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A pre experimental study to assess the effectiveness of warm compression on thrombophlebitis among patients on receiving intravenous therapy admitted in selected hospital of Kashmir

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Abstract

Background: Thrombophlebitis is recognized as a potential complication of intravenous therapy. Treatment typically involves discontinuing the infusion line. Initially, a cold compress is applied to reduce blood flow and promote platelet aggregation. Subsequently, a warm compress is used. Elevating the affected extremity and relocating the intravenous line to the opposite extremity are also recommended. The present study analysed the efficacy of warm compression in patients with thrombophlebitis.

Methods: Present study was conducted among 50 thrombophlebitis patients at MCH-SKIMS, Bemina Srinagar. The sample for the present study were selected by non-probability convenience sampling technique. We utilized a standardized Visual Infusion Phlebitis scale for data collection. Subsequently, the collected data was analysed using paired-sample t-test to compare pre- and post-intervention scores using SPSS version 20.

Results: The study revealed that participants were predominantly aged 31-50 years (74%), with males comprising 56% and females 44%. Habits included 30% smokers, no alcohol consumers, 28% tobacco users, and 42% without harmful habits. Cannula duration varied: <2 days (18%), 2-3 days (36%), 3-5 days (30%), and 5 days (16%). Medication frequency was once daily (10%), twice daily (52%), thrice daily (32%), and every four hours (6%). Cannula sizes were 18 G (40%), 20 G (54%), and 22 G (6%). Pre-intervention thrombophlebitis mean score was 2.74 ± 1.337, reducing significantly post-intervention to 1.1 ± 1.055 ($p < 0.0001$), affirming the efficacy of warm compression in reducing thrombophlebitis severity.

Conclusion: In conclusion, nurses are pivotal in promoting patient health, especially in managing complications like thrombophlebitis during intravenous therapy. This study confirms that warm compression effectively reduces thrombophlebitis severity in patients. Significant differences in thrombophlebitis scores before and after warm compression demonstrate its clinical effectiveness.

Keywords: *Intravenous therapy, thrombophlebitis, warm compression, infusion therapy, nursing interventions, clinical effectiveness*

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Evidence in Context

- Warm compression significantly alleviates thrombophlebitis, confirming its clinical utility.
- Thrombophlebitis severity shows no significant link with demographic factors except age and cannulation duration.
- Predominantly middle-aged males participated, with varying medication frequencies and cannulation durations.
- The Visual Infusion Phlebitis scale provides a standardized assessment method.
- Limited sample size and study setting restrict the generalizability of findings.

To view Article

Introduction

Various healthcare facilities utilize infusion therapy to treat patients of diverse ages and demographics. Infusion therapy, which involves administering intravenous drugs and fluids [1], is integral across a broad spectrum of healthcare settings.

Intravenous therapy is essential in clinical treatment, making intravenous catheters indispensable in medical practice. Approximately 80% of new healthcare system entrants receive intravenous treatment annually. Inserting an intravenous cannula is often a proactive step to ensure rapid and efficient access during emergencies. However, superficial thrombophlebitis can hinder the prolonged use of a single indwelling cannula [2].

Intravenous therapy encompasses nutritional support, transfusion therapy, and the parenteral delivery of fluids and medications [3]. Various methods such as IV push, bolus, continuous, or intermittent infusion using central infusion devices are utilized for administration. Technological advancements and research have led to the development of modern infusion products and equipment tailored for effective delivery of parenteral fluids and medications. An example of such advanced equipment used for superior IV therapy in the twenty-first century includes Intravenous Therapy Systems [4].

Thrombophlebitis is considered a side effect of intravenous treatment. Mechanical, chemical and infectious factors can all contribute to thrombophlebitis which can result in extravasation, ecchymosis, thrombosis and embolism as well as discomfort, inflammation, infiltration and nerve injury [1]. Peripheral catheter-related phlebitis results from inflammation of the tunica intima of a superficial vein. Untreated inflammation can escalate to infection or formation of thrombus [5].

