

## Effect of Therapeutic Massage on Fatigue among Children with Leukemia following Chemotherapy

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### Abstract

**Background:** Fatigue is a common side effect of chemotherapy that adversely affects patient's sense of wellbeing, activities, relationships and tolerance to treatment. **This study aimed to** determine the effect of therapeutic massage on fatigue in children with leukemia following chemotherapy. A quasi- experimental research design was used to conduct the study. The study was conducted at Pediatric Oncology Department in South Egypt Cancer Institute in Assiut University and Pediatric Oncology Department at Sohag Cancer Center. A convenience sample of 66 children with leukemia of aging 4- 16 years were divided into two groups study and control group (33 children for each group). Sample was collected for a period of 6 months. Two tools were utilized in the study, Sociodemographic and clinical interview questionnaire was developed to assess data about children and Multidimensional fatigue scale was used to assess level of fatigue among the studied children. **The study revealed that,** highly statistical significant difference was found between both groups in relation to fatigue scores at  $p= 0.000$ . **Conclusion:** Children with leukemia who are receiving therapeutic massage were experiencing less incidence and severity of fatigue than those who are receiving only the routine hospital care. **Recommendations:** Encourage health care professionals to use therapeutic massage techniques to reduce chemotherapy induced fatigue in children.

**Key words:** *Therapeutic massage, Fatigue, Leukemia, Children & Chemotherapy.*

### Introduction

Children living with cancer experience multiple symptoms as a result of their disease and/or its treatment. Symptoms experienced by children with cancer are distressing, and multiple manifestations may share underlying mechanisms and influence the severity of the distress experienced (Cleve et al., 2012). The leukemias are the most common malignant neoplasm in childhood, accounting for approximately 31% of all malignancies that occur in children under 15 years (Metayer et al., 2013). Incidence and survival of childhood leukemia varies globally, and this variation may be attributed to environmental risk factors, genetics, and/or disparities in diagnosis and treatment (Demanelis et al., 2015). In the USA, leukemia is diagnosed in about 3.250 children less than 15 years of age each year, an annual incidence of 4.5 cases per 100.000 children (Kliegman et al., 2011).

A thirteen year retrospective study of pediatric malignancies in South Egypt Cancer Institute, Assiut University in Egypt, stated that, from January 2001 to December 2013, leukemias, myeloproliferative diseases and myelodysplastic diseases account for 33.4% of all tumors in the pediatric oncology department. Acute lymphoblastic leukemia (ALL) is the most common hematological malignancy. It

accounts for 29.3% of total malignancies among patients admitted to the department and 87.8% of total leukemias, myeloproliferative diseases and myelodysplastic diseases and 58% of hematological malignancies during study period with peak incidence at the age group 1-<5 years (Ali et al., 2016).

Chemotherapy is a long-term treatment and leads to many side effects (Hayat, 2013, Can et al., 2011). Acute side effects after chemotherapy include nausea, vomiting, mucositis, diarrhea, constipation, alopecia, rash, dark skin, nail changes, ocular toxicity arrhythmia, pericarditis, myocarditis, left ventricular changes, hypotension, pneumonitis, electrolyte disturbances, leukoencephalopathy and acute pancreatitis (Tomlinson & Kline, 2010).

Fatigue is recognized as one of the most common and distressing symptoms experienced by pediatrics with cancer (Abrams et al., 2016). The prevalence of fatigue during cancer treatment ranges from 25 to 99% (Cho, 2013). The National Comprehensive Cancer Network defines cancer- related fatigue as upsetting, persistent, subjective sense of physical, emotional and/or cognitive tiredness or exhaustion related to cancer or cancer- related treatment that is not proportional to recent activities and interferes with usual functioning (Berger et al., 2012).

Causes of fatigue in cancer children can be associated with the hypermetabolic state associated with growth of the tumor, competition for nutrients between the organism and the tumor, harmful effects of the chemotherapy and radiotherapy, inadequate nutritional intake, associated with nausea and vomiting due to the antineoplastic therapy, anemia, sleep disorders, uncertainty about the future; fear of death and mutilations (Nunes et al., 2014).

