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Nursing Intervention Program for Mothers of Newly Diagnosed Children with Non–Hodgkin Lymphoma

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***Abstract*: Non-Hodgkin lymphoma is the sixth most common cancer worldwide and more common than the other general types of lymphoma. Aim of the study was to evaluate the effect of nursing intervention program for mothers of newly diagnosed children with non-Hodgkin lymphoma. A research design was quasi-experimental study carried out at the Lymphoma Outpatient Clinic in Children's Hospital, affiliated to Ain Shams University. A purposive sample of 54 mothers accompanying their children newly diagnosed with non-Hodgkin lymphoma. One tool was used for data collection; it was a structured interviewing questionnaire to assess: the mothers' demographic characteristics, past obstetric history, knowledge about non- Hodgkin lymphoma, reported practices related to care of their children and parenting stress index. Results: More than three quarters of the studied mothers had satisfactory total knowledge about non-Hodgkin lymphoma post implementation of nursing intervention program compared to slightly more than quarter of them pre implementation with statistically significant difference. Also, mothers' reported practices related to care of their children were statistically improved post implementation. Moreover, mothers' sever stress level was significantly decreased post implementation. Conclusion: It can be concluded that, the research hypothesis is justified since the implementation of the nursing intervention program led to significant improvements in mothers' knowledge and practices as well in reducing stress levels regarding the care of their children with non-Hodgkin lymphoma. Recommendation: Nursing intervention program for all mothers having children with non-Hodgkin lymphoma must be conducted in lymphoma outpatient clinics and oncology units.**

Keywords: **Nursing intervention, non-Hodgkin lymphoma, children, mothers and parent stress.**

1. INTRODUCTION

Lymphoma is the most prevalent cancer seen in children. Lymphoma is a cancer of the lymphatic system. Malignant lymphoma is neoplasm of lymphoid cells, a component of body's immune system; it is a network which helps fight infection and some other diseases. Lymphoma represents 20% of childhood cancers in children less than 20 years. It is the third most common childhood malignancy following leukemia and nervous system tumors [1].

Lymphoma is divided into main types, Non-Hodgkin lymphoma (NHL) and Hodgkin lymphoma (HL), which is named after Dr. Thomas Hodgkin, who first described it. Both NHL and HL occur in children, with NHL more common between ages 5–12 years, where prevalence reaches as high as 65% of lymphoma in children and 35% of lymphoma in adolescents, while HL is seen more in adolescence 73% and 27% in children [2].

Non-Hodgkin lymphoma is cancer that occurs when lymphocytes replicate in uncontrolled manner. This error causes an over production of abnormal lymphocytes which then clump together and form a mass in the lymph nodes or other organs of the lymphatic system. NHL is one of the most common diagnosed cancers worldwide. It comprises approximately 80% of childhood cancers [3].

Childhood health conditions are major life problems that affect the health of all family members, so it is imperative to realize not only the impact of cancer on the welfare of the child, but also on that of the entire family. Studies have proven that even though the population of childhood cancer survivors is growing, chronic health problems can cause psychological, physical, environmental, and social problems [4].

Mothers are the primary caregivers when their child is diagnosed with cancer. They are often the main source of social and emotional support for children and play a major role in managing the illness and they are expected to function broadly, providing direct care, case management and medication supervision. As well, appreciating mother's knowledge needs and practices about their children's health care is important to overcome the problems of NHL, side effects of drugs, complications of disease, and needs of children. Mothers must develop information and educational skills to provide support through the phases of illness. This can improve the preventive care for children at home and their use of professional care services [5].

Mothers of children with NHL facing various sources of stress include; the emotional challenges of caring for their child, disturbance in daily routines, financial challenges due to income loss and medical cost, and challenges communicating with medical professionals and their children about complex aspects of the disease and treatment. As well, mothers of children with NHL experience a high level of distress especially in the first year after diagnosis. The most common types of distress are anxiety and after traumatic stress symptoms. It is estimated that moderate and severe symptoms of stress range from 51% to 75% among all mothers having cancer children [6].

Nurses are considered as the heart or backbone of health care. In these modern times, the nursing profession has become more demanding and multidimensional in order to respond to the fast changes and trends in health care [7]. Population aging and growth coupled with the adoption of high risk lifestyle choices such as smoking, physical inactivity, and fast food have been identified as underlying factors contributing to the increasing incidence of cancer worldwide. It is now expected that by 2025 more than 20 million people will be affected by cancer [8].

The role of nurse for caring of children suffering from lymphoma is important and vital because the child has many physical and psychological needs, in addition to performing specialized care. The nurse helps mothers to identify symptoms requiring intervention, treatment and its side effects and recovery from the disease [9].

Significance of the study:

Childhood is one of the most important phases of human development and the most important target group for the health team intervention. Children who are ill or have a disability may require painful, invasive procedures, which cause parents stress before, during, and after the procedures have been completed [10]. Mothers are typically the primary mandatory in promoting the children's health, giving direct care, providing access to health services and modeling attitudes that influence the children's well-being. Sometimes, mothers are in difficult position of having to care for children who are faced with life threatening conditions [11].

Cancer develops in approximately 1 in 600 children between the ages of 1 and 18 years, making it the second most common cause of death, after injuries, in this group. Every year, about 9000 children are diagnosed with cancer and also about 1,500 die related to the disease. NHL accounts for 70 % of all childhood lymphoma with incidence of approximately 1.9 million children under the age of 20 years worldwide. The NHL is considered the 7th most common cause of death in children [12]. In Egypt, lymphoma is the most frequent reason for visits to the oncologist units. Non-Hodgkin Lymphoma represents approximately 76.6% of total population of lymphoma per 100,000 [13].

