



RESEARCH ARTICLE

EFFECT OF PROGRESSIVE MUSCLE RELAXATION TECHNIQUE VERSUS ACUPRESSURE ON CHEMOTHERAPY INDUCED NAUSEA AND VOMITING IN LEUKEMIC CHILDREN

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ABSTRACT

Chemotherapy is a cornerstone of therapy for most patients with leukaemia. It is often accompanied by a number of unwanted side effects, the most prevalent of which is nausea and vomiting. Despite use of antiemetics the incidence chemotherapy induced nausea and vomiting is greater than 50% even after antiemetic prophylaxis. Progressive Muscle Relaxation Technique (PMRT) and acupressure help to reduce the severity, frequency and duration of chemotherapy induced nausea and vomiting. This study aimed to compare the effect of progressive muscle relaxation technique versus acupressure on chemotherapy induced nausea and vomiting in leukemic children. The study sample comprised 90 children's of age 7-18 years, diagnosed as Acute Lymphoblast leukaemia (ALL), free from other chronic diseases. They were equally divided into three groups. The first study group who received progressive muscle relaxation technique, the second study group who received acupressure technique at P6, St 36 and Lv 3 acupoints and the third studied group received routine hospital care only (control group). Three tools were used to collect the required data: Medical assessment sheet, Rodes Index of Nausea and Vomiting Form 2 (INVR) and Behavioural relaxation self rating scale. The main yielded results indicated that the total anticipatory nausea and vomiting was experienced significantly less often in children performing the progressive muscle relaxation technique than in children within acupressure group and control group. While the mean value of total acute and delayed nausea and vomiting experience which occurred during the first day after chemotherapy administration were lower in children within acupressure group than in children in both progressive muscle relaxation technique group and control group. The study recommended that acupressure and progressive muscle relaxation technique must be included in the chemotherapy protocol of management of leukemic children.

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INTRODUCTION

Leukaemia is the most common form of cancer in children under age 15 years. It is defined as a group of malignant diseases in which genetic abnormalities of hematopoietic cells give rise to an unregulated clonal proliferation. It occurs more frequently in boys than in girls, the peak onset is between 2-6 years of age (Janelle *et al.*, 2008). Chemotherapy is usually used for treatment of all leukemic children to interrupt the cell cycle of proliferating malignant cells and minimizing the damage to the normal cells. It has several side effects such as anaemia, loss of appetite, bleeding, infection, constipation, hair

loss, fatigue, nausea and vomiting. (Dorothy and Barbara 2007) Chemotherapy induced nausea and vomiting is divided into: anticipatory, acute and delayed. Anticipatory nausea and vomiting is considered as a conditioned response linked to the repeated association of chemotherapy side effects with environmental stimuli that occur within one week prior to the actual administration of chemotherapy. While, acute nausea and vomiting occurring within 24 hours following chemotherapy and delayed nausea and vomiting that were beginning more than 24 hours after chemotherapy. The incidence and severity of chemotherapy induced nausea and vomiting vary according to the emetogenic potential of the drug, the dose, the schedule and the route of administration of the drug. (Tenore and Levene 2011). Since pharmacological treatments have completely failed to manage chemotherapy induced nausea and vomiting, exploring of complementary role

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of other non-pharmacological techniques that can be used in addition to pharmacological approaches becomes paramount. Moreover cancer treatments become more aggressive during the last 20 years, so the need for new complementary/alternative modalities (CAM) to manage nausea and vomiting has become apparent. Children respond well to various types of mind/body interventions of CAM as a relaxation technique. Such intervention is commonly used to treat nausea and vomiting particularly for anaesthesia. Progressive Muscle relaxation (PMR) as a type of cognitive behavioural therapy in mind body medicine domains in CAM can effectively control anticipatory nausea and vomiting in adult and pediatric patients undergoing cancer chemotherapy as mentioned by Mundy *et al.* (2003). Progressive Muscle Relaxation Technique (PMRT) was defined as a technique of alternately tensing and relaxing muscle groups throughout the body to become aware of tension and contrast between muscle tension and relaxation. This tensing and relaxing various muscle groups throughout the body produce a deep state of relaxation. The physiological mechanisms that are triggered by inducing the relaxation response are: reduced oxygen consumption, reduced respiratory rate, reduced heart rate, reduced muscles tension (Rosemary 1995; Koreen and Lawrence 2011).