Massage therapy is one of the more commonly employed practices of complementary therapies used by children in general and specially children with cancer (Jacobs, 2014). It is considered as the use of therapeutic touch for the purpose of reducing fatigue and pain and restoring structure and function of the musculoskeletal and nervous systems. The techniques of massage therapy vary, and involve manual soft tissue manipulation, including holding, causing movement, and/or applying pressure to the body (Tomlinson and Kline, 2010). Massage therapy improves side effects, such as nausea, fatigue, and anxiety, in patients with cancer (Lee et al., 2015).

Massage therapy exerts its effects through physiological, psychological, and mechanical pathways. Also, it reduces muscular tension, promotes relaxation, improves circulation, relieves pain, and increases flexibility. The gate control theory suggests that massage may provide stimulation that helps to block pain signals sent to the brain. Endorphins and serotonin can be released through massage therapy, which can improve mood. It may enhance activity of autonomic nervous system causing an integrated effect at the hypothalamic level leading to a relaxation response. These effects may vary depending on the patient's perception of touch (Mitchinson et al., 2014, Abrams et al., 2016).

Pediatric massage is technically very easy to learn and requires little and cheap equipment but it needs time. Pediatric nurses are important members of medical health groups and have an essential role in pediatric cancer care, improving their performances and skills could improve the quality of the care. So there are a need to develop educational tools for training nursing students, patients, and families on the use of therapeutic massage techniques (Hughes et al., 2008).

### Significance of the study

Fatigue is one of the most common side effects of chemotherapy (Gerber et al., 2011, Breitbart & Alici, 2010 & Barsevick et al., 2010). It adversely affects not only a patient sense of wellbeing but also his/her daily performance, activities, relationships with family and friends and tolerance to treatment (Karagozlu & Kahve, 2013, Oh & Seo, 2011). Massage has been demonstrated to be very beneficial

for decreasing symptoms of nausea, fatigue, anxiety, pain and insomnia in clinical trials (Stringer et al., 2008). So this study was conducted to decrease occurrence and severity of fatigue to enhance treatment tolerance.

### Aim of the Study

This study aimed to determine the effect of therapeutic massage on fatigue among children with leukemia following chemotherapy.

### Research question

Are children with leukemia who receiving therapeutic massage are experiencing less incidence and severity of fatigue following chemotherapy than those who are receiving only routine hospital care?

### Hypothesis

Children with leukemia who were receiving therapeutic massage are experiencing lower fatigue than those who are receiving only the routine hospital care.

### Materials and Method

#### Research Design

The quasi- experimental research design was used in the study.

#### Setting

The study was conducted at Pediatric Oncology Department in South Egypt Cancer Institute in Assiut University and Pediatric Oncology Department at Sohag Cancer Center, Sohag.

#### Patients

Convenience sampling of 66 children with leukemia. They were divided into two group study and control group (33 children for each group). Sample was collected for a period of 6 months.

#### The criteria for the selection of the study subjects were as follow

- Children diagnosed with leukemia and hospitalized for at least 3 days for receiving chemotherapy protocol.
- Children aged 4- 16 years.
- Children with gastrointestinal and nervous system cancer, loss of consciousness, injury in the massage area and children under radiation were excluded from the study.

#### Two groups were distributed as follows

**Group one for control group:** consisted of children with leukemia undergoing chemotherapy who were receiving only the routine hospital care.

**Group two for study group:** consisted of children with leukemia undergoing chemotherapy who were receiving therapeutic massage in addition to routine hospital care.

### Tools of the study

#### Two tools were used in this study

##### Tool (1): Demographic and clinical data interview questionnaire.

It was developed by the researcher after reviewing literature and consists of two parts:

**Part (1):** Sociodemographic data about children. It included questions about age, sex, residence and family history of oncological disorders.

**Part (2):** Clinical data which included questions about the child's diagnosis, stage of disease and side effects of chemotherapy.