Therefore, the application of nursing intervention for these mothers aids in improving basic quality of nursing care rendered through assisting the mothers in meeting their knowledge and practices' needed for caring of their children with NHL.

Aim of the study:

The aim of this study was to evaluate the effect nursing intervention program for mothers of newly diagnosed children with NHL through:

1. Assessing mothers' knowledge and practices regarding care of their children with NHL.
2. Assessing mothers' stress levels regarding care of their children with NHL.
3. Designing and implementing a nursing intervention program for mothers regarding children's needs.
4. Evaluating the effect of the nursing intervention program on mothers' knowledge, practices and stress levels regarding care of their children with NHL.

Research hypothesis:

The nursing intervention will improve knowledge and practices of mothers regarding caring their children with NHL as well as reduce their stress level.

2. SUBJECT AND METHODS

The subjects and methods of the present study will be discussed under the following four designs:

Technical design, operational design, administrative design and statistical design;

Technical Design:

It included research design, setting, sample and tool of data collection.

Research design:

A quasi-experimental design was used to conduct the study.

Setting:

The study was conducted at Lymphoma Outpatient Clinic in Children's Hospital, affiliated to Ain Shams University: The clinic serves children diagnosed with lymphoma for follow up; it offers the services to a large sector in Egypt.

Sample:

A purposive sample consisting of 54 mothers accompanying their children newly diagnosed with NHL, who were attending the previously mentioned setting over a 6 months period, was recruited under the following inclusion criteria; mothers of children newly diagnosed with NHL at least from 3 to 6 months and children whose ages are from 6 to 18 years.

Tool of data collection:

One tool was used for data collection (pre/post nursing intervention program):

Structured interviewing questionnaire, developed by the researchers, based on the recent literature review and experts' opinions, it was written in simple clear Arabic language in the form of open and closed-ended questions. It is composed of five parts;

Part I: Designed to collect data about the demographic characteristics of mothers of children with NHL. It included mother's age, level of education, residence, occupation, number of children, consanguinity between couples and monthly income. In addition, children with NHL demographic characteristics such as age, gender and child rank (questions: 1- 10).

Part II: Designed to collect data about past obstetric history for mothers such as; mothers exposed to X-ray, suffered from disease or took medication during pregnancy (questions: 11- 13).

Part III: Devoted to the mothers' knowledge about NHL covered areas such as; meaning, function and component of lymphatic system, meaning of immunity and NHL related knowledge as; meaning, causes, manifestations, types, stages, diagnosis and treatment, child nutrition and protection of the child from associated health problems (questions: 14- 28).

Scoring system:

This part of interviewing questionnaire was carried out according to the following scoring system: For knowledge items, the correct answers were predetermined according to literature review, a correct answer was scored 2 and the incorrect one was scored 1. For each item of knowledge, the scores of the items were summed–up and the total divided by the number of the items. These scores were converted into a percent score. The total score of mothers' knowledge was 30 points, classified into: satisfactory ≥ 50% = (15-30 points) and unsatisfactory < 50 = (1-<15 points).

Part IV: It was designed to assess mothers' reported practices related to care of their children with NHL. Adopted from [14, 15, 16, 17, 18, 19]**,** it covered the following practices; mouth care, relieve pain, exercise and dealing with associated health problems (dealing with fever, loss of appetite, skin itching, constipation, dyspnea, diarrhea and hair loss).

Scoring system:

It was concerned with mother's practices regarding:

Mouth care; it consisted of 9 items.

Scoring system: Each item has been scored as 2 grades = always reported, 1 grade = sometimes reported, and zero= never reported. Total optimal score = 18 grades.

Relieve pain; it consisted of 5 items.

Scoring system: Each item has been scored as 2 grades = always reported, 1 grade = sometimes reported, and zero = never reported. Total optimal score = 10 grades.

Exercise; it consisted of 27 items.

Scoring system: Each item has been scored 2 grades = always reported, 1 grade = sometimes reported, and zero= never reported. Total optimal score = 54 grades.

Dealing with associated health problems; it consisted of 37 items, divided as the following;

Scoring system: Each item has been scored 2 grades = always reported, 1 grade = sometimes reported, and zero= never reported. Total optimal score = 74 grades.

Total score of practices was evaluated and compared with the ideal action in the list; accordingly it was categorized as follows:

Adequate reported practices, 50% or more, = (78-156 points).

Inadequate reported practices, less than 50%, = (0-<78 points).

Part V: Parenting Stress Index (PSI), it was adopted from [20] to measure mothers' stress levels toward care of their children, the PSI consisting of 18 items (8 positive and 10 negative), it has three parts; child characteristics, parent characteristics, and stress stemming from situational or demographic conditions.

Scoring system: The index items were scored using a 5-point rating scale ranging from 1= strongly agree, 2= agree, 3= not sure, 4= disagree and 5= strongly disagree. The 8 positive items are reversely scored so that possible scores on the scale can range from 18 to 90. Higher scores on the scale indicate greater stress. Total mothers' stress was divided into 3 levels; mild stress (1-<30), moderate stress (30-<60) and severe stress (60- 90).

Validity and reliability:

The tool was tested for their content validity by a jury of five experts in the fields of community, psychiatric and medical surgical nursing. The required modifications were carried out accordingly. Testing reliability of the study tool was done by Cronbach alpha, the result was 0.78 for the questionnaire and 0.74 for the PSI.