Also, acupressure is one of the other Complementary/Alternative Modalities. It is a way of accessing and releasing blocked or congested energy centers in the body. According to Chinese philosophy, chi (vital energy) is circulating within the human body. The pathways of running chi are called the meridians along the meridians there are acupoints, which are controlling points for chi energy flow. If the energy flow in the meridians is slowed, blocked, it can be rebalanced or re-stimulated by acupressure (Barrie and Marjet 2008). The most common two acupoints known for relieving nausea and vomiting are P6 and ST36. While the third point that was choice in this study is LV3 which helping the patient to relax, maintain a general sense of calm, even in tense situations and digestive issues as nausea, vomiting, constipation, diarrhea and indigestion. Some studies of acupressure have suggested that pressure on P6 points may an effective method to reduce chemotherapy induced nausea and vomiting (CINV) in women undergoing chemotherapy (Rakel and Faass 2006). The nurses play significant role in management of child with leukaemia and their families. The focus of nursing management is on the long term as well as the immediate needs of the children and their families. In addition, nursing interventions are directly related to the regimen of therapy (chemotherapy) and its side effects, so there are some strategies to prevent or manage complications of the disease and its treatment such as

- 1) providing patient and family education,
- 2) providing emotional support,
- 3) actively monitoring and assessing. Nurses are acts as care providers, teachers and consultants, for the children and their family during chemotherapy sessions. The development of new technology in diagnosis and treatment of leukaemia make the nurse in a position to be knowledgeable about teaching the children and their families about these new technologies for treatment of chemotherapy side effect as progressive muscle relaxation technique, and acupressure (Suh 2012).

Aim of the Study

The study aims to compare the effect of progressive muscle relaxation technique (PMRT) versus acupressure on chemotherapy induced nausea and vomiting in leukemic children.

MATERIALS

Design

Quasi experimental design was used in the present study.

Setting

The study was conducted in the Pediatric Department, Hematology/ Oncology Unit of Tanta University Hospitals.

Subjects

A convenient sample of 90 children, aged between 7-18 years, of both sexes, diagnosed as Acute Lymphoblast leukaemia (ALL), free from other chronic diseases were included. Received moderately emetogenic chemotherapy drugs (doxorubicin, cyclophosphamide, cytarabine and methotrexate) and they were included at least two weeks after 1st chemotherapy session.

Tools: Three tools were used to collect the necessary data.

Tool one: Medical assessment sheet: this tool consists of two parts:

Part I: Included the demographic data about the children and their mothers.

Part II: Medical information which include: chemotherapy name, dose, rout and the schedule of administration, antiemetic ordered for use, the chemotherapy side effects, child weight and children reactions during chemotherapy session.

Tool II: Rhodes Index of Nausea and Vomiting Form (2) (Rhodes and Mc denial 1999)

This is an eight-item five-point Likert-type self-report pencil and paper instrument measuring the patient's perceived nausea, vomiting and retching experience, occurrence and distress.

Tool III: Behavioral Relaxation Self Rating Scale

This tool was developed by Poppen 1988 (Norton and Holm 1997) . It is a self-report instrument, completed immediately before and after each relaxation session. It consists of seven numbered descriptive phrases signifying the different degrees of relaxation and tension.

Pilot study

A pilot study was carried out on 10% of children to verify the applicability and feasibility of the developed tool.

METHODS

- An official permission was obtained from Pediatric Hematology and Oncology Unit for carrying out the study through official letters from Faculty of Nursing explaining the purpose of the study.
- The researcher has undergone a special training for about performing acupressure and progressive muscles relaxation technique for three months under the supervision of a specialist trainer in the field who has one of the supervisors of the thesis.
- Data for this study was conducted in fifteen months from September 2012 to November 2013 and by means of children who met the predetermined collection criteria.
- Children and their mother's oral consents were obtained. Every child and their parents were informed that confidentiality will be assured.
- Each child and his/her mother was interviewed individually and collected required information about socio-demographic data and medical data was collected from medical record (Tool I).
- Frequency, occurrence and intensity of the nausea, vomiting and retching were estimated by Rodes Index of Nausea and Vomiting Form 2 (INVR). Children were instructed to draw around the sentence in each row what most clearly corresponds to their experience (Tool II).
- Tool III (Behavioural relaxation self rating scale) was explained by the researcher to the subjects of the study and was scaled for young children by the researcher.
- The children response to progressive muscle relaxation was assessed by (Tool III) before and after each relaxation session.