##### Tool (2): PedsQL Multidimensional Fatigue Scale.

It was developed by Varni (1998), It was used to assess fatigue in pediatrics. It consists of 18 items. Using five- point likert scale, respondents choices are labeled 0 = never a problem, 1 = almost never a problem, 2 = sometimes a problem, 3 = often a problem, and 4 = almost always a problem. Questions are reversely scored and linearly transformed to a 0-100 scale (0 = 100, 1 = 75, 2 = 50, 3 = 25, and 4 = 0). Higher scores indicate fewer problems with fatigue.

#### Method of data collection

- Research proposal was approved by Ethical Committee in the Faculty of Nursing, Assiut University.
- Official permission was obtained from the Dean of Ethical Committee of South Egypt cancer Institute in Assiut University and Sohag Cancer Center.
- The developed tool (I) was tested for content validity by 5 experts three in the field of pediatric nursing and two in pediatric oncology medicine, the needed modification was done, accordingly.
- Reliability of tools II was done using the cronbach's alpha test to examine the internal consistency (0.97)
- Written informed consent from parents of studied children was obtained after explaining the nature and purpose of the study.
- Confidentiality and anonymity was assured.
- Pilot study was carried out on 10% (8 children) to evaluate the clarity, competence and applicability of tools. The data obtained from the pilot study was analyzed; no change was done in the assessment sheet, so the 8 children selected for the pilot study were included in the study. Children were assigned to control and study groups according to parent preferences.
- Assessment of children condition was done by the researcher through using tools I and II for both control and study groups.
- Therapeutic massage was used with effleurage, petrissage, friction, and tapotement movements with mild to moderate pressure using non-scented olive oil. The pressure was guided by the child's feedback and tolerance. The children's massage

included the back, legs, arms and neck. In three sessions (two session before receiving chemotherapy and one session after receiving chemotherapy), children in study group were massaged for 20 min, 24 hour and half an hour before receiving chemotherapy and 24 hour after chemotherapy administration. The researcher was trained by physical therapist before study implementation.

- Fatigue was assessed for both control and study groups during and after chemotherapy administration for 48 hours.

### Ethical Considerations

Children in study group had the right to refuse to participate or withdraw from the study without any rational any time. The privacy of the included patients was considered during collection of data.

### Statistical analysis

Date entry and data analysis were done using SPSS version 19 (Statistical Package for Social Science). Data were presented as number, percentage, mean, standard deviation. Chi-square was used to compare between qualitative variables. Mann-Whitney test was used to compare quantitative variables between two groups and Kruskal Wallis Test for more than two groups due to data was non-parametric. P-value considered statistically significant when  $P < 0.05$ .

## Results

Table (1): Sociodemographic characteristics of children in control and study groups (n= 66).

Items	Control (n= 33)		Study (n=33)		p- value
	No	%	No	%	
<b>Age (years)</b>					<b>0.678</b>
4:< 8	19	57.6	17	51.5	
8:<12	8	24.2	7	21.2	
12: ≤ 16	6	18.2	9	27.3	
<b>Mean± SD</b>	<b>8.07 ± 3.76</b>		<b>8.24 ± 3.88</b>		
<b>Sex</b>					<b>0.453</b>
Male	18	54.5	21	63.6	
Female	15	45.5	12	36.4	
<b>Residence</b>					<b>0.580</b>
Rural	23	69.7	25	75.8	
Urban	10	30.3	8	24.2	
<b>Family history of oncological diseases</b>					<b>0.792</b>
+ve	11	33.3	10	30.3	
-ve	22	66.7	23	69.7	

Table (2): Clinical data of children in control and study groups (n= 66).