Operational Design: Preparatory Phase

During this phase, a review of the literature was done through reviewing the available national and international related literature to be oriented with various aspects of the research problem and to develop the study tool.

Pilot study:

A pilot study was carried out on 5 mothers and their children to test the applicability and feasibility of the study tool. Mothers included in the pilot study were excluded from the main study sample since some modifications were done in the form of rephrasing for some statements. The final form of the tool was then obtained and the time needed for completing each tool was also estimated.

Ethical considerations

Informed consent was obtained from each mother who agreed to share in the study, prior to data collection. The studied mothers were informed about the purpose and the expected outcomes of the study and they were assured that the study was harmless to their children, that their participation was voluntary and they have the right to withdraw from the study at any time without giving any reason. They were also confirmed that, confidentiality undertaking, also the collected data will be used for the study aim, and its benefits to their children. Ethics, values, culture and beliefs were respected.

Field work:

- The actual field work was done over a period of six months from beginning of April 2018 up to the end of September 2018.
- The Lymphoma Outpatient Clinic runs every Sunday and Thursday every week, the researchers were available in these 2 days from 10.00 a.m. to 2.0 p.m.
- Data were collected from the mothers through individual interviews at the Lymphoma Outpatient Clinic. Each interview took about one hour.
- Preparation for assessment took one month for developing the data collection tool based on literature review.
- Data collection and filling in of the questionnaire and application of the nursing intervention program took 5 months. The follow up was started immediately after finishing baseline assessment for all mothers having children with NH L.
- Mothers of children with NHL were informed to be in contact with the researchers through telephone calls for any guidance, at any time, and for reporting any health problems with their children.

Nursing intervention program development included 3 phases:

Phase 1: Preparation for assessment (1 month): It was based on the preparatory phase for developing the data collection tool obtained from the interviewing questionnaire, as well as literature review (pre/post test).

Phase II: Design and implementation (5 months): The nursing intervention was designed based on analysis of the actual needs of mothers of children newly diagnosed with NHL in pre assessment by using the pre constructed tool. The nursing intervention program was developed through determining the general objective, content, teaching methods and aids used.

The general objective: was to improve the knowledge, practices and reduce stress level of mothers of newly diagnosed children with NH L.

Content: Content was designed to meet needs of mothers of children with NHL and to fit into their interest and level of understanding. Teaching methods used in theoretical part were lectures with presentation and group discussions, while in practical part they were conducted through demonstration and re-demonstration. Teaching aids included: laptop, posters and a booklet.

Sessions: The sessions took place at the reception of the Lymphoma Outpatient Clinic in Children's Hospital. The total number of sessions' hours was 10 (4 hours for theory sessions & 6 hours for practical sessions). The duration of each session was 1-2 hours. The sessions included the following two parts:

Part I: Promotion of mother's knowledge about NHL, the researchers are providing information about meaning of immunity and meaning, function and component of lymphatic system; meaning of and meaning, causes, manifestations, types, stages, diagnosis and treatment of NHL, as well as child's nutrition and protection of the child from associated health problems.

At the starting of the first session, an orientation about the program and its purposes was given. From the second session, each one started by a summary about what was given through the previous session and objectives of the new one, taking into consideration using simple and clear language to suit the level of all mothers.

By the end of every session a summary was made, and time was allocated for questions and answers, and a plan for next session was presented. The researchers adjusted with the mothers a day for the next session according to follow up time of each mother. Except for the last session, a termination of sessions through feedback was done.

Part II: Practices for the mothers of children with NHL included many activities, like mouth care, relieve pain, exercise and dealing with associated health problems (dealing with fever, loss of appetite, skin itching, constipation, dyspnea, diarrhea and hair loss).The intervention illustrated booklet was evaluated for its content validity and clarity by a panel of experts, professors in the fields of community, psychiatric and medical surgical nursing. In the light of their comments, the necessary modifications were carried out and the final form of the intervention booklet was administered. The mothers were given the intervention illustrated booklet, designed by the researchers in Arabic language, to serve as a referral guideline for mothers.

Phase III: Evaluation of the nursing intervention program: Evaluation of the program was done by using the post test questionnaire which was the same formats of pre-test in order to compare changes in mothers of children with NHL in relation to their knowledge, practices and stress level. It was assessed immediately post implementation of the nursing intervention program.

Administrative Design:

An official permission to carry out the study was obtained through an issued letter from the Dean of the Faculty of Nursing, Ain Shams University to the medical and nursing directors of the previously mentioned setting. The letter included the title, aim and the expected outcomes of the study.

Statistical Design

The collected data were organized, revised, scored, tabulated and analyzed using the number and percentage distribution. Statistical analysis was done by computer using statistical package for social sciences (SPSS). Qualitative variables were compared using Chi-square test and quantitative variables were compared using Pearson correlation coefficient (r) for continuous parametric variables. The significance of the results was considered as follows: When $P > 0.05$: it is a statistically insignificant difference, while $P < 0.05$ and $P < 0.001$: it is a statistically significant difference.

3. RESULT

Table (1) indicates that, the current study sample included 54 mothers of children newly diagnosed with NHL. The mean age of this study sample was 32.0 ± 6.8 years and 63.0%, 64.9% and 61.2% of them were from rural areas, not working and had insufficient income respectively. As regards educational level, 40.5% of them had secondary level of education. Regarding number of children, 55.6% of them had three children or more. Meanwhile 20.3% of them had consanguinity with their husbands.

Table (2) clarifies that, the age of these children ranged from 6-> 10 years with a mean age of 9.6 ± 2.1 years. 55.6% of them were girls and 37.0% ranked middle child.

