Effectiveness of Proximal Massage Versus Palm Fisting Exercise on Reducing the Risk of Thrombophlebitis among IV Cannulated Patients Receiving Chemotherapy

Abstract

Background

Peripheral venous catheters (PVCs) are frequently used for vascular access cannulation, which is thought to be the most frequent invasive treatment carried out on hospitalized patients. Thrombophlebitis is considered a side effect of chemotherapy due to the drug's chemical actions on the vein wall which lead to pain, inflammation, hematoma, thrombosis and embolism . Therefore, in order to find ways to reduce this complication, the purpose of this study was to compare the effectiveness of proximal massage versus palm fisting exercise on reducing the risk of thrombophlebitis among IV cannulated patients receiving chemotherapy in selected hospital in Mangalore

Methods

Seventy-five chemotherapy patients were selected according to inclusion criteria and assigned randomly to group I (n=25) and group II (n= 25) and group III (n= 25) using coin flip method . The researcher provided massage on the proximal area for group I and group II patients performed palm fisting exercise under the supervision of researcher by squeezing the soft ball where as group III received only routine care. The level of thrombophlebitis was assessed in Group I, Group II and Group III using VIP scale after 24 hours, 48 hours and 72 hours of cannulation.

Results : The study findings revealed that on day 3 in the Group I, most (88%) of the samples were with Grade 0 level of thrombophlebitis. While in the, Group II 32% of the samples had Grade 0 level of thrombophlebitis where as in Group III only 16% of the samples had Grade 0 level of thrombophlebitis. Differences in thrombophlebitis scores were statistically significant (P<0.001).

Conclusion: Proximal massage and palm fisting exercises are cost-effective, safe, complementary, non - pharmacological intervention which can be performed by nursing personnel.

. **Key words**

Chemotherapy ; IV Cannulated Patients; Palm fisting exercises; Proximal massage ; Thrombophlebitis

Introduction

Chemotherapy, which uses "Cytotoxic" medications, is a common systemic approach to treat cancer [1]. Any chemotherapy that lasts longer than 24 hours acts as a very potent intravenous stimulant, typically resulting in "Phlebitis," which then results in the loss of superficial veins.[2] Between 27% and 70% of all patients undergoing IV therapy experience thrombophlebitis, which is a typical side effect of the treatment. [3]

Pain, erythema, swelling, and visible thrombosis of the cannulated vein are the symptoms of thrombophlebitis. A study finds that 67.2 percent of cannula removals for IV infusions are caused by problems, necessitating the removal of the cannula and its replacement. [4]. However, the complete prevention of thrombophlebitis incidence due to chemotherapy administration is difficult. There are some interventions which may help to reduce the incidence of thrombophlebitis. [5] . One recognised consequence of peripheral administration of intravenous chemotherapy is venous irritation leading to phlebitis and thrombophlebitis resulting from the chemical effects of the drug on the vein wall [6] Phlebitis is an inflammatory reaction to chemotherapy medications administered intravenously that may linger for weeks or months. [7] The rate of chemotherapy-induced phlebitis incidence has been reported as 70%, [8] , which increases the probability of thrombophlebitis and embolism danger, affecting the health of patients. [9] According to the standards of the Infusion Nurses Society (INS), the accepted phlebitis rate is 5% or less . Phlebitis incidence ranges from 0.5 percent to 59.1 percent at the moment. [10] The peripheral venous catheter is a common and necessary intravenous device that is commonly used in medical procedures [11] and is an essential component of professional nursing practise in all healthcare facilities. [12]

Even when nurses administer chemotherapy with care, all difficulties, including drug extravasations into surrounding tissues, cannot always be prevented. [13] The use of a peripheral IV catheter (PIVC), the length of the procedure, and the type of therapy are the main variables that affect

how well peripheral IV chemotherapy is administered. [14] Nurses should know about the dynamic, evidence-based practice guidelines for the prevention, management, and treatment of local and systemic problems. [15] However, totally preventing the development of thrombophlebitis as a result of chemotherapy administration is difficult. Several interventions have the potential to lower the prevalence of thrombophlebitis. [5]

According to the findings of a meta-analysis, any type of upper limb movement can increase the blood flow rate during venous catheterization and lower the incidence of thrombus in patients with PICC. Although there are many distinct types of upper limb motions, they can all help to speed up the blood flow, increase the limb's flow rate on the catheterization side and encourage lymphatic and venous circulation to decrease the likelihood of thrombosis. [16]