Items	Control (n= 33)		Study (n=33)		p- value
	No	%	No	%	
<b>Diagnosis</b>					0.642
ALL*	30	90.9	31	93.9	
AML**	3	9.1	2	6.1	
<b>Stage of disease</b>					0.225
Induction	3	9.1	7	21.2	
Remission	28	84.8	22	66.7	
Relapse	2	6.1	4	12.1	
<b>Side effects of chemotherapy #</b>					0.922
Diarrhea	11	33.3	19	57.6	
Nausea and vomiting	33	100	33	100	
Alopecia	28	84.8	28	84.8	
Anorexia	28	84.8	28	84.8	
Bruising/ bleeding	7	21.2	7	21.2	
Infection	16	48.5	13	39.4	
Fatigue	33	100	33	100	
Mouth sores	21	63.6	25	75.8	
<b>Type of chemotherapy #</b>					0.719
Ara-C	4	21.1	5	15.2	
VePesid	2	6.1	3	9.1	
Pharmorubicin	4	21.1	5	15.2	
Triple intrathacecal chemotherapy	15	45.5	21	63.6	
Asparaginase	2	6.1	7	21.2	
Endoxan	2	6.1	1	3	
Vincristine sulfate	9	27.3	6	18.2	
Methotrexate	18	54.5	17	51.5	

# More than one answer might be given.

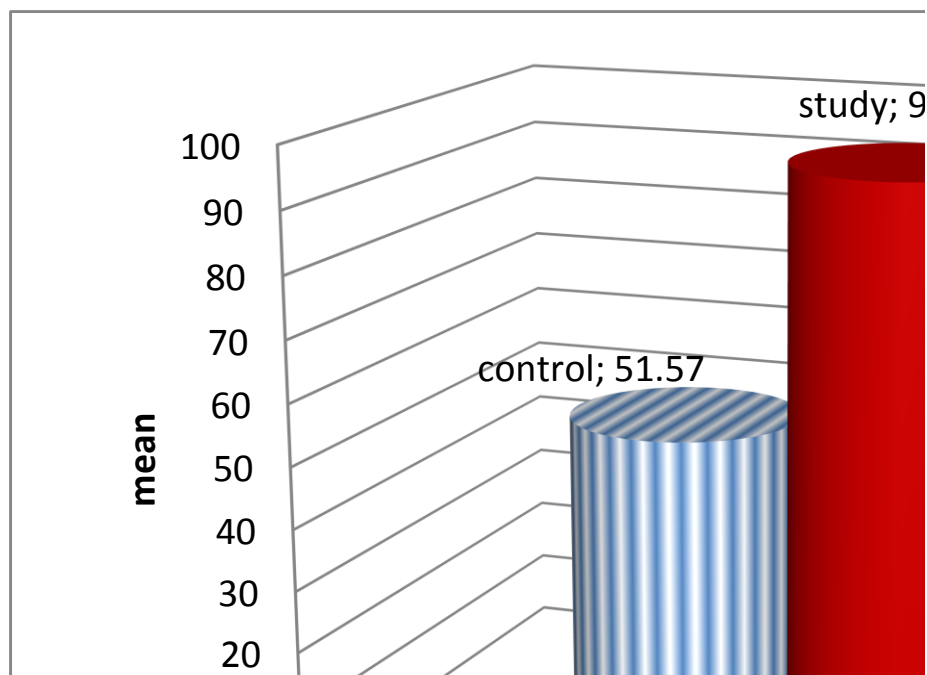
\*ALL; Acute lymphoblastic leukemia.

\*AML; Acute myeloid leukemia.

**Table (3): Factors affecting mean scores of fatigue during 48 hours from the beginning of chemotherapy administration in the study group.**

Item	Fatigue(0-100)	P-value
	Mean $\pm$ SD	
<b>Age</b>		
4 - < 8 yrs	97.30 $\pm$ 2.53	0.030*
8 - < 12 yrs	90.48 $\pm$ 13.76	
12 - 16 yrs	93.75 $\pm$ 9.02	
<b>Sex</b>		
Male	93.55 $\pm$ 9.92	0.111
Female	97.22 $\pm$ 2.40	
<b>Stage of disease</b>		
Induction	90.47 $\pm$ 13.75	0.077
Remission	96.21 $\pm$ 5.94	
Relapse	95.31 $\pm$ 5.20	

Statistical significant difference at  $P < 0.05$ , Kruskal-Wallis and Mann-Whitney tests.

