

# Efficacy of Ezio Foot Massage Intervention to Reduce the Impact of Chemotherapy Adverse Effects among Children with Hematological and Solid Tumors at AIMS, Kochi, Kerala

## Abstract

FM has been practised for thousands of years in different parts of the world, including Egypt, India and China.

**Objectives:** To identify the level of nausea, vomiting, insomnia, fatigue among the control and experimental group children before chemotherapy administration. 2,3,4,5 are to assess the efficacy of EFM in reducing the CINV, Insomnia, and Fatigue among children with haematological and solid tumours respectively.

**Materials & methods:** The tool consists of 3 sections. I Demographic profile, II Clinical profile, III Modified (NCICTC) version 3.0 was used to explore the AE of chemotherapy and its severity. Sampling technique adopted cluster randomization, the size 140 children the first 70 were selected for the control group and the next 70 were allotted for the experimental group. The Factorial research design was used [2 X 4 X 10 (2 X 5)] with repeated measures for the last variable.

**Results:** The non-significant PCL- AE assessment between the control and experimental groups shows that both groups were more or less similar and comparable. The significant 'P' value of the highest order of interaction effect between Assessment, Drug and Group confirms that children in the experimental group who received FM the AE of nausea (P=0.016), vomiting (P=.001), Insomnia (P=0.000) and fatigue (P=0.000)

**Conclusion:** The EFM, significantly, reduces the chemotherapy AE such as nausea, vomiting, insomnia and fatigue.

**Keywords:** Adverse Effects (AE) Complementary and Alternative Medicine (CAM) Chemotherapy Induced Nausea and Vomiting, (CINV) Cancer Related Fatigue (CRF) Ezio Foot Massage (EFM) Foot Massage (FM) National Cancer Institute of Common Toxicity Criteria (NCICTC) PCL- Pre Chemotherapy Assessment

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## Introduction

Chemotherapy has played an important role in improving the patient outcomes in oncology and it remains the cornerstone of the therapy for most patients with cancer. Among the patients receiving chemotherapy, 64.4 % have one or more episodes of CINV. Sleep problems among children who suffer from cancer can be mediated by the direct effects of cancer; or the indirect effect of chemotherapy (Rosen, 2007). Sleep-wake disturbances are prevalent among approximately 30%-75% of patients with cancer.<sup>1</sup> CRF is described as a near universal experience of the 70% individuals who undergo cancer treatment.<sup>2</sup> for patients receiving chemotherapy, the prevalence of fatigue is 75% to 90%.<sup>3</sup> Symptom management is a key component of oncology nurses' scope for practice. Each nurse has the opportunity to impact the quality of life of her patients by being familiar with current literature that supports specific practices.<sup>7</sup> Recent surveys have demonstrated that 31 to 84% of pediatric oncology patients worldwide use some type of CAM. FM has been practiced for thousands of years in different parts of the world, including Egypt, India and China.<sup>9</sup> FM offers a wide range of potential benefits to the nurses practicing in all health sectors. The EFM includes the following six steps: namely stroking, circular motion, rotation, kneading, rolling and squeezing, sliding.<sup>4</sup>

**Objectives:** 1. To identify the level of nausea, vomiting, insomnia, fatigue among the control and experimental group children with hematological and solid tumors before the chemotherapy

administration. Objectives 2,3,4,5 are to assess the efficacy of EFM in reducing the CINV, Insomnia, and Fatigue among children with hematological and solid tumors respectively.<sup>10</sup>

**Materials & Methods:** In this study, the tool consists of 3 sections. Section I: Demographic profile, section II: Clinical profile, section III: Modified (NCICTC) version 3.0 was used to identify the common AE of chemotherapy and its severity. The researcher had selected 4 AE related to chemotherapy namely, nausea, vomiting, insomnia and fatigue. The AE were measured in 5 grades for all four variables. The reliability of the tool was established by using the inter-rater (interobserver) method. Sampling technique and sampling size- used cluster randomization, the first 70 children were selected and allotted for the control group and the next 70 children were allotted for the experimental group. The Factorial research design was used [2 X 4 X 10 (2 X 5)] with repeated measures for the last variable. In the study, totally 3 variables were manipulated such as group, drug and time of assessment. The numbers in the factorial design indicate the following: 2 refers to independent variable "Group" which consists of two levels (Experimental and control groups). 4 refers to the other independent variable "Drug" with four levels (four drugs – Drug 1 Carboplatin, Drug 2 Cyclophosphamide (moderate risk), Drug 3 Cisplatin, Drug 4 Cyclophosphamide (high risk)) 10 refers to the dependent variable "Assessment" (10 chemotherapy AE assessment for nausea, vomiting, insomnia and fatigue) Since EFM has been repeated 3 times in a day for 5 days, the variable "assessment" is called as repeated measure, which consists of 10 levels (2 assessments / day with the total of 10 assessments).

