

## Effect of Moist Heat on Vein's Integrity and Pain among Patients Receiving Peripheral Intravenous Chemotherapy

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### Abstract

**Background:** Peripheral intravenous access is a commonly performed technical nursing procedure in hospital and is vital for patients with chemotherapy. Obtaining venous access is the first step in patient care, it may be difficult and cause patient discomfort, and pain that may cause delay in patient management. **Design:** To achieve the aim of the study, a quasi-experimental research design was utilized. **Purpose of the study:** to determine the effect of moist heat on vein's integrity and pain among patients receiving peripheral intravenous chemotherapy. **Setting:** The Oncology Department of Menoufia University Hospital. **Subjects:** A convenient sample of 100 adult patients of both sexes with chemotherapy treatment were selected and divided alternatively into two equal groups: 50 patients for each group (study - control). **Tools:** Three tools were used for data collection: Structural interview questionnaire, Vein Assessment Scale, and Pain Assessment Scale. **Results:** There was a highly statistical significant improvement in vein assessment score (visibility and palpability) ( $p<0.000$ ) and VAS score ( $p<0.000$ ) in study group compared to control group after intervention **Conclusions:** moist heat were effective in improving vein visualization and alleviating pain during cannulation in studied patients.

**Key words:** Moist heat, Vein's integrity, Peripheral cannulation, and chemotherapy.

### Introduction

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Chemotherapy is the most commonly used anticancer treatment regimen that provides cure, control, or palliation. Chemotherapeutic drugs are mainly delivered intravenously. Peripheral venous cannulation is vital in the practice of modern medicine. It is one of the commonest and frequently used methods of drug administration in hospitals (Sarsar, et al., 2019).

Peripheral venous cannulation is the most common invasive clinical procedure performed worldwide, with more than 1.4 billion procedures performed daily in the USA alone, in up to 70% - 80% of hospitalized patients (Osti, et al., 2019).

The peripheral venous catheter is the most common and essential intravenous (IV) device, frequently used in medical practices. Peripheral intravenous cannulation (PIC) is an invasive procedure performed in hospitalized patients where the patient's skin is punctured with a needle to allow insertion of a temporary plastic tube into a vein (Urbanetto, et al., 2016).

Peripheral intravenous cannula (PIVCs) can be inserted for a number of indications including administration of medication, fluids, blood and nutrients. Infusion therapy and, therefore, cannulation is also an integral part of many oncology patients' care pathways, including IV access to diagnose and treat cancer through the administration of anticancer therapies. However, peripheral cannulation is associated with numerous

risks. These include multiple cannulation attempts, phlebitis, infiltration and extravasation; it may lead to mortality and morbidity, increased duration of hospital stay and significant cost (Farrell, et al., 2017).

It is an integral part of professional nursing practice in all the healthcare institutions, in which a suitable vein is located by both visual and tactile inspection. (Arbaee, 2016; Leipheimer, et al., 2020).

Technically, cannulation can be easily done and leads to less discomfort to patients but in some, it is not easy to identify the veins, so it takes time to do cannulation. Although the insertion of a PVC is usually a simple technique, difficulty can arise in this cannulation, requiring multiple punctures before the device is correctly situated (Pan et al., 2019)

Although cannulation is the most common invasive procedures performed in a hospital, most nurses receive insufficient formal training in this area and constantly seek techniques to enhance their success rates, which reflect to a greater extent on patients comfort and facilitation of insertion. Moreover, they may encounter difficulty that may cause a number of potentially serious patient adverse effects, such as physical pain and nerve injury, as well as regret, and additional labor for the health care personnel (e.g. time and cost). (Keleekai et al., 2016; Ichimura et al., 2020).

Attaining venous access is often challenging particularly in patients undergoing chemotherapy because of the repeated exposure to IV cannulation. Also, the high PH and osmolality of chemotherapy drugs irritate the endothelial layer causing extravasation of

the drug, pain, erythema, ecchymosis, infiltration at the IV catheter site and sympathetically induced vasoconstriction (Hassanein&Deif, 2020).