Hand exercises and massage are two of the most basic methods for increasing circulation flow through the hands. While performing hand exercises, the muscles in the hands and the surrounding blood vessels will relax, allowing more oxygenated blood to flow through. [16] Increasing blood flow to muscle tissue is one of massage's most well-known benefits. Improved blood circulation is thought to increase the amount of oxygen and other nutrients delivered to the muscular tissue. [17]

Considering the importance of phlebitis induced by intravenous injection of chemotherapy drugs and the consequence of imposing additional treatment costs for the patient and the health system, the present study was designed to compare the effectiveness of proximal massage versus palm fisting exercise on reducing the risk of thrombophlebitis among IV cannulated patients receiving chemotherapy in selected hospital in Mangalore.

Methods

Quantitative research approach was adapted to compare the effectiveness of proximal massage versus palm fisting exercise on reducing the risk of thrombophlebitis among IV cannulated patients . The researchers adopted quasi experimental post-test only repeated treatment measure time series design.The study was conducted during the period from October 2022 to March 2023.

Sample size was calculated based on power analysis with a power 0.80, level of significance 0.05 and the effect size 0.5 . Recommended sample size was 25 sample in each group. Using purposive sampling technique 75 chemotherapy patients newly cannulated with an IV cannula in the upper extremities, conscious and admitted for more than 3 days were recruited and assigned randomly to group I (n=25) and group II (n= 25) and group III (n= 25) by flip coin method

Outcome measures :

The visual infusion phlebitis (VIP) scale was established by Andrew Jackson in 1998 was used to assess risk of thrombophlebitis. The VIP scale provides a score from **0 to 5**, in ascending order of severity of inflammation. **Score 0** - the insertion site appears healthy and there are no signs of phlebitis.

Score 1 - one of the following signs is evident: slight pain or slight redness near IV insertion site. These are possible early signs of phlebitis.

Score 2 - two of the following signs are evident: pain at IV site, redness or swelling.

Score 3 - all of the following signs are evident: pain along the path of the cannula, redness around the insertion site and swelling.

Score 4 - all of the following signs are evident and extensive: pain along the path of the cannula, redness around the insertion site, swelling, palpable venous cord.

Score 5 - all of the following signs are evident and extensive: pain along the path of the cannula, redness around the insertion site, swelling, palpable venous cord, pyrexia.

The present study consists of independent variable are proximal massage and palm fisting exercise , dependent variable thrombophlebitis. demographic variables age, gender, previous history of smoking and alcohol, current alcoholic status, and current smoking status and and clinical variables cannula size, number of needle prick, previous hospitalization previous history of thrombophlebitisand anti-coagulant therapy

Participants and Randomization.

Prior to the data collection formal permission was obtained from hospital authority . An ethical clearance was obtained from institutional ethical committee board . Subject were selected according to inclusion criteria and randomly assigned to Group I, Group II and Group III by flip coin method. . Informed consent was obtained from subject after explaining the purpose of the study. Base line information was collected using socio demographic and clinical proforma.

Interventions:

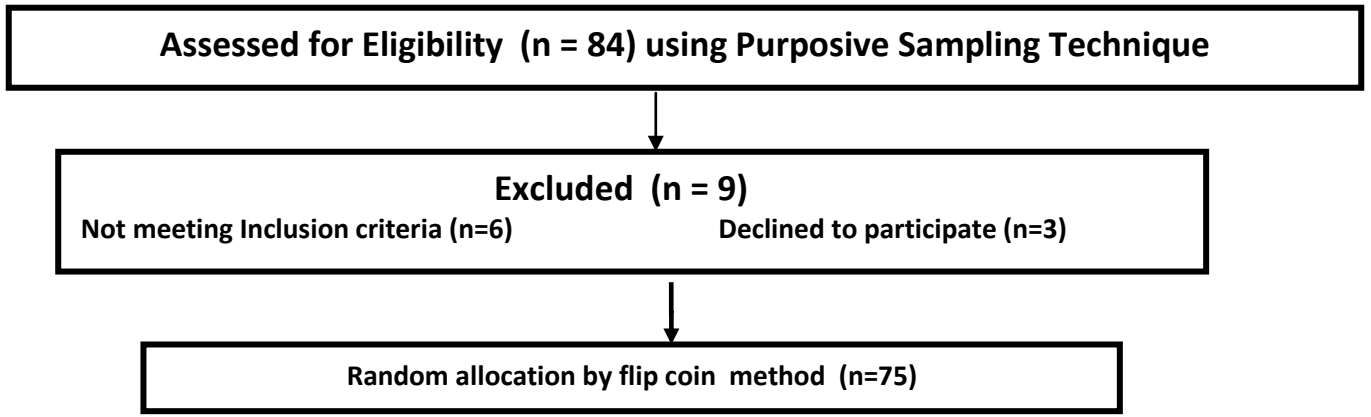
Group I : :- Gentle massage was provided on the proximal area about two centimeters away from cannulation site in the direction of blood flow that allows the blood to move in one direction after pouring a drop of coconut oil on the site for 5 minutes about 20 strokes per minute using palmer surface of the fingers and given once a day on day of cannulation and thrice a day for next 2 days with 3hours interval .