Thrombophlebitis refers to clot formation and inflammation in a vein, often triggered by various insults. Treatment involves discontinuing the IV infusion, applying a cold compress, followed by a warm compress, elevating the affected body part, and considering reinsertion of the line other sites [6]. The global incidence of thrombophlebitis is reported to be 41.09%. Thrombophlebitis can result in pain, inflammation, and nerve injury, as well as serious complications such as thrombosis, and embolism [7].

A study examined the evidence connecting thrombosis, particularly prothrombotic conditions like inherited thrombophilic disorders, with peripheral vein infusion thrombophlebitis. This condition affects 25% to 35% of hospitalized patients and carries significant implications for patients, including the risk of sepsis, as well as economic consequences such as increased nursing time [8].

A study involving 300 patients reported that the incidence of the condition increased to 100% after 5 days of continuous infusion. Moreover, Grade-1 thrombophlebitis (71.33%) had higher incidence as compared to Grade- 2 (22.67%) [9]. Another study involving 82 postoperative patients examined risk factors including and found a 50% incidence rate, with 61% classified as Grade 1 and 39% as Grade 2; no cases of Grade 3, 4, or 5 were observed [10].

Although numerous pharmacological and non-pharmacological therapies exist to alleviate the signs and symptoms of phlebitis and thrombophlebitis [4], sterile wet hot compresses offer several advantages. They improve circulation in open wounds, provide relief from edema, and aid in infection prevention. The water temperature in hot compresses should ideally be maintained between 40.5°C and 43°C (105°F and 110°F), and it is crucial to replace the compress frequently to sustain the desired temperature, as heat dissipates quickly during application [1, 11, 12]. Nursing interventions aimed at preventing phlebitis and ensuring correct use of catheter include strategies related to the maintenance of IV therapy, maintaining asepsis during procedures, and selecting appropriate dressing materials [13].

The study aimed to evaluate the incidence of thrombophlebitis in patients undergoing intravenous therapy, assess the efficacy of warm compression in its management, and investigate the associations between pre-intervention thrombophlebitis levels and demographic variables such as age, gender, habits, duration of cannulation, medication frequency, and cannula size.

Methods

The pre-post experimental study conducted at Sher-i-Kashmir Institute of Medical Science MCH Bemina June 5 to June 25, 2023 on a sample of 50 patients from medical and surgical departments using convenience sampling. Informed consent was obtained from the patients. Anonymity and confidentiality of the study participants was promised. Furthermore, permission was obtained from Medical Superintendent SKIMS MCH Bemina for data collection. The study investigated

Demographic variables including age, gender, habits, duration of cannulation, frequency of medication, and size of cannula

A standardized tool, the Visual Infusion Phlebitis Scale, was used to collect data. Each patient received warm compression (48 ^{o}C) three times daily for 30 minutes over three days, with a post-test conducted using the standardized scale on the fourth day. The collected data was analysed for descriptive analysis and paired-sample t-test to compare pre- and post-intervention scores using SPSS version 20. The data is presented as frequency, percentage and Mean±SE. p-value of <0.05 was considered significant.

Description of the tool

The tool utilized in the current study comprises two sections: Section I: This section includes items related to demographic variables such as age, gender, habits, duration of cannulation, frequency of medication, and size of cannula. Section II: A standardized tool developed by Andrew Jackson was employed, featuring 6 distinct scores. The Standardized Visual Infusion Phlebitis (VIP) Scale assigns scores ranging from 0 to 5, indicating progressively severe levels of inflammation. Each grade corresponds to different stages of phlebitis or thrombophlebitis, characterized by varying degrees of specific clinical signs.

Grading

0 - No signs of phlebitis

1 - Possible first signs.

2 - Mild stage of phlebitis.

3 - Moderate stage of phlebitis.

