurses' roles, caregivers' burden, and coping patterns to deal with children with leukemic.

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