Figure (1) demonstrates that 37.0 %, 31.5% and 7.4% of them were taking medication during pregnancy, were exposed to X-ray during pregnancy and suffered from disease during pregnancy respectively.

Table (3) elaborates that there are statistically significant differences ($p<0.001$), in all items of studied sample knowledge regarding lymphatic system pre /post implementation of nursing intervention program.

Table (4) indicates that there are statistically significant differences ($p<0.001$), in all items of studied sample knowledge regarding non-Hodgkin lymphoma pre/post implementation of nursing intervention program.

Figure (2) illustrates that, there is statistically significant difference (X^2 =31.245 at $p<0.001$) between pre/post implementation of nursing intervention program regarding mothers' total knowledge, where 26.0% of studied sample had

satisfactory total knowledge pre-implementation of the nursing intervention program compared to 79.7% of them had satisfactory total knowledge post implementation.

Table (5) displays that there are statistically significant differences ($p<0.001$) in all items (mouth care, relieve pain, exercise and dealing with associated health problems) of studied sample according to their adequate reported practices regarding care of their children with NHL pre/post implementation of nursing intervention program.

Figure (3) shows that, there is statistically significant difference ($X^2= 40.458$ at $p<0.001$) between pre/post implementation of the nursing intervention program regarding adequate reported practice score level about care of their children with NHL pre/post implementation of the nursing intervention program, where 16.8% of studied sample had adequate total practice score pre implementation of the nursing intervention program regarding compared to 77.8% of them had adequate total practice score post implementation.

Figure (4) elaborates that, there is statistically significant difference ($X^2= 27.820$ at $p<0.001$) between pre/post implementation of the nursing intervention regarding mothers' total stress levels related to care of their children with NHL, where 66.7% of studied mothers had severe stress pre implementation of the nursing intervention compared to 16.8% of them post implementation.

Table (6) clarifies that, there are negative correlations ($r = - 0.593^{**}$ & $r = - 0.705^{**}$at $p<0.001$) between total mothers' stress levels and their total knowledge as well as total practices respectively regarding care of their children with NHL pre implementation of the nursing intervention. Additionally, the table reveals that, there are negative correlations ($r = - 0.514^{**}$ & $r = - 0.829^{**}$ at $p<0.001$) between total mothers' stress levels and their total knowledge as well as total practices respectively regarding care of their children with NHL post implementation of the nursing intervention program.

Table (1): Distribution of the Studied Mothers Regarding to their Demographic Characteristics (n=54).

Characteristics	No.	%
Age in years		
<25	9	16.8
25-	25	46.2
35 - ≤ 45	20	37.0
Mean ± SD = 32.0 ± 6.8		
Educational level		
Don't read and write	8	15.0
Primary school	10	18.5
Secondary school	22	40.5
University education	14	26.0
Residence		
Urban	20	37.0
Rural	34	63.0
Occupation		
Working	19	35.1
Not working	35	64.9
No. of children		
< 2	24	44.4
3-	30	55.6
Consanguinity between couple	11	20.3
Monthly income		
Sufficient	21	38.8
Insufficient	33	61.2

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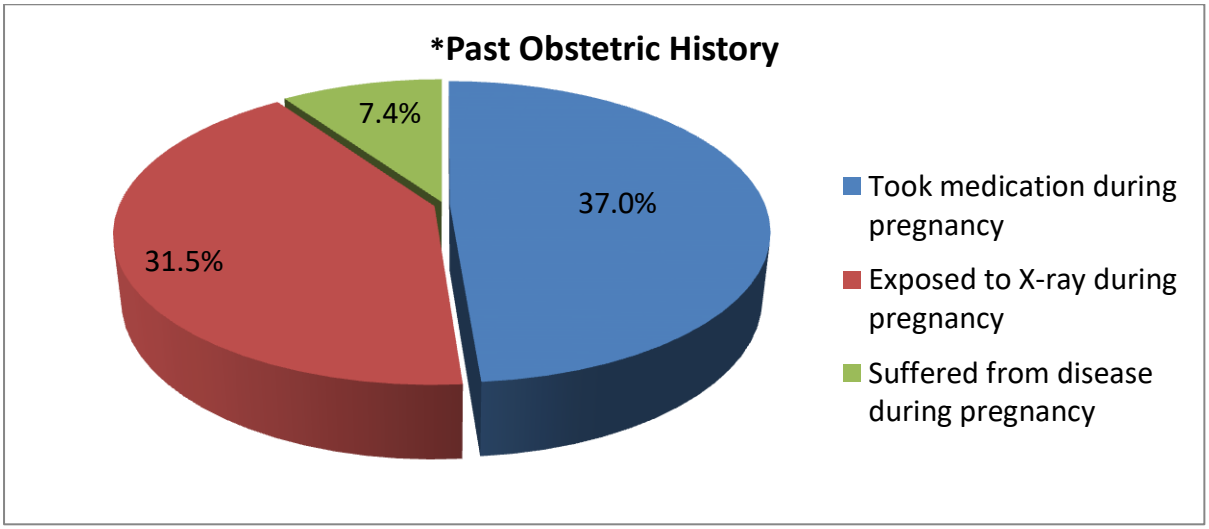
Table (2): Distribution of the Children's with NHL According to their Demographic Characteristics (n= 54).

Characteristics	No	%
Age in years		
6- <8	9	16.8
8 - 10	26	48.1
> 10	19	35.1
Mean ± SD = 9.6 ± 2.1		
Gender		
Boy	24	44.4
Girl	30	55.6
Child rank		
First	17	31.5
Middle	20	37.0
Youngest	17	31.5

Figure (1): Distribution of the Studied Mothers According to their Past Obstetric History (n=54).