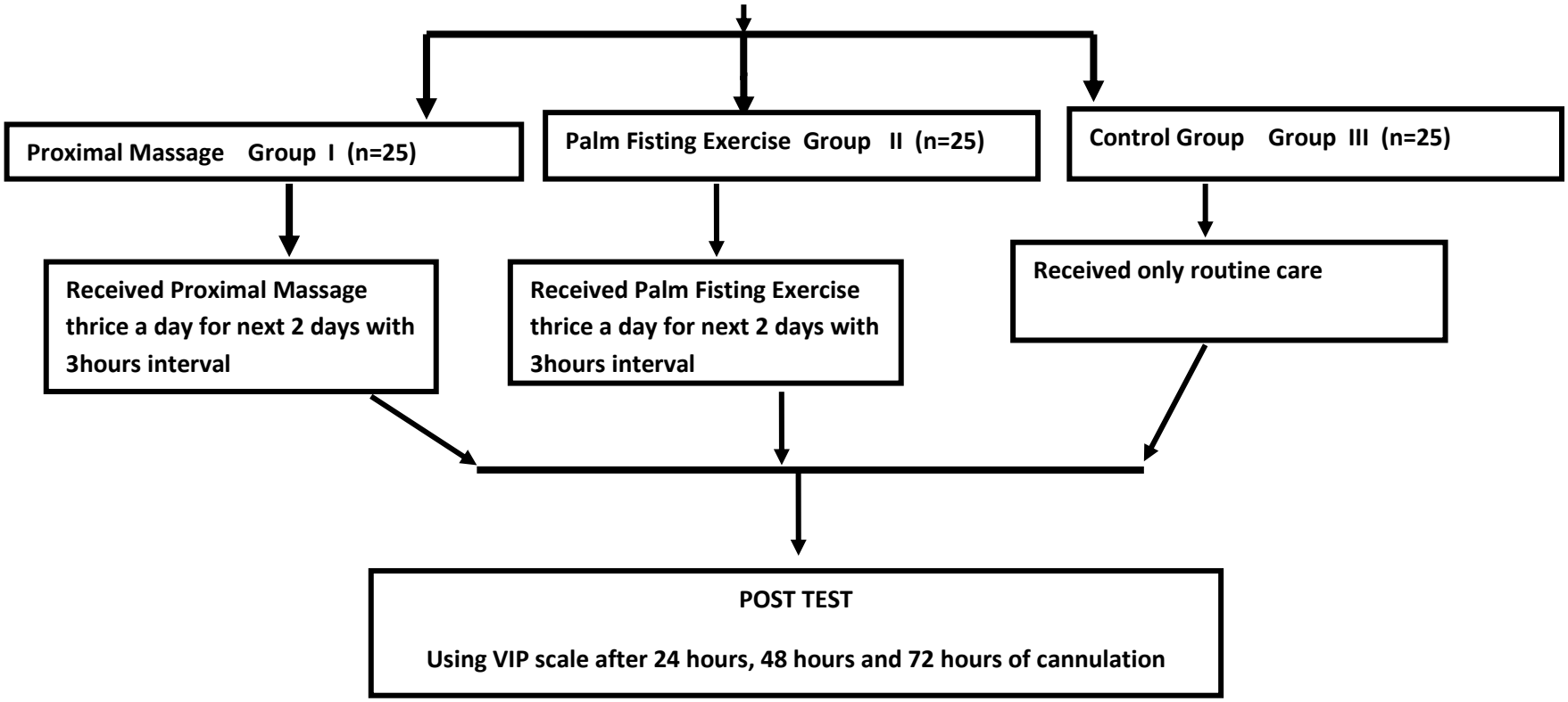
Group II : Palm fisting exercise was demonstrated by the researcher and asked patients to perform exercise under the supervision of researcher by squeezing the soft ball in the cannulated hand for 5 minutes about 20 times per minute once a day on day of cannulation and thrice a day for next 2 days with 3hours interval .