## Results and Discussion

The (Table 1) depicting the findings related to PCL of Nausea, Vomiting, Insomnia and Fatigue among control and experimental group are;

PCL of Nausea: In the control group 42(60%) children had mild grade and 27(38.6%) had moderate grade. In the experimental group 40(57%) children had experienced mild grade and 26(37%) had moderate grade before the chemotherapy administration

PCL of Vomiting: In the control group 34(48.6%) children had mild grade episodes and 25(35.7%) had moderate grade episodes. In the experimental group 35(50%) children had mild grade, 26(37%) had moderate grade episodes before the chemotherapy administration

PCL of Insomnia: In control group 21(30%) children had mild grade. In the experimental group 16(22.9%) children had mild grade and 2(2.9%) had moderate grade

PCL of Fatigue: In the control group 45(64.3%) children had experienced mild grade. In the experimental group 36(51.4%) children had experienced mild grade before chemotherapy administration. Demographic variables revealed that age and gender distribution among control and experimental group's children were almost equal. Clinical variables among the control and experimental groups showing the subjects with the same diagnosis were distributed in both groups. Regarding chemotherapy drugs administered on both control and experimental were similar. The non-significant pre-chemotherapy AE assessment between the control and experimental groups shows that both groups were more or less similar and comparable.

**Table 1** Mean Level of Pre Chemotherapy Adverse Effects among Children in Control and Experimental Groups

Variable	Control group (n=70)		Experimental group (n=70)		't' value	'P' value
	Mean	SD	Mean	SD		
Nausea	1.37	0.52	1.31	0.59	0.617	0.538(NS)
Vomiting	1.2	0.69	1.24	0.67	0.372	0.71(NS)
Insomnia	3	0.46	2.86	0.52	1.36	0.863(NS)
Fatigue	0.64	0.48	0.51	0.67	1.29	0.197(NS)

N = 140

## Discussions

**The first objective of the study was to assess the efficacy of EFM intervention in reducing the chemotherapy-induced nausea among the children with hematological and solid tumors**

Figure 1 depicts the significant 'P' value (<0.001) of the interaction effect between the two main variables "Group and Drug" indicates that the variation in nausea depends on EFM received or not and the type of chemotherapy drugs administered. The children in the experimental group who received chemotherapy drugs and EFM intervention had experienced less nausea than in the control group. The nausea sensation was high among the children who had received drug 4 Cyclophosphamide (high risk) and drug 3 Cisplatin.

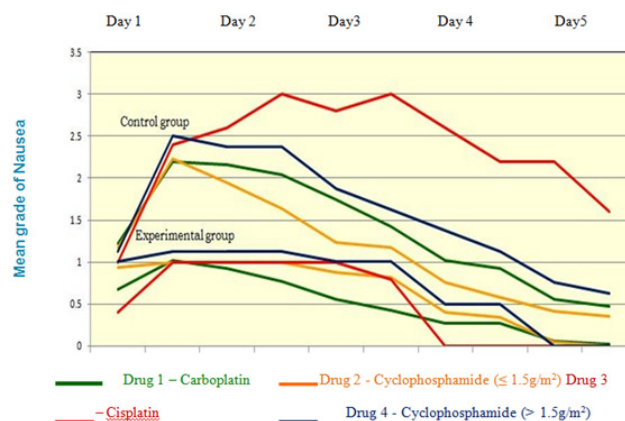
The significant 'P' value (0.016) in the highest order of interaction effect between "Assessment, Drug and Group" confirms that in fact that the children with among experimental group who received EFM intervention got the nausea sensation reduced to nil from 7<sup>th</sup>(4<sup>th</sup> day) and 9<sup>th</sup>(5<sup>th</sup> day) assessment onwards for drug 3 Cisplatin and drug 4 Cyclophosphamide. On the 10<sup>th</sup> assessment no nausea sensation was experienced by children who received foot massage intervention for all drugs except drug 1 Carboplatin. The children in the control group experienced moderate to severe nausea sensation for all 4 drugs, especially for drug 3 Cisplatin and drug 4 Cyclophosphamide (high risk). The children had experienced nausea sensation during all the 10 assessments. They were not free from nausea during the assessment period.