*Total items are not mutually exclusive

According to the research hypothesis:

Table (3): Distribution of Studied Mothers According to their Knowledge about Lymphatic System Pre /Post Implementation of Nursing Intervention Program (n=54).

Mothers' knowledge about lymphatic system	Pre nursing intervention				Post nursing intervention				X^2	p value
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory			
	No.	%	No.	%	No.	%	No.	%		
Meaning of lymphatic system	9	16.8	45	83.2	40	74.0	14	26.0	35.900	**0.000***
Meaning of immunity	13	24.0	41	76.0	46	85.0	8	15.0	40.682	**0.000***
Function of lymphatic system	7	13.0	47	87.0	44	81.5	10	18.5	50.861	**0.000***
Components of lymphatic system	11	20.3	43	79.7	46	85.0	8	15.0	45.511	**0.000***

*Statistically significant difference

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Table (4): Distribution of Studied Mothers According to their Knowledge about Non-Hodgkin Lymphoma Pre/Post Implementation of Nursing Intervention Program (n=54).

Mothers' knowledge about Non-Hodgkin lymphoma	Pre nursing intervention				Post nursing intervention				X^2	p value
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory			
	No.	%	No.	%	No.	%	No.	%		
Meaning.	14	26.0	40	74.0	49	90.7	5	9.3	46.667	**0.000***
Causes.	7	13.0	47	87.0	51	94.5	3	5.5	72.099	**0.000***
Manifestations.	14	26.0	40	74.0	51	94.5	3	5.5	52.899	**0.000***
Types.	3	5.5	51	94.5	46	85.0	8	15.0	69.074	**0.000***
Stage.	0	0	54	100	41	76.0	13	24.0	66.090	**0.000***
Diagnosis.	9	16.8	45	83.2	51	94.5	3	5.5	66.150	**0.000***
Treatment.	10	18.5	44	81.5	46	85.0	8	15.0	48.066	**0.000***
Child nutrition.	11	20.3	43	79.7	49	90.7	5	9.3	54.150	**0.000***
Protection of child from associated health problems.	6	11.1	48	88.9	42	77.8	12	22.2	48.600	**0.000***

*Statistically significant difference

Figure (2): Distribution of the Studied Mothers According to their Total Knowledge Pre/Post Implementation of Nursing Intervention Program (n=54).

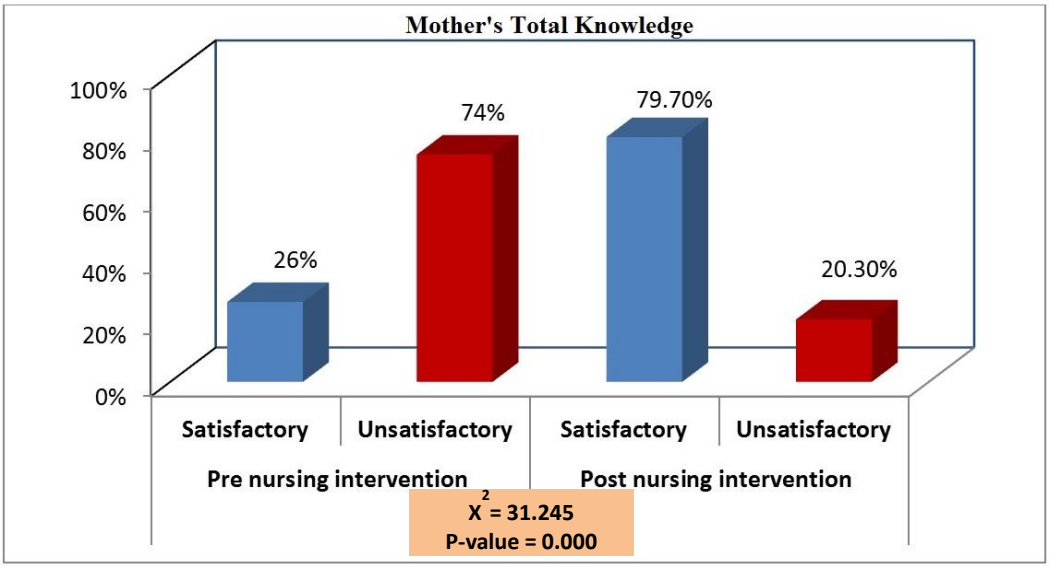

Table (5): Distribution of Studied Mothers According to their Reported Practices Regarding Care of their Children with NHL Pre/Post Implementation of Nursing Intervention Program (n=54).

Mothers' reported practices	Pre intervention program				Post intervention program				X^2	p value
	Adequate		Inadequate		Adequate		Inadequate			
	No.	%	No.	%	No.	%	No.	%		
Mouth care	11	20.3	43	11	49	90.7	5	9.3	54.150	**0.000***
Relieve pain	6	11.1	48	88.9	40	74.0	14	26.0	43.776	**0.000***
Exercise	5	9.3	49	90.7	44	81.5	10	18.5	56.820	**0.000***
Dealing with associated health problems.	9	16.8	45	83.2	46	85.0	8	15.0	50.721	**0.000***

*Statistically significant difference

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Figure (3): Distribution of the Studied Mothers According to Their Total Reported Practices Regarding Care of their Children with NHL Pre/Post Implementation of Nursing Intervention Program (n=54).