Group III : Routine care was provided by the ward staff which includes changing the cannula plaster and observing for thrombophlebitis

Post-tests were carried out to assess the risk of thrombophlebitis in Group I, Group II and Group III using VIP scale after 24 hours, 48 hours and 72 hours of cannulation.(Figure 1 Flow Diagram – Methodology)

Figure 1 Flow Diagram - Methodology




Proximal Massage Group I (n=25)
Palm Fisting Exercise Group II (n=25)
Control Group Group III (n=25)
Received Proximal Massage thrice a day for next 2 days with 3hours interval
Received Palm Fisting Exercise thrice a day for next 2 days with 3hours interval
Received only routine care
POST TEST
Using VIP scale after 24 hours, 48 hours and 72 hours of cannulation

Data Analysis

SPSS version 20 was used for the statistical analysis of the data. Descriptive statistical parameters of mean, standard deviation and percentage were calculated for socio-demographic and clinical information and repeated measures ANOVA test for intra group comparison.

Results

Descriptive characteristics

Equal percentage of the respondents in group I (28%) were in the age group of 25-35 and >55, and group III (36%) were in the age group of 45-55 and >55 where as the highest percentage of the respondents in group II (44%) were in the age group of 45-55. Majority of the respondents in group I (76%), group II (76%) and group III (64%) were males. The calculated p value reveals that the 3 group didn't vary in demographic characteristics except for past history of smoking and alcohol.. (Table 1).

Table 1.Analysis of Demographic Variables

	GroupI(N=25)		GroupII(N=25)		GroupIII(N=25)		P value
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	
	(f)	(%)	(f)	(%)	(f)	(%)	
Agein Years							
25-35	7	28%	4	16%	3	12%	.3386
35-45	5	20%	5	20%	4	16%	
45-55	6	24%	11	44%	9	36%	
>55	7	28%	5	20%	9	36%	
Gender							
Male	19	76%	19	76%	16	64%	.551
Female	6	24%	6	24%	9	36%	
History of Alcohol							
Yes	0	0%	7	28%	6	24%	0.017
No	25	100%	18	72%	19	76%	
History of Smoking							
Yes	0	0%	6	24%	6	24%	0.009
No	25	100%	19	76%	19	76%	
CurrentAlcoholic Status							
Yes	0	0%	0	0%	0	0%	1
No	25	100%	25	100%	25	100%	
Current SmokingStatus							
Yes	0	0%	0	0%	0	0%	1
No	25	100%	25	100%	25	100%	
Body Mass Index							
<18.5:-underweight	8	32%	3	12%	1	4%	1
18.5-24.9:-Normal	15	60%	18	72%	23	92%	
25-29.9:-Preobesity	2	8%	2	8%	1	4%	
30-34.9 :-ObesityI	0	0%	2	8%	0	0%	
>40:-ObesityIII	0	0%	0	0%	0	0%	

Analysis of clinical proforma showed that highest percentage of the respondents shows that majority of the respondents duration of illness in groupI (60%) and group III (68%) from 6 months - 1 year, where as in group II (48%) duration of illness was less than 6 months. Majority of the respondents in group I (80%), group II (68%) and group III (84%) had single needle prick for cannulation. Majority of the respondents in group I (52%) and group II (40%) had the frequency of infusion more than thrice and majority of the respondents in

group III (52%) had the frequency of Infusion more than twice . Majority of the respondents in group I (68%) , group II (72%) and group III (64%) do not have the history of thrombophlebitis. The calculated P value reveals that the 3 groups didn't vary in clinical variables (Table 2)