**Figure (1): Comparison between total mean scores of children in control and study groups according to multidimensional fatigue scale from the beginning of chemotherapy and for 48 hours (score= 0- 100).**

**Table (1):** Shows that children in control and study groups are well matched regarding their demographic characteristics and no statistical significant difference were found regarding their age, sex, residence and family history of oncological diseases.

The mean age of children was  $8.07 \pm 3.76$  years for control group and  $8.24 \pm 3.88$  years for study group. More than half of children in both groups (57.6 % and 51.5 % respectively) were aged 4 :< 8 years. Males were prominent in both control and study groups accounting for 54.5 % and 63.6 % respectively and about two thirds in both groups were living in rural areas (69.7

% and 75.8 % respectively). As regards family history the results revealed that nearly about one third of children in control and study groups had positive family history of oncological diseases (33.3 % and 30.3% respectively).

**Table (2):** Shows that children in control and study groups are well matched regarding their clinical data and no statistical significant difference was found regarding their diagnosis, stage of disease, type of chemotherapy and side effects of chemotherapy ( $p= 0.922$ ).

As regard type of leukemia the majority of children had ALL (90.9 % in control group and 93.9 % in study group), while minority of children had AML (9.1 % and 6.1 % respectively). Most of children in control and study groups were in remission stage (84.8 % and 66.7 % respectively) followed by 9.1% and 21.2 % respectively in induction stage while only 6.1 % and 12.1% respectively were in relapse. Fatigue, nausea and vomiting were the main side effects of chemotherapy suffered by all children in this study (100%) followed by anorexia and alopecia (84.8 %) in both control and study groups. In control and study group, more than half of children were receiving Methotrexate and 45.5% and 63.6% respectively were receiving triple intrathecal chemotherapy (Methotrexate, Cytarabine and Hydrocortisone).

**Table (3):** Shows that statistically significant difference was found among different age groups, as regards fatigue mean scores, that was most prominent in 4:< 8 years age group ( $p= 0.030$ ) while no statistical significant differences were found between both sex and different stages of disease.

**Figure (1):** Shows that children in the study group significantly suffered from lower fatigue ( $p= 0.000$ ) than children in control group. Fatigue mean $\pm$  SD were  $51.57\pm 19.26$  in control group and  $94.88\pm 8.17$  in study group, higher degree means lower fatigue.

## Discussion

Symptoms during chemotherapy are no longer viewed as manifestations of the side effects of treatments but as subjective indicators of distress, which impact on a child's quality of life (Rajapakse, 2009) Unlike other cancer symptoms that may disappear when the treatment is completed, fatigue has a persistent and lasting effect on children and adolescents undergoing cancer treatment (Wu et al., 2010, Bastani et al., 2015) Massage promotes relaxation, reduces muscular tension, relieves pain, improves circulation, and increases flexibility (Mitchinson et al., 2014, Abrams et al., 2016).

It was observed that more than half of children in control and study group were 4 to < 8 years old. Mean $\pm$  SD of age was  $8.07\pm 3.76$  and  $8.24\pm 3.88$  in control and study children respectively. In both control and study groups more than half were males, also more than two thirds of children in control group and more than three quadrants of children in study group were living in rural areas.

In the present study, no statistical significant differences were found in diagnosis, stage of disease, family history of oncological disorders and side effects of chemotherapy between two groups.

It was observed that the majority of children in control and study groups had acute lymphoblastic leukemia

while minority of them had acute myeloid leukemia. The highest percent of children in control and study groups were in remission, 9.1% and 21.2 % respectively were in induction while 6.1 % and 12.1% respectively were relapsed.

Results of the present study are consistent with Syan et al., (2014) who studied 90 children with leukemia at South Egypt Cancer Institute and found that, more than two fifth of children were in the age group, the mean age was  $7.1\pm 3.5$  years, more than half of children were males and regarding residence more than two thirds of children were from rural area. The majority of children were diagnosed with ALL while the minority of them had AML, more than two thirds of children were in the first year of disease, while minority of them were from 2-3 years of the disease onset but in contrast with our study more than two fifth of children were in the induction phase of leukemia treatment.