For progressive muscle relaxation technique group

- The researcher was explaining progressive muscle relaxation technique. Its effects, purposes, steps, frequency and duration of the technique (it lasted from 15-30 minutes).
- The children asked to lay on the bed and close his/her eyes and keep the eyes closed until the end of the technique and take three deep breaths for 10 seconds before the steps of the technique were started.
- The children were trained by the researcher on how the technique performed.
- The muscles in the body were divided into six groups, the first one was the muscles of the head and neck, the second was the two arms' muscles, the third was the muscles of the abdomen, the fourth was the muscles of the back, the fifth was the muscles of the right leg and finally the last group was the muscles of the left leg.
- The first step of the technique was to tense the muscles of the first group for 5-7 seconds and then relaxed for 20-30 seconds, then moving to the second group just like the first one and so on gradually until the last group.

For acupressure technique group

- The researcher gave simple information about the acupressure (definition, benefits, frequency, duration and the location of three acupoints P6, lv3 and St36).

- The researcher was apply acupressure firstly on (P6) acupoint, that located bilaterally on the pericardial meridian on the anterior surface of the forearm, approximately three fingers widths up from the first crease and between the tendons of the flexor carpi radialis and palmaris longus.
- The second point was St 36 that was located four finger widths below the kneecap on the outside, in the depression between the shin bone and the leg muscle.
- The third acupoint was Lv 3 which located on the dorsum of the foot, on the first interosseous space of the metatarsus in a depression distal to the intermetatarsal joint between the first and second metatarsal bones.
- Pressure was applied gently, press about 1cm deep and applied for 3-5 min/ 3 times/ day before meals for 7days before administration of chemotherapy, the day of administration and 2 days after administration of chemotherapy (30 sessions).

Analysis of data

The collected data were organized, tabulated and statistically analyzed using SPSS version 19.

RESULTS

Table (1) illustrated the socio-demographic characteristics of the studied groups children. It was found that children age ranged from 7-13 years. The studied children had a mean age of 9.30, 8.43 and 9.63 years for children who were trained to perform progressive muscles relaxation technique (PMRT group), acupressure group and the control group respectively. The highest percentages of PMRT group, acupressure group and control were males (60%, 73.7% and 80%) respectively. As regards to residence, it was noticed that slightly more than half (53.3%) and nearly two thirds (60%) of the children in PMRT group and control group respectively lived in rural areas while, only (20%) of the children among acupressure group lived in urban areas.

Table (2) showed the distribution of the studied groups children according to clinical data. It was found that about two thirds of children (66.8%) of PMRT group and (60%) of acupressure group were admitted once or twice to the hospital compared to one third of children (33.3%) in control group were admitted three to four times to the hospital. As regards children's weight, it was observed that forty percent of the children within PMRT group and 46.7% of acupressure group were underweight compared to 73.4% of children in control group. While, forty percent for each of the first and second groups of children were overweight compared to only 13.3% of children in the control group. In relation to the previous experience of motion sickness, two thirds of the studied children (66.7), one third (33.3%) and more than half of the children (53.3%) among the PMRT group, acupressure group and control group had a history of previous experience of motion sickness. The difference was statistically significant among the three groups where ($P= 0.034$). These percentages were illustrated in Figure (1).

Table 1. Socio-Demographic Characteristics of Studied Groups Children

Variables	PMRT Group		Acupressure group		Control group		X ²	P
	N	%	N	%	N	%		
Age in years:							MCET	0.022*
7	12	40.0	14	46.7	10	33.3		
8-9	6	20.0	10	33.3	8	26.7		
10-11	6	20.0	6	20.0	2	6.7		
12-13	6	20.0	0	0.0	10	33.3		
Mean±SD	9.30±1.97		8.43±1.14		9.63±2.19			
Gender:							3.029	0.220
Male	18	60.0	22	73.7	24	80.0		
Female	12	40.0	8	26.7	6	20.0		
Residence:							5.043	0.080
Rural	16	53.3	24	80.0	18	60.0		
Urban	14	46.7	6	20.0	12	40.0		
Education:							MCET	0.033*
Primary	24	80.0	30	100.0	26	86.7		
Preparatory	6	20.0	0	0.0	4	13.3		
Number of siblings:							18.429	0.001*
1	8	26.7	22	73.3	12	40.0		
2	14	46.7	4	13.3	6	20.0		
3+	8	26.7	4	13.3	12	40.0		
Birth order:							MCET	0.022*
First	6	20.0	10	33.3	4	13.3		
Second	22	73.3	16	53.3	24	80.0		
Third	0	0.0	4	13.3	0	0.0		
Fourth	2	6.7	0	0.0	2	6.7		
Family size:							MCET	0.011*
3	0	0.0	2	6.7	0	0.0		
4	8	26.7	18	60.0	12	40.0		
5+	22	73.3	10	33.3	18	60.0		