Table 2. Analysis of Clinical Variables

	GroupI(N=25)		Group II(N=25)		GroupIII(N=25)		P value
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	
	(f)	(%)	(f)	(%)	(f)	(%)	
Current Diagnosis							
Breastcancer	0	0%	3	12%	3	12%	0.191
Thyroidcancer	0	0%	1	4%	0	0%	
Leukaemia	4	16%	5	20%	5	20%	
Laryngeal cancer	1	4%	1	4%	1	4%	
Prostatecancer	5	20%	6	24%	5	20%	
Lungcancer	10	40%	3	12%	5	20%	
Oral Cancer	5	20%	6	24%	6	24%	
Duration of Illness							
<6months	3	12%	12	48%	3	12%	0.803
6months-1year	15	60%	7	28%	17	68%	
1year- 2year	6	24%	1	4%	5	20%	
>2years	1	4%	5	20%	0	0%	
Cannula size							
18G	0	0%	0	0%	0	0%	
20G	25	100%	22	88%	20	80%	
22G	0	0%	3	12%	5	20%	
Site of Cannulation							
a. Brachialvein	0	0%	5	20%	1	4%	.0757
b. Basalic vein	4	16%	9	36%	3	12%	
c.Cephalic vein	11	44%	7	28%	11	44%	
d. Dorsalmetacarpal	10	40%	4	16%	10	40%	
Frequency of Infusion							
a.Once	3	12%	7	28%	5	20%	0.223
b. Twice	5	20%	5	20%	13	52%	
c.Thrice	4	16%	3	12%	6	24%	

d. Morethan thrice	13	52%	10	40%	1	4%	
Number of needle prick							
a.One	20	80%	17	68%	21	84%	.372
b. Two	4	16%	3	12%	4	16%	
c.Three	1	4%	5	20%	0	0%	
Previous Hospitalisation							
a.None	0	0%	0	0%	0	0%	0.465
b.Once	11	44%	8	32%	7	28%	
c. Twice	8	32%	7	28%	9	36%	
d.Morethan twice	6	24%	5	20%	9	36%	
a.None	0	0%	5	20%	0	0%	
Previoushistoryof Thrombophlebitis							
a. Present	8	32%	7	28%	9	36%	0.832
b.Absent	17	68%	18	72%	16	64%	

On day 1 in the group I, majority (60%) of the samples were with grade 1 level of thrombophlebitis. While in the, group II (56%) group III(64%) of the samples had grade 2 level of thrombophlebitis and 34% of the samples had grade 1 level of thrombophlebitis. Where as on day 3 in the group I, most (88%) of the samples were with grade 0 level of thrombophlebitis. While in the, group II 32% of the samples had grade 0 level of thrombophlebitis where as in group III only16% of the samples had grade 0 level of thrombophlebitis.(Figure2) .