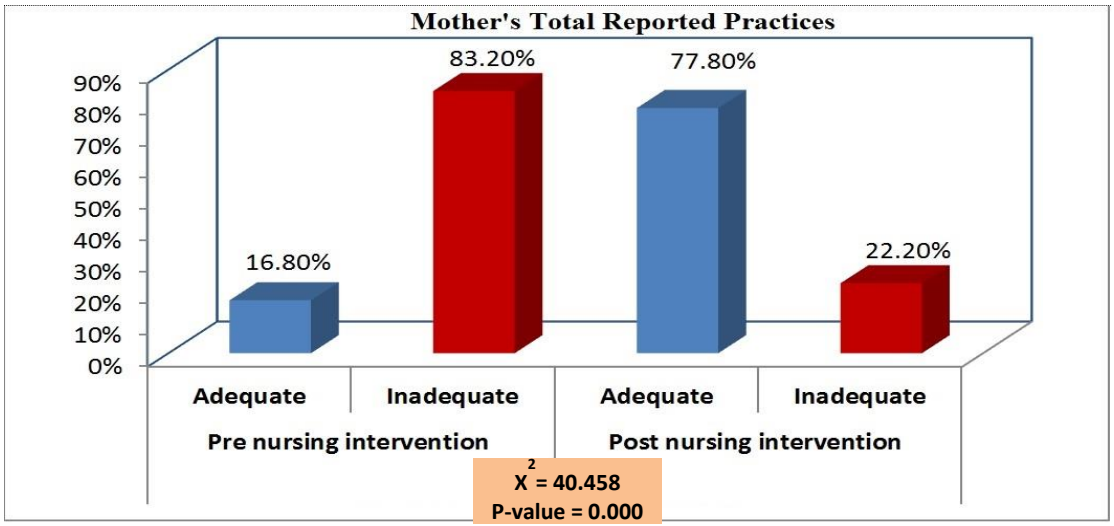

Figure (4): Distribution of the Studied Mothers According to their Total Stress Level Regarding Care of their Children with NHL Pre/Post Implementation of Nursing intervention Program (n=54).

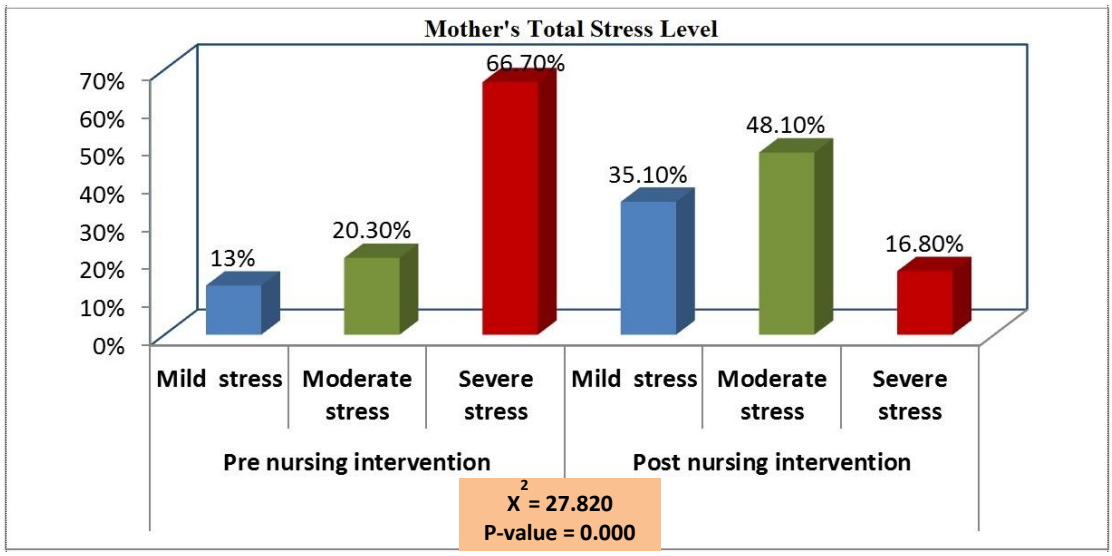

Table (6): Correlation Between Studied Mothers' Total Stress Level and their Total Knowledge and Total Reported Practices Regarding Care of their Children with NHL Pre/Post Implementation of Nursing Intervention Program (n=54).

Items	Total Mothers' Stress Level			
	Pre nursing intervention program		Post nursing intervention Program	
	r	p	r	p
Total mothers' Knowledge				
Pre nursing intervention	- 0.593**	0.000	-0.521**	0.000
Post nursing intervention	- 0.542**	0.000	-0.514**	0.000
Total mothers' reported Practices				
Pre nursing intervention	-0.705**	0.000	-0.631**	0.000
Post nursing intervention	-0.821**	0.000	-0.829**	0.000

*Correlation is significant at p< 0.05

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4. DISCUSSION

Lymphoma is the most common malignancy of childhood. In Egypt the total deaths from childhood lymphoma was 5629 between the ages from 8 to 12 years, more often in males than females. Lymphoma disease is the second leading cause of death in children [21].

Nursing intervention program is one of the approaches most frequently utilized to help mothers to improve knowledge, and practices to gain confidence in their ability to find solutions to their children's health problems, health needs and complications of lymphoma disease. Therefore, nursing intervention must be part of the treatment and care given to children with lymphoma disease [3].