4 - Severe stage of phlebitis.

5 - Advanced stage of thrombophlebitis.

Data collection procedure

Before collecting data, written permission was obtained from the Medical Superintendent of SKIMS MCH Bemina. Subjects who met the inclusion criteria were selected, and they were informed about the purpose of data collection to facilitate their participation. The study was conducted based on the convenience of the patients, ensuring privacy and maintaining confidentiality throughout the process.

Table 1: Distribution of demographic variables

Demographic Variables					
Age (years)					
Frequency (%)	21-30	31-40	41-50	51-60	> 60
	10 (20)	15 (30)	12 (24)	10 (20)	3 (6)
Gender					
Frequency (%)	Male	Female			
	28 (56)	22 (44)			
Habits					
Frequency (%)	Cigarette Smokers	Alcoholic	Tobacco Users	None	
	15 (30)	0 (0%)	14 (28)	21 (42)	
Duration of Cannulation (days)					
Frequency (%)	< 2	2-3	3-5	> 5	
	9 (18)	18 (36)	15 (30)	8 (16)	
Frequency of Medication (no. of times in a day)					
Frequency (%)	1	2	3	6	
	5 (10)	26 (52)	16 (32)	3 (6)	
Size of Cannula					
Frequency (%)	18G	20G	22G		
	20 (40)	27 (54)	3 (6)		

Results

The demographic characteristics of the study sample, including age, gender, habits, duration of cannulation, frequency of medication, and size of cannula is presented in Table 1. Highest incidence was observed in age group of 31-40 years, mostly male, with duration of cannulation using 18G for 3-5 days (Table 1). Based on the analysis, no significant (P>0.05) association was recorded between the pre-interventional level of thrombophlebitis and demographic variables such as Gender, Habits, Frequency of Medication, and Size of Cannula, whereas only age was significantly (P<0.05) associated (Table 1S). The effect of warm compression intervention is presented in Table 2 and 3. The intervention significantly (P<0.001) reduced the score level by 2-folds.

Table 2: Frequency & Percentage distribution of patients (with thrombophlebitis) according to pre- and post-interventional score level of thrombophlebitis.

Score level (n= 50)	Pre –intervention f (%)	Post intervention f (%)
No signs of phelibitis	0 (0)	17 (34)
Possible first signs	10 (20)	19 (38)
Mild stage of phelibitis	14 (28)	6 (12)
Moderate stage of phelibitis	13 (26)	8 (16)
Severe stage of phelibitis	5 (10)	0 (0)
Advanced stage of thrombophelibitis	8 (16)	0 (0)

Discussion

Description of demographic variables

The findings of the present study revealed a diverse demographic profile among participants: 20% were aged 21-30 years, 30% were 31-40 years, 24% were 41-50 years, 20% were 51-60 years, and 6% were above 60 years. Males constituted the majority at 56%, with females comprising 44%. Regarding habits, 30% were cigarette smokers, none reported alcohol use, 28% were tobacco users, and 42% had no identified habits. In terms of cannulation duration, 18% had cannulas for less than 2 days, 36% for 2-3 days, 30% for 3-5 days, and 16% for 5 days. Medication frequency varied with 10% taking medication once daily, 52% twice daily, 32% thrice daily, and 6% every four hours. Cannula sizes used were 0% with 16 G, 40% with 18 G, 54% with 20 G, and 6% with 22 G. These findings provide a detailed snapshot of participant characteristics across age, gender, habits, duration of cannulation, frequency of medication, and cannula size in the study.

Table 3: Descriptive statistics of pre- and post-interventional level of thrombophlebitis.