PMRT group: progressive muscle relaxation technique *Significant

Table 2. Distribution of Studied Groups Children According to Clinical Data

Clinical data	PMRT group		Acupressure group		Control group		X ²	P
	N	%	N	%	N	%		
Hospital admissions:							MCET	0.078
1-2	20	66.8	18	60.0	8	26.7		
3-4	4	13.3	6	20.0	10	33.3		
4-5	2	2.6	4	13.3	6	20.0		
6+	4	13.3	2	6.7	6	20.0		
Children's weight							MCET	0.089
Underweight	12	40.0	14	46.7	22	73.4		
Normal	6	20.0	4	13.3	4	13.3		
Overweight	12	40.0	12	40.0	4	13.3		
Age at illness:							MCET	0.022*
6-	16	53.3	18	60.0	16	53.3		
8-	2	2.6	8	26.7	2	6.7		
10-	6	20.0	4	13.3	4	13.3		
12-	6	20.0	0	0.0	8	26.7		
Previous experience of motion sickness	20	66.7	10	33.3	16	53.3	6.759	0.034*

PMRT group: progressive muscle relaxation technique *Significant

Table 3. Distribution of Studied Groups Children by Rhodes Index for Nausea Subscale compared to Control group

Rhodes index for nausea	Rhodes index Mean±SD			F	P
	PMRT Group	Acupressure group	Control Group		
Total anti-nausea experience	0.73±1.26	1.60±1.92	3.00±2.92	8.513	0.001*
•Anti-nausea duration	0.33±0.61	0.60±0.72	1.00±0.91	5.893	0.004#
•Anti-nausea frequency	0.27±0.45	0.47±0.51	1.00±0.91	10.046	0.001*
•Anti-nausea distress	0.13±0.35	0.53±0.82	0.93±1.20	6.444	0.002#
Total acute nausea experience	6.20±2.01	5.67±1.85	7.47±2.67	5.275	0.007**
•Acute nausea duration	2.27±0.69	1.87±0.63	2.47±0.82	5.438	0.006**
•Acute nausea frequency	2.13±0.63	1.93±0.69	2.60±1.16	6.294	0.003**
•Acute nausea distress	1.8±1.00	1.87±0.90	2.40±1.16	3.086	0.051
Total delayed 1 st day nausea experience	4.33±2.45	2.40±2.43	5.87±2.37	15.464	0.001##
•Delayed 1 st day nausea duration	1.67±0.96	0.8±0.76	2.00±0.74	16.841	0.001##
•Delayed 1 st day nausea frequency	1.60±0.97	0.73±0.69	1.93±0.78	16.993	0.001##
•Delayed 1 st day nausea distress	1.07±0.79	0.80±1.00	1.93±1.08	11.379	0.001*
Total delayed 2 nd day nausea experience	0.53±1.43	0.40±1.04	1.40±1.73	4.326	0.016**
•Delayed 2 nd day nausea duration	0.13±0.35	0.13±0.35	0.53±0.63	7.565	0.001*
•Delayed 2 nd day nausea frequency	0.27±0.79	0.13±0.35	0.53±0.63	3.301	0.042**
•Delayed 2 nd day nausea distress	0.13±0.35	0.13±0.35	0.33±0.71	1.611	0.206

PMRT group: progressive muscle relaxation technique Scheffé test: *PMRT group and acupressure group significantly different from control group.

** Acupressure group significantly different from control group. # PMRT group significantly different from control group.

Acupressure group significantly different from PMRT group and control.