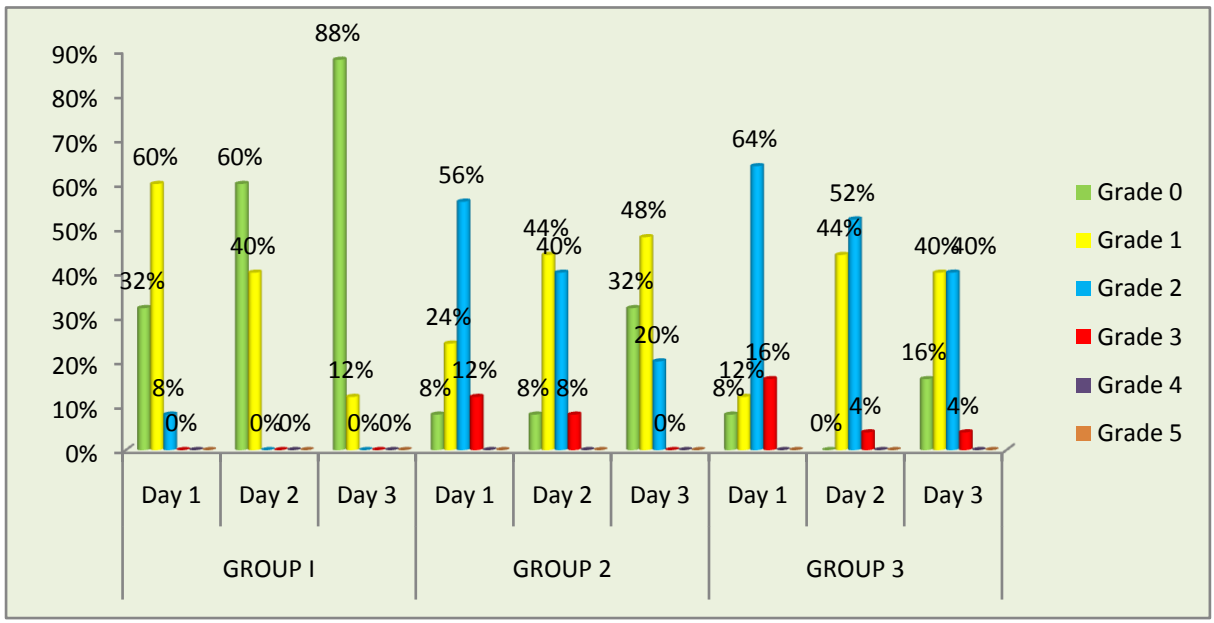


Figure 2. Grading of Risk For Thrombophlebitis

From the data it can be concluded that, in group I there was significant difference , from day 1 to day 2 (t=3.36, P=0.000) and from day 2to day 3 (t=2.29, P=0.03) and from day 1 to day 3(t=2.28, P=0.03). In Group II, there was significant difference from day 1 to day 2(t=3.05, P=0.005) and from day 2 to day 3 (t=5.19, P=0.000) and day 1 - day 3. (t=3.05, P=0.005). In Group III, there was significant difference from day 1 – day 2(t=5.19, P=0.000) ,from day 2 – day 3(t=7.58, P=0.000)and day 1 – day 3. (t=3.41, P=0.002) (Table 3)

Table 3. Distribution of mean score and SD of post-test level of thrombophlebitis among patients of Group I, Group II and Group III .

Days		**Group I**			**Group II**			**Group III**	
	Mean+_SD	t value	p value	Mean+_SD	t value	p value	Mean+_SD	t value	p value
Day 1- Day 2	0.72 ± 0.61	3.36	0.000	1.72 ± 0.79	3.05	0.005	1.88 ± 0.78	5.19	0.000
Day 2- Day 3	0.4 ± 0.5	2.29	0.03	1.48 ± 0.77	5.19	0.000	1.6 ± 0.58	7.58	0.000
Day 1- Day 3	0.12 ± 0.33	2.28	0.03	0.88 ± 0.73	3.05	0.005	1.32 ± 0.8	3.41	0.002

To compare the risk of Thrombophlebitis in IV cannulated patients receiving chemotherapy between group I, group II and group III, one way ANOVA was computed which showed a high statistical significance. (p = 0.001). On day 3 the mean VIP score of the group I was lower than the mean VIP scores of the group II and group III. Thus, indicating that proximal massage was effective in reducing the risk of thrombophlebitis in comparison with palm fisting exercises. (Table 4)

Table 4. Comparison of risk of thrombophlebitis between 3 groups

	Mean+_SD	**F value**
Day 1		
GroupI	0.72+_0.61	< 0.0001
Group II	1.72+_0.79	
GroupIII	1.88+_0.78	
Day 2		

GroupI	0.4+_0.5	< 0.00001
Group II	1.48+_0.77	
GroupIII	1.6+_0.58	
Day 3		
Group1I	0.12+_0.33	< 0.00001
Group II	0.88+_0.73	
GroupIII	1.32+_0.8	

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Discussion:-

Majority of the respondents in all three groups were males. This finding were similar with the other studies where most of patients were males. None of the respondents in group I and majority of respondents in group II and III had no history of alcohol and smoking . None of the respondents in all 3 groups had current alcoholic and smoking status where as in other study conducted showed that most of the respondents uses alcohol and has smoking history.[18] In the present study, majority of samples in all 3 groups did not had previous history of phlebitis . This finding was similar with the study [19] which showed that, very few patients were having previous history of phlebitis.

It should be noted that factors such as age, gender, smoking history have an impact on incidence of thrombophlebitis. However in current study all these variables were statistically the same across all 3 groups.

In present study on day 3 the risk of thrombophlebitis was reduced in group I and group II where as in group III the risk was high . This study was similar with the study where intervention group respondents had reduced level of thrombophlebitis ,while in the control group, respondents had increased level of thrombophlebitis. [20] This study was also consistent

with another study [21] showed that most of the intervention group patients had no phlebitis in the post-test.

In the current study there was meaningful statistical difference was observed in thrombophlebitis scores in all 3 days among samples in 3 groups. (P value is < 0.001). This indicates that the applied intervention in the current study has delayed the phlebitis incidence in group I and group II . The present study findings are consistent with other studies where there was significant difference was observed in thrombophlebitis scores at 0.05 level.[5,9]

CONCLUSION

The present study showed that the practice of proximal massage and palm fisting exercises in patients under chemotherapy has reduced the risk of thrombophlebitis and can be implemented as non-pharmacological treatment. These results have a guiding role in clinical treatment and create a foundation for additional research in the future.

Ethical Approval and Consent

Institutional review board approval was obtained from Institutional Ethics Committee. Permission has been obtained from concerned authority to collect data. Informed consent was obtained from all the participants of the study. The participants were informed that their participation in the study was entirely voluntary and they may withdraw from the study anytime.

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