The finding of the current study revealed that, the age of studied sample of mothers ranged from <25-≤ 45 years with a mean age of 32.0 ± 6.8 years (table 1). This finding is to same extend in agreement with those of ***Ali et al.*** [22]**,** who found, in a study entitled "Impact of teaching guidelines on quality of life for children with cancer", in **Egypt** that, the age of the mothers ranged between 30-40 years. As well, ***Aung et al.*** [23]**,** who reported, in their study about "The hidden impact of childhood cancer on the family; A multi- institutional study", in **Singapore** that, all the caregivers were in the age group 30-40 years. In contrast to the previous results**,** ***Al-Jauissy*** [24] whose study about" Health care needs of Jordanian caregivers of children with cancer receiving on outpatient basis" in **Jordan,** revealed that, the age of study sample ranged from 21 to 62 years, with a mean of 36.2 ± 15.8 years.

Concerning the educational level of the study sample, the current study findings revealed that, almost two fifth of mothers had studied up to secondary level of education, while more than one quarter of them were graduate from university whereas, an equal percentage of less than one fifth of them had either primary level of education or even don't read and write (table 1).

The present study results are on the same line with those of ***Aung et al.*** [23]**,** who found that 50% included in their study were secondary level of education. As well, a study done in Egypt by ***Afifi*** [25]**,** who carried out a study about" Needs and problems of parents caring for their cerebral palsy children" reported that 48.5% of caregivers were secondary school. As well, these findings are supported by that of ***Al-Jauissy*** [24] in **Jordan** who mentioned that the education level of the study sample ranged from 2 to 18 years, with a mean of 8.4 ± 12.6 years. *These results may be due to* that about two third of the study sample reside rural areas where the early marriage is common and the education is not the main concern of the rural girls.

Concerning residence less than two third of the studied sample was from rural areas (Table 1). This finding is supported by that of ***Sabry et al.*** [26], whose study entitled "Assessing the coping strategies in a sample of mothers of Egyptian children with leukemia & Lymphoma", in **Egypt**, found that 59.5% of the study sample were from the rural community.

Furthermore, this result is consistent with those of ***Casulo and Rich*** [27] who reported that, there is a higher incidence of NHL in farming communities, related to specific ingredients in herbicides and pesticides such as, organochlorine, organophosphate and phenoxy acid compounds are linked to lymphoma. The pesticides used in agricultural and home are associated with cancer risk. Also, exposure to certain bacteria and viruses is attached with NHL. It is reasoning that infection with a virus or bacteria may lead to intense lymphoid cell proliferation which increases the probability of a cancer. In contrast to the previous results, ***Mahmoud and Abd Elaziz*** [28] whose study about "Effect of psycho educational training Program for parents having child with leukemia on their experience and psychological wellbeing", in **Egypt,** found that 73.3% in their study sample are living in urban areas. *This result may be related to* the lack of specialized oncology health care services in the rural areas so, these cases are referred to specialized oncology health care service in the urban area.

Considering occupation and monthly income the present study results revealed that slightly less than two third of the study sample was not working and slightly more than three fifth of them had insufficient monthly income (table I). These findings are to the same extent supported by those of ***Mahmoud and Abd Elaziz*** [28], in **Egypt,** who found that, 50% were housewives and 93.3% with insufficient monthly income. As well, these results are consistent with those of ***Abdelkhalek et al.*** [29], in their study in **Egypt** about "Factors associated with delayed cancer diagnosis in Egyptian children" reported that, 68.3% of the study sample had low and average monthly income. *These results could be due to* the expensive life needs and that most of the study sample are from rural areas so, they pay costs for transportation, and

that most of the mothers are housewives, in addition sometimes those children need immediate medical care in private clinics.

Regarding the consanguinity between couples, the present study result revealed that one fifth of the study sample had consanguinity with their husbands (table I). This finding is parallel to that of ***Bener et al.*** [30], who highlighted that recessive gene diseases are more common among the offspring of consanguineous families and many increase risk of lymphoma. Causal link was found between lymphoma and consanguinity in the parent.

Considering profile of the children with non-Hodgkin lymphoma, the results of the present study clarified that, the age of these children ranged from 6 -> 10 years with a mean age of 9.6±2.1 years (table 2). This finding is supported by that of ***Mahmoud and Abd Elaziz*** [28], in **Egypt**, who found that, 73.3% of children with lymphoma are in the age group 6 -<12 with a mean age of 7.07±2.5. as well, the result is similar to those of ***Shalaby et al.*** [31], which revealed that, in their study about "Bcl-2 expression and chromosomal abnormalities in childhood acute lymphoblastic leukemia", in **Egypt**, that lymphoma is more prevalent in young age less than 15 years old. This finding is also parallel to that of ***Njuguna*** [32], who reported in his study about "Adherence with childhood cancer treatment", in **Kenya,** that the peak incidence of cancer in children was in the age 6–10 years with a mean age 8.6± 5.0 and median 8.

The result of the present study indicated that, more than half of the children were girls (table 2). In contrast to the previous result, ***Mahmoud and Abd Elaziz*** [28], and ***Shalaby et al.*** [31], in **Egypt,** and ***Njuguna*** [32], in **Kenya**, found that 58%, 58.3% and 59% respectively were boys. *This result could be due to* that the number of girls' births has been increasing in recent years.

Regarding mothers' past obstetric history, the present study result clarified that more than one third of them took medication and less than one third of them were exposed to X-ray during their pregnancy, while only a minority representing less than tenth suffered from disease during pregnancy. These findings are in agreement with those of ***Ali et al.*** [22]**,** in **Egypt,** who reported that 27.4% of the studied mothers took some medications during pregnancy. This finding is also parallel to that of ***Grufferman et al.*** [33]**,** who found that in their study about "Prenatal X-ray exposure and rhabdomyosarcoma in children: A report from the children's oncology group" suggested that prenatal X-ray exposure is one of the few well-established environmental risk factors for childhood cancer.