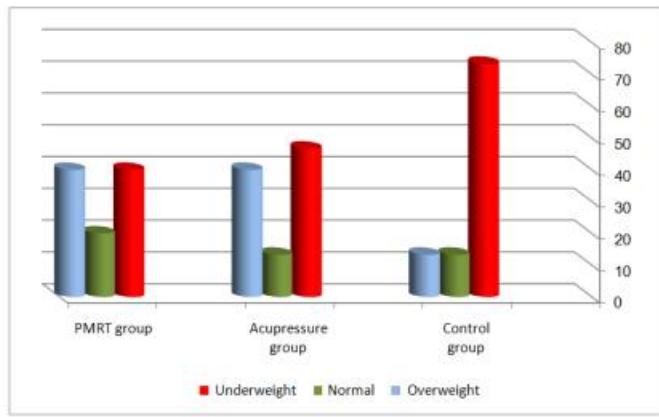


Figure 1. Distribution of the studied children according to their weight

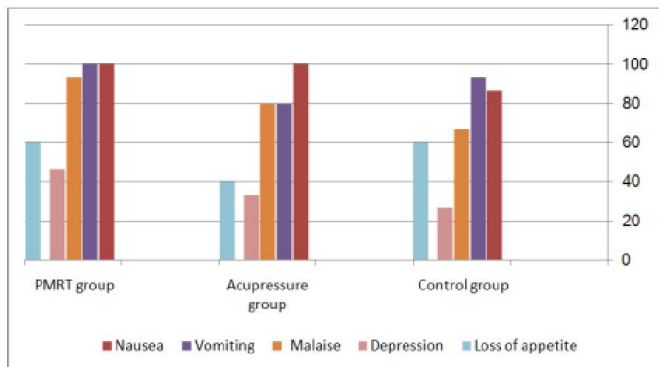


Figure 2. Distribution of Studied Children by Side Effects of Chemotherapy

Figure (2) showed the distribution of studied groups children by side effects of chemotherapy compared to control group children. It revealed that less than two thirds of the children (60%) in both PMRT group and control group suffered from pain compared to 40% in acupressure group. The same figure showed that all the children among PMRT group and acupressure group suffering from nausea compared to (86.7%) in the control group. The difference was statistically significant among the three groups ($P= 0.033$). All children (100%) of the PMRT group and the majority of children (80% and 93.3%) in the acupressure and control groups; respectively, were suffering from vomiting. The difference was statistically significant among the three groups where ($P= 0.011$). Nearly two thirds of the studied children (60%) within PMRT group and control group suffered from loss of appetite compared to forty percent in acupressure group.

Figure (3) presented the mean differences of the total nausea and vomiting scores between the studied children among the three groups measured by (Rhodes Index Scale). It was observed that total anticipatory nausea and vomiting was experienced significantly less often in children performing the progressive muscle relaxation technique than in children within acupressure group and control where ($F=9.123, P =0.001$) with a mean value ($0.87+1.28, 2.07+3.36$ and $3.39+4.04$) in the PMRT group, acupressure group and control group respectively. By applying acupressure technique on the children in the second group, it was found that the mean value

of total acute nausea and vomiting was lower than in children in PMRT group and control group. That meant a statistical significant difference among acupressure group and both PMRT group and control group where ($F=11.337, P =0.001$). Regarding delayed nausea and vomiting which occurred during the first day after chemotherapy administration, it was noticed that both PMRT group and acupressure group had a less mean value ($6.20+4.49, 4.40+5.47$) respectively compared to ($10.73+4.21$) in control group. A statistically significant difference was found between the two studied groups and control group.

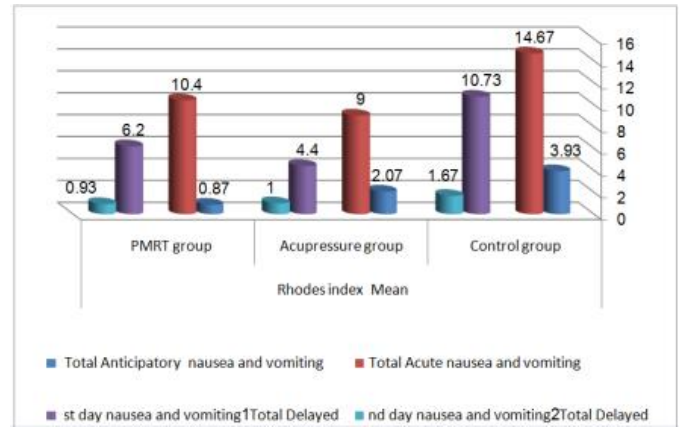


Figure 3. The Mean Differences of the Total Nausea and Vomiting Scores between the Studied Children among the Three Groups Measured by (Rhodes Index Scale)

Table (3) demonstrated the distribution of the studied groups children by Rhodes Index for nausea subscale compared to control group. It was observed that a total anticipatory nausea experience and duration were significantly less often in both PMRT group and acupressure group compared to the control group where ($F =8.513, P =0.001$) and ($F =5.893, P =0.004$) respectively. The most prominent reduction was shown in children within PMRT group compared to those in acupressure group and control group ($1.60+1.92$ and $3.00+2.92$) respectively.