Overall to say,

- Among the children in the experimental group the nausea sensation was found to nil from 7<sup>th</sup>(4<sup>th</sup> day) and 9<sup>th</sup>(5<sup>th</sup> day) assessment onwards for drug 3 Cisplatin and drug 4 Cyclophosphamide. On the 10<sup>th</sup> assessment no nausea sensation was experienced by the children who received EFM intervention for all drugs except drug 1 Carboplatin.

- The children with control group had experienced nausea sensation during all the 10 assessments. They were not found free from nausea during the assessment period.

The above result confirms that the repeated Ezio Foot Massage intervention was effective in minimizing the nausea among the children who had received chemotherapy treatment.



**Figure 1** Drug, day and timewise assessment of nausea.

**Nausea:** The children in the experimental group who had received EFM experienced less nausea from 4<sup>th</sup> day onwards. Whereas the control group children had experienced moderate to severe nausea for all 5 days.

Hence, the hypothesis 1 ( $H_1$ ) stated as "the children in the experimental group experience less nausea after foot massage intervention than the control group" was accepted.

**The study result is supported by the following studies:**

**Comparison of pain level among subjects in experimental and control group for first 24 hours and 48 hours** –the result revealed that the FMI was effective in the experimental group children before

receiving chemotherapy 54 (77%) of them do not have pain for a trial version itself. The significant P value  $<0.001$  indicates the control group children 49 (70%) experienced pain in mild grade. Children have adverse effect of pain after receiving chemotherapy within 24 hours the grade of severity of the pain was compared by a chi-square test for the both groups. The significant P value  $<0.001$  indicates the control group children 51 (72%) experienced pain in moderate grade. The experimental group children 15 (21%) of them do not have any specific abdominal pain due to chemotherapy and 55(78%) experienced mild pain not interfering with normal function and ADL. Children have pain experience after receiving chemotherapy within 48 hours the level of severity of the pain adverse effect was compared by a chi-square test for the experimental group and control group. The significant P value  $<0.001$  indicates the control group children 54(77%) experienced pain at moderate grade. Because of FMI the experimental group children 46 (65%) experienced only mild grade pain. This study findings supported the present study in a sample of 87 hospitalized cancer patients, a 10 minute foot massage was found to decrease pain levels ( $P = 0001$ ).<sup>3</sup>

Chemotherapy induced nausea occurred twice as often as vomiting with 62.5% of the time as compared to 26.0% and the patients typically viewed nausea as more distressing than vomiting and having a greater negative impact on their lives.<sup>20</sup>

Younger patients are more likely to experience severe CINV. The patient and the chemotherapeutic regimen contribute to the overall risk of CINV.<sup>11</sup> The previous experience with chemotherapy also increases the risk of CINV.<sup>8</sup> A study conducted on patients receiving chemotherapy (N=151) found that 31% of the patients experienced delayed CINV without prior acute-symptoms.<sup>5</sup>

Complementary therapies such as reflexology and foot massage could be introduced in to healthcare settings as an ideal non-pharmacological method of reducing the stress and anxiety and managing difficult symptoms such as pain and nausea.<sup>13</sup>

## The second objective of the study was to determine the efficacy of EFM intervention in reducing the chemotherapy-induced vomiting among the children with hematological and solid tumours

Figure 2 depicts the significant 'P' value ( $<0.001$ ) of the interaction effect between the two main variables "Group and Drug" indicates that the vomiting episodes varies depends on foot massage received or not and the type of chemotherapy drugs administered.

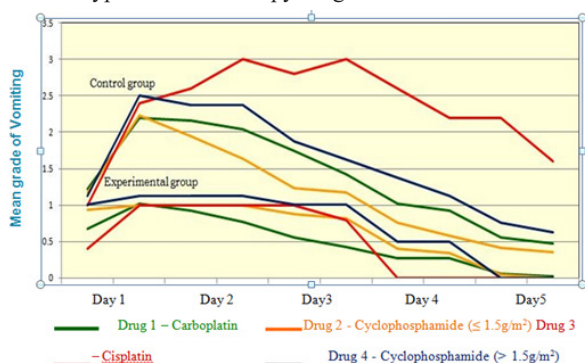


Figure 2 Drug, day and timewise assessment of vomiting.

**Vomiting:** The children in the experimental group who had received EFM experienced minimal vomiting episodes and no vomiting from 3<sup>rd</sup> day onwards. Whereas the children in the control group had experienced vomiting episodes for all 5 days. They were not found free from vomiting during the assessment period.