Considering the mothers' knowledge, about lymphatic system and NHL, the results of the current study indicated that there are statistically significant differences in all items of mothers' knowledge post implementation of the nursing intervention program compared to pre implementation regarding meaning, function and components of lymphatic system and meaning of immunity, as well as, NHL related knowledge as; meaning, causes, manifestations, types, stages, diagnosis and treatment, child nutrition and protection of the child from associated health problems (tables 3 & 4).

The present study findings are in the same line with those of a study done in **Egypt,** by ***Mahmoud and Abd Elaziz*** [28]**,** which revealed that the majority of their study subjects had extremely unsatisfactory level of knowledge, as indicated by the pre program implementation which statistically highly improved post program implementation. As well, this finding is corresponding with that of ***Lewis et al.*** [34]**,** who reported that mothers are usually the main caregivers of their children suffering from lymphoma. So it is important to assess mother's knowledge and practices that affect consequently the care provided to their children. *This result could be due to* that the mothers of children with cancer have been insisting to acquire knowledge in order to minimize the complications of the disease and its treatment also, to maintain better life for their children.

Considering the studied sample according to mothers total knowledge, the result of the present study indicated that, there is statistically significant difference between pre/post implementation of nursing intervention program where more than quarter of the studied sample had satisfactory total knowledge pre-implementation of the nursing intervention program compared to more than three quarter of them had satisfactory total knowledge post implementation (Fig. 2). The results of the present study were supported by those of ***Northouse et al.*** [35]**,** whose study entitled "Interventions with family caregivers of cancer patients: Meta-analysis of randomized trials", which offered to family caregivers of patients with cancer different types of interventions as psycho-educational, skills training, and therapeutic counseling, which led to, improved caregivers' awareness, ability to cope, increased their self-efficacy, and improved their quality of care.

This improvement in mothers' total knowledge justified the research hypothesis, and attributed it to the fact that the nursing intervention program was planned after assessment of mothers' identified knowledge gaps and needs and the mothers were willing to get more information to help their children. From the researchers' point of view this emphasizes the importance for conducting nursing intervention program in all oncology units for newly diagnosed children with lymphoma and for their mothers.

As regards reported practices of the study sample, the results of present study revealed statistically significant differences between pre/post implementation of the nursing intervention program regarding to all items; mouth care, relieve pain, exercise and dealing with associated health problems, post implementation of the nursing intervention program compared to pre implementation (Table 5 & Fig 3). The results of the present study were supported by those of ***Hashemi and Shokrpour*** [36]**,** in their study entitled "The impact of education regarding the needs of pediatric leukemia patients' siblings on the parents' knowledge and practice", which revealed that 87.2% of the parents performance in the experimental group and 36.4% of the control group toward the siblings of the sick child was appropriate 2 months after the intervention.

This may be explained, the mothers having a strong desire to overcome their children's problems associated with the disease and to control side effects of treatment to keep healthy life for their children in the future, in addition they were actively involved in the intervention and in communication with the researchers.

Considering mothers' stress, the result of the present study clarified that, there was statistically significant difference between pre/post implementation of the nursing intervention program regarding mothers' stress levels related to care of children with NHL, where two third of the studied mothers had severe stress pre implementation of the nursing intervention compared to less than fifth of them post implementation (Fig. 4). This reduction in mothers' stress level justified the research hypothesis and reflected the positive effect of the nursing intervention program on mothers' stress levels.

This result is congruent with that of ***El Sayed*** [37]**,** who conducted a study entitled "Impact of supportive care for mothers of children with brain tumor on their coping" and reported that, mothers who received supportive care experienced less level of stress than those who did not. *The researchers attributed this result to* the numerous new sources of stress that faced mothers, including physical effects of treatment, uncertainty about the disease and inability of mothers to meet their infants' basic care needs while post implementation of the nursing intervention they were assimilating new information and practicing new skills that helped them in caring for their children.

The results of the current study revealed that, there are negative correlations between mothers' stress and their total knowledge as well as total practices regarding care of children with NHL post implementation of the nursing intervention program (table 6). These result in the same line with those of a study done in **Egypt** by ***Mohamed*** [38]**,** entitled "Effect of discharge plan for children undergoing chemotherapy and their caregivers on improving practice and coping pattern", who found that, there are negative correlations between caregivers' stress and their knowledge, practices and coping patterns post discharge plan.

These findings can be due to the fact that, the mothers who acquired satisfactory knowledge and adequate practices become more powerful and more oriented to take the right decision related to their children's health. As well, the good opportunity in involving them to care for their children's health by themselves led to avoid many stressful situations related to care of their children.

5. CONCLUSION

Based on the results of the current study, it can be concluded that, the research hypothesis is justified since the implementation of the nursing intervention program led to significant improvements in mothers' knowledge and practices as well as in reducing stress levels regarding the care of their children with non-Hodgkin lymphoma.

6. RECOMMENDATIONS

Based on the results and conclusion of the present study, the following recommendations are suggested:

- Nursing intervention program for all mothers having children with NHL must be conducted in lymphoma outpatient clinics and oncology units.

- Distributing different illustrated instructional booklets and simplified brochures in lymphoma outpatient clinics and oncology units as a reference consisting of a clinical plan to produce better outcomes for children with NHL, using simple health-related information.

- Counseling intervention program focus on psychosocial problems among mothers of children with NHL based on their actual needs and problems.

- Periodical follow-up for the level of knowledge and practices of mothers of children with NHL.

- Replication of the study on a larger sample and on different geographical settings to allow generalization of findings.

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