Descriptive Statistics	Mean ± S.D.	Mean %	Range	Mean Diff	Paired T test	P value	Table value at 0.05
Pre-intervention thrombophelibitis	2.74± 1.337	54.8	1-5	-1.640	20.605*	<0.001	2.01
Post-intervention thrombophelibitis	1.1 ± 1.055	22	0-3				
*Significant							

The findings from the study conducted by Sivakami in 2015 [2] on the effectiveness of warm compression for thrombophlebitis in 60 patients receiving IV therapy in Tittagudi, Tamil Nadu, show notable similarities and distinctions compared to the current study. In the pre-intervention phase, the experimental group showed that 76.67% (23 participants) had a moderate level of thrombophlebitis, and 23.33% (7 participants) had a severe level. Meanwhile, in the control group, 83.33% (25 participants) had a moderate level, 13.33% (4 participants) had a severe level, and 3.33% (1 participant) had a mild level. Post-intervention, the experimental group demonstrated that 56.67% (17 participants) had a mild level of thrombophlebitis, and 43.33% (13 participants) showed no thrombophlebitis. In contrast, the control group had 86.67% (26 participants) with a mild level and 13.13% (4 participants) with a moderate level of thrombophlebitis. The post-intervention mean and standard deviation were 5.80 ± 0.85 in the experimental group and 9.37 ± 1.52 in the control group. The findings of this study align with research conducted by Deka and Dutt in 2022 [1], involving 60 patients receiving IV therapy for thrombophlebitis. Results from the

Experimental group indicated a mean difference of 4.60 in scores between pre-test and post-test. However, other studies concluded that warm compression resulted in decrease of the phlebitis grades, but the difference was not statistically significant [14].

The present study identified significant associations between demographic variables such as age and duration of cannulation with the pre-interventional level of thrombophlebitis, with a significance level of $p < 0.05$. Conversely, no significant associations were observed between variables including gender, habits, frequency of medication, and size of cannula with the pre-interventional level of thrombophlebitis. These findings are consistent with those of Sivakani's study [2] on the effectiveness of hot fomentation on thrombophlebitis among patients receiving IV therapy. In Sivakani's study, statistical significance was found between variables such as body mass index and history of chronic disease with the post-interventional level of thrombophlebitis among patients receiving intravenous therapy, at a significance level of $p<0.05$. Contrary to the present study, no significant associations were observed between variables such as gender, age, diet, habits, ambulation, size of cannula, frequency of medication, type of drugs, and type of intravenous fluids with the post-interventional level of thrombophlebitis. Using a warm compress may benefit inflamed wounds in cases of phlebitis by promoting vasodilatation and enhancing blood circulation. This improved circulation can accelerate wound healing by ensuring that blood delivers essential nutrients and oxygen more effectively [15]. Additionally, the application of warm water could increase patient comfort. Research on non-pharmacological pain relief has suggested that warm water can alleviate discomfort in patients experiencing pain [16] (Kulisch, Bender, Németh, & Szekeres, 2009). Methods such as warm water compresses can create a warm environment, potentially reducing symptoms like redness, pain, and edema associated with phlebitis.

Limitations

The generalization of the research findings is limited due to the small number of subjects involved in the study. Specifically, the sample size comprises only 50 individuals who were present in the Medical and Surgical ward. This constraint may affect the ability to apply the results broadly to other populations or settings.

Conclusion

Nurses play a crucial role in patient health promotion. Thrombophlebitis, a common complication of intravenous therapy, leads to various issues such as extravasation, ecchymosis, hematoma, thrombosis, embolism, and discomfort. Recent research has demonstrated the effectiveness of warm compression in reducing thrombophlebitis severity among patients undergoing intravenous therapy. The study highlighted a significant decrease in the mean thrombophlebitis score after the application of warm compression, underscoring its beneficial impact in clinical practice.

Abbreviations: None

Supporting information: None

Ethical Considerations: Ethical permission was obtained from the institutional ethical committee of Islamic University of Science and Technology, Awantipora Protocol #RP/044/2023. Informed consent was obtained from the patients. Anonymity and confidentiality of the study participants was promised. Permission was obtained from Medical Superintendent SKIMS MCH Bemina for data collection.

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