The children in the experimental group who received chemotherapy drugs and foot massage intervention had experienced minimal vomiting episodes and no vomiting days than the control group. The severity of vomiting episodes were found more among the children who had received drug 4 Cyclophosphamide (high risk) and drug 3 Cisplatin. The significant 'P' value (0.001) of the highest order of interaction effect between "Assessment Drug and Group", confirms that among the children with experimental group who received foot massage intervention the vomiting episodes were found reduced to nil from 3<sup>rd</sup> assessment (2<sup>nd</sup> day) onwards for drug 4 Cyclophosphamide (high risk) and drug 3 Cisplatin. On the 5<sup>th</sup> assessment (3<sup>rd</sup> day) onwards there was no vomiting among the children in the experimental group who received foot massage intervention for all 4 drugs.

The children in the control group had experienced moderate to severe vomiting episodes for all 4 drugs. The severity of vomiting was more for the drug 3 Cisplatin and drug 4 Cyclophosphamide (high risk) than the drug 2 Cyclophosphamide (moderate risk) and drug 1 Carboplatin. The children had vomiting during all the 10 assessments. They were not found free from vomiting during the assessment period.<sup>14</sup>

Overall to say,

- On 5<sup>th</sup> assessment (3<sup>rd</sup> day) onwards there was no occurrence of vomiting among the children in the experimental group who received EFM intervention for all 4 drugs
- Children in the control group had vomiting during all the 10 assessments. They were not found free from vomiting during the assessment period.

The above result confirms that the repeated Ezio foot massage intervention was effective in reducing the occurrence of vomiting among the children who had received chemotherapy treatment. Hence, the hypothesis 2 ( $H_2$ ) stated as "the children in the experimental group experience minimal vomiting after foot massage intervention than the control group" was accepted.

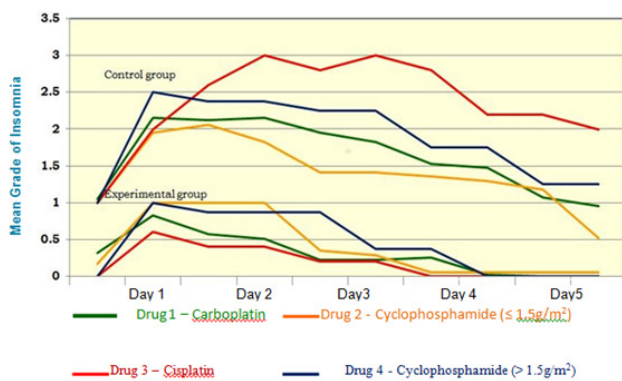
## The study result is supported by the following studies:

The incidence of acute CINV has ranged from 36% to almost 60% and the incidence of delayed CINV has ranged from 47.1% - 75.4%. A study by found 38% of the patients (N=67) on the High Emetogenic Chemotherapy regimen experienced delayed emesis and 33% experienced delayed nausea without acute symptoms. In the same study, 19% of 231 patients, receiving Moderately Emetogenic Chemotherapy, experienced delayed emesis and 21% experienced delayed nausea without acute symptoms<sup>15</sup> in another study on six patients, who were given a 40-minute reflexology sessions thrice over five days found that some relief from cancer symptoms and all said they experienced an improvement in quality of life<sup>12</sup> found 64.4% of the patients, receiving chemotherapy, had one or more episodes of CINV. Delayed CINV occurred almost twice as often as acute episodes, 60.7% of the patient's experienced delayed episodes versus 32.8% of the patients experienced acute CINV.

## The third objective of the study was to assess the efficacy of EFM intervention in reducing the chemotherapy induced insomnia among the children with hematological and solid tumors.16

Figure 3 depicts the highly significant 'P' value ( $<0.000$ ) of the interaction effect between the two main variables "Group and Drug" indicates the point that the occurrence of insomnia (sleep disturbances) variation depending on foot massage received and the type of chemotherapy drugs administered.





**Figure 3** Drug, day and timewise assessment of insomnia.

**Insomnia:** The children in the experimental group who had received EFM experienced very minimal sleep disturbances till the 3<sup>rd</sup> day. From the 4<sup>th</sup> day onwards, the children were able to sleep well. The children in the control group had experienced moderate to severe disturbances for all 5 days.