Table 3 also revealed that acute nausea duration and frequency was less experienced in children among acupressure group than children in control group. In addition, children within acupressure group had a less mean value ($2.40+2.43$) of delayed nausea experience which occurred during the first day after chemotherapy administration compared to ($4.33+2.45, 5.87+2.37$) in PMRT group and control group respectively. That meant acupressure group was significantly different from PMRT group and control group ($F =15.464, P =0.001$). In relation to the duration of delayed nausea which occurred during the first day after chemotherapy administration, it was found that acupressure group had a statistical significant decrease in mean value of duration ($0.8+0.76$) compared to ($1.67+0.96$ and $2.00+0.74$) in PMRT group and control group respectively where ($F=16.841, P=0.001$).

Table (4) demonstrated the distribution of the studied children by Rhodes index for vomiting and retching subscales among the three groups. It was found that no one experienced anticipatory vomiting in both PMRT group and acupressure

Table 4. Distribution of Studied Children by Rhodes Index for Vomiting and Retching Subscales Among the Three groups

Rhodes index for vomiting	Rhodes index Mean±SD			F	P
	PMRT Group	Acupressure group	Control Group		
Anticipatory vomiting experience	0.00+0.00	0.00+0.00	0.47+1.22	4.359	0.016*
•Anti-vomiting amount	0.00+0.00	0.00+0.00	0.20+0.55	3.955	0.023*
•Anti-vomiting frequency	0.00+0.00	0.00+0.00	0.13+0.35	4.462	0.014*
•Anti-vomiting distress	0.00+0.00	0.00+0.00	0.13+0.35	4.462	0.014*
Acute vomiting experience	3.67+3.17	2.60+2.82	6.33+3.14	11.937	0.001*
•Acute vomiting amount	1.27+1.14	0.87+0.97	2.33+1.32	12.933	0.001*
•Acute vomiting frequency	1.07+1.08	0.60+0.62	1.40+0.89	6.174	0.003**
•Acute vomiting distress	1.33+1.16	1.13+1.38	2.47+1.22	9.807	0.001*
Delayed 1 st day vomiting experience	1.33+2.37	1.20+2.20	4.07+2.79	12.908	0.001*
•Delayed 1 st day vomiting amount	0.40+0.72	0.40+0.72	1.40+1.16	12.500	0.001*
•Delayed 1 st day vomiting frequency	0.33+0.61	0.27+0.45	0.87+0.63	10.081	0.001*
•Delayed 1 st day vomiting distress	0.60+1.10	0.53+1.11	1.80+1.30	11.102	0.001*
Delayed 2 nd day vomiting experience	0.40+1.04	0.20+0.76	0.20+0.76	0.537	0.585
•Delayed 2 nd day vomiting amount	0.13+0.35	0.27+0.79	0.07+0.25	1.167	0.316
•Delayed 2 nd day vomiting frequency	0.13+0.35	0.07+0.25	0.07+0.25	0.537	0.585
•Delayed 2 nd day vomiting distress	0.13+0.35	0.07+0.25	0.07+0.25	0.537	0.586
Total anti-retching experience	0.13+0.51	0.13+0.51	0.53+1.22	2.384	0.098
Total acute retching experience	0.73+1.55	1.40+1.65	1.20+1.83	1.242	0.294
Total delayed retching experience	0.40+1.04	0.27+1.02	0.87+1.28	2.387	0.098

PMRT group: progressive muscle relaxation technique Scheffe test:
 *PMRT group and acupressure group significantly different from control group.
 ** Acupressure group significantly different from PMRT group.

while in control group the total anticipatory vomiting experience mean was (0.47+1.22).The frequency of acute vomiting in acupressure group's children was significantly decreased among children in acupressure group compared to PMRT group and control group where (F =6.174, P =0.003). While children in PMRT groups and acupressure group significantly experienced a less frequent delayed vomiting that occurred during the first day after chemotherapy administration compared to control group where (F= 10.081, P= 0.001).