In the present study more than two thirds of children in control and study groups had negative family history while about one third had positive family history of oncological diseases. This result is in contrast with Perrillat et al., (2001) who demonstrated that, among 279 children with acute leukemia 135 children (near half) had family history of oncological disorders. From the researcher point of view this result may be due to cancer genes runs in certain families.

In the present study all children in control and study groups were suffering from fatigue, nausea and vomiting and more than three quadrants were suffering from anorexia and alopecia.

These results were in the same line with those of Khalil et al., (2013) who evaluate nutritional status of 105 children suffering from cancer under chemotherapy, found that the majority were suffering from anorexia and vomiting, and about three quadrants were suffering from nausea. From the researcher point of view this result may be due to chemotherapeutic agents are designed to destroy rapidly dividing cancer cells and also affects rapidly dividing healthy cells e.g., gastrointestinal tract.

In the present study high statistical significant differences were found between control and study groups regarding fatigue mean scores from the beginning of chemotherapy and for 48 hours. Mean $\pm$  SD of fatigue were  $51.57\pm 19.26$  for control group and  $94.88\pm 8.17$  for study group (higher degree means lower fatigue). Also, statistically significant difference was found among different age groups, as regards fatigue mean scores, that was most prominent in 4:< 8 years age group ( $p= 0.030$ ).

From the researcher point of view, results of this study may be attributed to physiological effects of massage which can release endorphins and serotonin

(can positively affect mood), may also enhance autonomic nervous system activity causing an integrated effect at the hypothalamic level leading to a relaxation response. Massage reduced muscle tension and neurological excitability, and an increased sense of well-being. Also, young children enjoyed massage techniques and viewed it as very fun, relaxing and comfortable game.

These results were in the same line with **Salama et al., (2011)** who studied 60 cancer children aging 1-18 years in Egypt, stated that, children who receive therapeutic massage had significant decrease in fatigue intensity. **Haun et al., (2009)** found that massage therapy can decrease physical and psychological distress and positively affect quality of life in children with cancer and blood diseases. **Fernandez-Lao et al., (2012) & Listing et al., (2009)** stated that massage is an effective adjuvant treatment for reducing fatigue in patients with cancer. **Robison & Smith, (2016)** found that, therapeutic massage for 20 minutes to patients concurrently receiving chemotherapy and/or biotherapy provided a statistically significant reduction in fatigue. **Karagozoglul & Kahve, (2013)** who tested the efficacy of back massage on the process of acute fatigue developing due to chemotherapy in cancer patients and found that, the level of fatigue in the intervention group decreased statistically significantly on the next day after chemotherapy ( $p = 0.020$ ).

Results of this study are in contrast with **Post-White, (2006)** who studied 23 children treated for leukemia and lymphoma ages 1-18 years received one 20- to 45-minute massage, depending on age and tolerance and stated that fatigue was not significantly changed with massage and children reported that, massage helped them feel better. **Post-White, (2009)** in another study stated that, there were no differences in fatigue in children with cancer after receiving massage therapy for four weeks (only 17 children completed the study). **Bastani et al., (2015)** who studied 120 hospitalized school-aged children with ALL found that, significant differences were observed between acupressure group and control group in the intensity of fatigue one hour after intervention ( $P < 0.001$ ). But there was no significant difference between them regarding fatigue 24 hours after intervention. Also, **Jacobs et al., (2016)** who conducted pilot study of massage to improve sleep and fatigue in hospitalized adolescents with cancer in Washington ( $n = 35$ ) stated that no significant changes in fatigue from pre- to post intervention.

### Conclusion

The study concluded that children with leukemia who were receiving therapeutic massage were

experiencing less incidence and severity of fatigue than those who are receiving only routine hospital care.

### Recommendations

- Encourage health care professionals to use therapeutic massage techniques to reduce chemotherapy-induced fatigue children.
- Educational programs should be provided to increase knowledge and skills of health care professionals in applying therapeutic massage techniques to manage chemotherapy induced-fatigue in children.
- Further studies should be expanded to address research questions, such as whether other problems of cancer and cancer treatment could be controlled by therapeutic massage techniques.

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