The children in the experimental group who received chemotherapy drug and EFM intervention had experienced minimal sleep disturbances than children in the control group. The sleep disturbances was found more among the children who had received drug 2 Cyclophosphamide (moderate risk) and drug 4 Cyclophosphamide (high risk). The highly significant 'P' value (0.000) in the highest order of interaction effect between "Assessment, Drug and Group" confirms that the children in the experimental group who received foot massage intervention had very mild sleep disturbances till the 6<sup>th</sup> and 7<sup>th</sup> assessment followed by good sleep without disturbance from 8<sup>th</sup> assessment for drug 3 Cisplatin and drug 4 Cyclophosphamide (high risk). For drug 1 Carboplatin and drug 2 Cyclophosphamide (moderate risk) the children had mild sleep disturbances for all 10 assessments.

The children in the control group experienced moderate to severe sleep disturbances for all the 4 drugs during all the 10 assessments. The sleep disturbances was found severe and moderate for the drug 3 Cisplatin, drug 4 Cyclophosphamide (high risk) than the other two drugs. For drug 2 Cyclophosphamide and drug 1 Carboplatin the children had mild and moderate sleep disturbances. The children had sleep disturbances during all the 10 assessments and they were not able to sleep well during the assessment period.

Overall to say,

- Children in the experimental group who received Ezio foot massage intervention had very mild sleep disturbances till the 6<sup>th</sup> and 7<sup>th</sup> assessment followed by good sleep without disturbance from the 8<sup>th</sup> assessment for drug 3 Cisplatin and drug 4 Cyclophosphamide (high risk). For drug 1 Carboplatin and drug 2 Cyclophosphamide (moderate risk) the children had mild sleep disturbances for all 10 assessments
- The children in the control group had sleep disturbances during all 10 assessments and they were not able to sleep well during the assessment period.

The above result confirms in fact that the repeated EFM intervention was found effective in improving the sleep pattern among the children who had received chemotherapy treatment. Hence, the hypothesis 3 (H<sub>3</sub>) stated as "the children in the experimental group experience minimal sleep disturbances after foot massage intervention than the control group" was accepted.

### The study result is supported by the following studies:

Lack of sleep or poor sleep can affect the overall quality of life as well as other compound symptoms.

Healing touch method is a non-invasive, non-condition specific method involving placing of hands on various parts of the body for about 40 minutes giving particular attention to areas of pain or discomfort. Statistically, significant improvement was found from pre to post-test on sleep disturbances.<sup>23</sup>

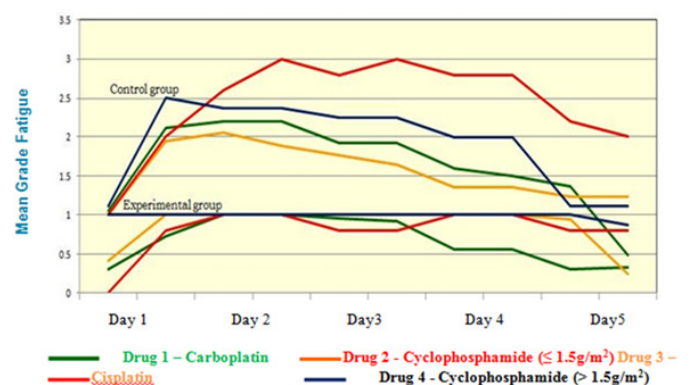
A study was conducted on special foot massage as a complementary therapy among a group of breast cancer patients undergoing radiation to chest wall and associated drainage areas to test its effectiveness on anxiety, depression and quality of life. It was found to cause a significant reduction in the anxiety and depression level with significant increase in the quality of life.<sup>6</sup>

### The fourth objective of the study was to evaluate the efficacy of EFM intervention in reducing the chemotherapy-induced fatigue among the children with hematological and solid tumours

Figure 4 depicts the significant 'P' value (<0.002) of the interaction effect between the two main variables "Group and Drug" indicates that the occurrence of fatigue varies depending on foot massage received and the type of chemotherapy drugs administered.

The children in the experimental group who received chemotherapy drugs and foot massage intervention had experienced minimal fatigue than the children in the control group. The fatigue was found more among the children who had received drug 4 Cyclophosphamide (high risk) and drug 2 Cyclophosphamide (moderate risk).

The highly significant 'P' value (0.000) in the highest order of interaction effect between "Assessment, Drug and Group" confirms the fact that the children in the experimental group who received foot massage intervention had mild to very mild fatigue during all 10 assessments for all the 4 drugs, especially for drug 3 Cisplatin and drug 4 Cyclophosphamide (high risk).