Table (5) showed a comparison of the relaxation state of the studied children before and after progressive muscles relaxation session. It was observed that before the relaxation session, (80%, 60%) of children felt generally tension throughout their bodies. Then the percentage was reduced to (53.3%, 46.7%) after performing progressive muscle relaxation technique among the studied children within the first two days of intervention respectively. A statistically significant difference was found before and after the intervention where (z = 2.828, p =0.005). The difference was statistically significant before and after the relaxation sessions from third and fourth days where (z =3.464, p=0.001) and (z=2.828, p =0.005) respectively. The same results were observed during the fifth, sixth and seventh days of intervention where (z = 3.162, p =0.002), (z =3.464, p=0.001) and (z=2.078, p = 0.038) respectively. On the other hand, there was no statistical significant difference before and after the relaxation sessions at the eighth day.

DISCUSSION

The present study revealed that the age of the studied children ranged from 7-13 years. This finding was in agreement with (Ruth et al., 2008) who mentioned that leukemia was among the most commonly diagnosed pediatric malignancies in children under 14 years. Also, the findings of this study showed that the majority of the studied children were boys. This result is supported by another study carried out by (Hussien and Abd El-Sadek 2010). The result of the present

study revealed that the majority of the studied children suffered from nausea as side effects of chemotherapy at initial assessment of leukemic children. This could be attributed to theory postulating that chemotherapy passes through the bloodstream into the gastro-intestinal tract, where it damages enterochromaffin cells and induces nausea. This is in the same line with (Valerie 2009) who mentioned that chemotherapeutic agents have an indirect effect secondary to drug induced gastrointestinal inflammation and damage causing nausea and vomiting. Also, Anorexia is directly related to nausea and vomiting caused by chemotherapy. This was reported in the current study where the highest percentage of children had loss of appetite. This is in the same line with (Tong et al., 2009) who reported that symptoms such as dry mouth, lack of appetite, and constipation are present in more than 50% of cancer population. In addition, the finding from a study done by (Allam et al., 2013) matched with the result of the present study as they observed that the highest percentage of their patients reported a loss of appetite at the initial contact and after three months.

The European Cancer Anaemia Survey (ECAS), a study conducted across 24 nations in Europe, reported that about most of patients who received chemotherapy demonstrated anemia. This was observed in the current study where a majority of the studied children suffered from anemia. This result was supported by (George et al., 2012) who reported that anemia is prevalent in 30% to 90% of patients with cancer. The finding of the present study revealed that forty percent of the children within the PMRT group and 46.7% in acupressure group and about three quarters of the children in control group were underweight. This result was supported by another study carried out by (Youssef 2002) who observed that more than half of the leukemic children within her study had weight loss after three and six months of the treatment. This also agrees with (Allam et al., 2013). The present study revealed that the occurrence of anticipatory nausea and vomiting was 60%. This result contradicted with (Cheryl et al., 2012) who reported that 30% of children experienced anticipatory CINV. While the

incidence of delayed CINV in this study was 70%. This result was in agreement with Cheryl *et al.*, 2012 and other studies carried out by (Liau *et al.*, 2005) as they documented that the incidence of delayed post chemotherapy nausea and vomiting is greater than 50% even after antiemetic prophylaxis. In the current study, acupressure was shown to reduce the frequency of acute CINV. This result was supported by (Abd El- Moneem 2010) who reported in his study that acupressure (P6) proved its effectiveness in decreasing frequency of chemotherapy – induced nausea and vomiting. In the same line, (Lee *et al.*, 2010) mentioned that nausea and vomiting occurrence were all significant lower in the experimental group who applied acupressure technique compared to the control group.

The present study illustrated that acupressure was shown to decrease the duration of CINV. This result was supported by (Yeong *et al.*, 2004) who reported that finger acupressure applied to p6 was effective in decreasing the duration of nausea. Also, the finding from the study done by (Taspinar *et al.*, 2010) matched with the result of the present study as they reported that acupressure was effective in reducing chemotherapy related to nausea and may decrease the antiemetic use after chemotherapy. By applying acupressure technique on the three selected acupoints which they are (P6, St 36 and Lv3) points on the studied children within the acupressure group, the mean value of total acute nausea and vomiting was lower in children within acupressure group than in control group. This result matched with what was concluded by (Yeh *et al.*, 2012) as they reported a significantly lower occurrence and severity of nausea and vomiting in patients of acupressure group than in patients of control group. However, the result presented by the study differed from the study results obtained by (Dibble *et al.*, 2007) which found that digitally applied acupressure was effective in controlling delayed N&V, but not in controlling acute.

Moreover, there are contradictory findings of the effect of acupressure on reduction of nausea and vomiting among cancer patients. For example, (Wulffa *et al.*, 2009) reported that no significant benefit was detected for children receiving acupressure in their study. In addition, (Jones *et al.*, 2008) reported that there was no significant difference in nausea or vomiting between pediatric oncology patients receiving acupressure and control one. Regarding delayed nausea and vomiting, it was noticed that a statistically significant difference was found between acupressure group and control. This result was supported by (Roscoe *et al.*, 2006) who noted a significant decline of delayed nausea and vomiting in acupressure group. In the current study, it was observed that total anticipatory nausea and vomiting were experienced significantly less often in children performing the progressive muscle relaxation technique than in children within acupressure group and control group. This could be attributed to the fact that PMRT help reduce the distress of chemotherapy and prevent or considerably delay the onset of classical conditioned responses which play an important role in developing anticipatory nausea and vomiting. This result was supported by (Yoo *et al.*, 2005) who found that the PMRT (progressive muscle relaxation technique) and GI (guided imagery) group experienced significantly less ANV (anticipatory nausea and vomiting) and PNV(post-

chemotherapy nausea and vomiting) than that of the control group. Furthermore, in relieving ANV behavioral interventions; especially, progressive muscle relaxation training and systematic desensitization, should be considered important methods for preventing and treating ANV as reported by (Figueroa *et al.*, 2007). In the current study, the children performing progressive muscle relaxation their muscles condition changed from feeling generally tension throughout their bodies before the relaxation session to feel more relaxed than usual after the session of the tenth day of intervention. In this aspect (Campos *et al.*, 2007) indicated that progressive muscle relaxation lead to statistically significant changes in muscle conditions and in nausea and vomiting levels.

This study revealed that there was no statistical significant reduction in total experience of delayed nausea and vomiting in children within PMRT group. This finding was supported by (Molassiotis, *et al.*, 2006) as their results did not show a significant reduction in the intensity of nausea and vomiting after chemotherapy (delayed nausea and vomiting). But this result contradicts with what was concluded by (Karen *et al.*, 2011) who indicated that PMR combined with guided imagery reduces the incidence of nausea and vomiting in the first four days after chemotherapy and the severity of nausea and vomiting up to five days following chemotherapy. With respect to teaching children how to perform progressive muscle relaxation technique, the result of the present study matched with (Williams *et al.*, 2001) who stated that children respond well to various mind body techniques of CAM including distraction, breathing exercise and relaxation technique. Progressive muscle relaxation is safe, inexpensive intervention that can reduce pediatric chemotherapy side effects and help with anxiety and depression. Concerning relation between the severity of nausea and vomiting and motion sickness, the present study revealed that there was no statistical significant relation between the severity of anticipatory, acute and delayed nausea and vomiting which occurred within the second day after chemotherapy administration and motion sickness among the children in two experimentally groups. On contrary, (Morrow 1984) concluded that a significant relationship between a susceptibility to motion sickness and anticipatory nausea and vomiting in cancer patients undergoing chemotherapy was found.

Findings from the present study confirmed a significant relation between the severity of acute nausea and vomiting and age of children. It meant that younger children had reached a severe level of acute nausea and vomiting compared to the older children in the same group. This result was supported by (Helin *et al.*, 2007) as they reported that a younger age was being associated with more nausea and retching experience than older one in their study. The current study revealed a highly statistical significant relation between the gender and severity of acute and delayed nausea and vomiting. It meant that girls had severe acute nausea and vomiting compared boys. This result matched with what was reported by (Lebaron *et al.*, 2008) as they found in their study that female children suffered feelings of nausea and attacks of vomiting more than male children. On the other hand, this is disagreed with (Hussien and Abd El-Sadek 2010) as they found that there was no

relationship between sex and frequency of nausea and vomiting.

Conclusion

The current study concluded that finger acupressure on the three acupoints (P6, St36 and Lv3) alongside antiemetics medications showed effectiveness lowering total acute and delayed nausea and vomiting experience which occurred during the first day after chemotherapy administration. While the progressive muscle relaxation technique effectively lower anticipatory nausea and vomiting experience.

Recommendations

- 1- Acupressure and progressive muscle relaxation technique are easy to be applied, so it is recommended that nurses and physicians should be aware of this technique and teach it to children and their parents to control nausea and vomiting.
- 2- Acupressure on (P6, St36 and Lv 3) and progressive muscle relaxation technique must be included in the chemotherapy protocol of management of leukemic children.
- 3- PMRT should be performed immediately or just before the first cycle of chemotherapy to prevent development of classical conditioning.

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