**Figure 4** Drug, day and timewise assessment of fatigue.

**Fatigue:** The children in the experimental group who had received EFM experienced mild to very mild fatigue on all 5 days. The children in the control group had experienced moderate to severe fatigue for all 5 days.

The children in the control group experienced moderate to severe fatigue for all the 4 drugs during all the 10 assessments. The severity of fatigue was more for drug 3 Cisplatin than the drug 4 Cyclophosphamide (high risk). For the other two drugs Carboplatin and Cyclophosphamide (moderate risk) the children had moderate to

mild grade fatigue during all the 10 assessments. The children were not found free from fatigue during the assessment period.

Overall to say,

- i. Among the children in the experimental group who received EFM intervention had mild to very mild fatigue during all the 10 assessments for all the 4 drugs, especially for drug 3 Cisplatin and drug 4 Cyclophosphamide (high risk).
- ii. The children in the control group experienced moderate to severe fatigue for all 4 drugs during all 10 assessments. The children were not free from fatigue during the assessment period.

The above result confirms the fact that the repeated Ezio foot massage intervention was effective in minimizing fatigue among children who had received chemotherapy treatment. Hence, the hypothesis 4 ( $H_4$ ) stated as “the children in the experimental group experience minimal fatigue after foot massage intervention than the control group” was accepted.

#### The study result is supported by the following studies:

Open-label pilot study of a combination of aromatherapy, foot soak with lavender for 30 minutes, and reflexology for 10 minutes on patients towards the end of life found significant decrease in the level of fatigue one and four hours after the treatment.<sup>22</sup> A non-randomized trial with 20 terminally ill-patients tested for a combined modality of aromatherapy, reflexology and foot soak for Cancer Related Fatigue. The intervention consisted of a foot soak in lavender for 3 minutes followed by reflexology with jojoba oil and 1% lavender for 10 minutes. The reflexology points were not described, and the lavender essential oil was chosen for its sedative, analgesic, and skin healing effects. Steroids were not controlled for in the analysis but were used by 70% of the patients. The authors reported that, statistically, significant improvements of fatigue scores based on the Cancer Fatigue Scale.<sup>17</sup>

In a randomized crossover study of massage and healing touch among 230 patients, receiving cancer chemotherapy, the authors compared the effect of therapeutic massage and healing touch. The patients included were receiving chemotherapy and had fatigue ratings of 3 or more on a 1 to 10 scale. The intervention was administered as a once-weekly session for 4 weeks. The sequence of the treatment was allocated in a random fashion. A mean of 16.7 days washout period was used between the two treatments. Compared with standard care, the healing touch was associated with improved fatigue, total mood disturbance, and pain ratings.<sup>18</sup>

The effectiveness of combined modality treatment consisting of aromatherapy, footsoak, and reflexology against fatigue in the form of an open study was performed on 20 terminally ill patients with cancer. After a patch test was performed, the patients received aromatherapy accompanied with footsoak in warm water containing lavender essential oil for 3 minutes, followed by a reflexology treatment with jojoba oil containing lavender for 10 min. The level of fatigue was evaluated using the Cancer Fatigue Scale (CFS)<sup>19</sup> before, 1 hour after and 4 hours after treatment. The total CFS scores were found improved significantly after the treatment. Since adverse effects were experienced all the patients desired to continue this treatment, they received treatment eight times on average. The researcher concluded that combined modality treatment consisting of aromatherapy, footsoak, and reflexology appears to be more effective for alleviating fatigue among terminally ill cancer patients.<sup>20</sup>

## Conclusion

The significant ‘P’ value of the highest order of interaction effect between Assessment, Drug and Group confirms that children in the experimental group who received EFM the AE of Nausea ( $P=0.016$ ), Vomiting ( $P=.001$ ), Insomnia ( $P=0.000$ ) and Fatigue( $P=0.000$ ). It can be concluded that the EFM intervention, significantly, reduces the chemotherapy AE such as nausea, vomiting, insomnia and fatigue. Other findings related to efficacy of EFM intervention on CINV, insomnia and fatigue .On day1, in the first assessment itself, the experience of AE (nausea, vomiting, insomnia and fatigue) were comparatively less among the experimental group children than in the control group for all 4 drugs. This is mainly due to the fact that the children in the experimental group had received trial version and the 1<sup>st</sup> session of EFM before receiving the chemotherapy drugs and continuous 5 days 3 times EFM for 15 sessions.

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## Conflicts of interest

None.

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