Multiple punctures provoke delays in care, in obtaining diagnosis or in initiating treatment. Furthermore, it generates stress, heightens perceptions of pain and reduces satisfaction, both among patients and among the professionals performing the technique. In addition, multiple punctures may be associated with a progressive deterioration of the vascular tree, termed ‘vascular exhaustion’, which makes vascular access even more difficult in successive contacts with the patient. (Rodriguez-Calero, et al., 2018).

Alongside various procedures, local warming is one technique that could be used to increase the diameter of superficial veins. The body's physiological response to moist heat is dilation of the blood vessels, causing an increase in the blood flow to the area under treatment. (Ajibola OOE, et al., 2018).

Many authors found that local warm compresses significantly reduce the number of attempts, decrease pain, relax muscles, and decrease the nursing time of IV cannulation (Sou, et al., 2017).

Nurses play a vital role in the prevention of such complication. Most of the interventions and prevention strategies such as insertion, monitoring and assessing peripheral venous catheter (PVC) site are part of routine nursing care. The nurse should have accurate knowledge of the preparation and administration of the IV Infusion and IV device. In addition, they should also know about the prevention, treatment and management of local and systematic

complications supported by dynamic evidence-based practice guidelines (Osti et al., 2017; Arbaee, 2016).

Warm compresses is a safe, evidence based, and cost-effective technique that nurses should use to facilitate IV cannulation for patients receiving chemotherapy and to improve the quality of nursing care. Consequently, this study sought to determine whether local warm compresses improves peripheral veins' assessment score (Biyik, et al., 2016).

### **Significance of the Study**

Hospitalized individuals are placed with at least one intravenous catheter in 80% of cases worldwide (Bayram&Caliskan,2016).The international use of peripheral intravenous catheters represent that over a billion peripheral intravenous catheters are inserted each year in hospitalized patients worldwide (Ray-Barruel, et al., 2015).There is limitation in the statistics regarding this topic in Egypt. Intravenous catheter placement is complicated in some situations, one of which is chemotherapy treatment because of the extreme pH and osmolality of chemotherapy that can result in irritation of the endothelial layer and thus extravasation of the drug, pain, urticaria, erythema, ecchymosis, infiltration at the catheter site and sympathetically induced vasoconstriction. These complications reduce the distension and visibility of the veins, making intravenous catheter insertion increasingly difficult (Doellman et al., 2009). Also it has been observed over a period of two years working as a clinical instructor in Medical Surgical Department with Nursing students that most patients with chemotherapy treatment experience severe discomfort caused by frequent

cannulation because of the bad condition of their veins. It has been reported that the local application of heat before catheter insertion provides vasodilation and venous distension that improve the experience of cannulation (Simón-López, et al.,2021). It is hoped that the current study open the door for evidence based practice and determine the effect of moist heat on veins integrity and experienced pain while undergoing peripheral intravenous cannulation among these patients.

### **Aim of the Study**

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The Purpose of the current study is to assess the effect of moist heat on vein's integrity and pain among patients receiving peripheral intravenous chemotherapy.

### **Research Hypothesis:**

- Patients who receive moist heat therapy (study group) will have more visible and palpable peripheral veins than patients who don't (Control group).
- Patients who receive moist heat therapy (study group) will have lower intensity of pain than patients who don't (Control group).

### **Operational definition:**

- **Moist heat:** defined as putting a towel soaked in warm water at a temperature of 39-40° Celsius intermittently for 10 minutes on the patient's selected vein in order to improve the visibility and palpability of peripheral veins before intravenous cannulation.
- **Pain:** defined as the patient's feeling of discomfort during intravenous cannulation.
- **Veins integrity:** defined as maintaining the visibility and palpability of

peripheral veins before intravenous cannulation.

### Methods

#### Research design:

A Quasi-experimental research design was utilized in this study (study &control group).

#### Research Setting:

The study was carried out at Oncology Department of Menoufia University Hospital.

#### Sample:

A convenient sample of 100 adult patients of both sexes with chemotherapy treatment whose veins are neither visible nor palpable were selected. They randomly assigned into two equal groups (control &study group) 50 patients for each.

#### Instruments:

**Instrument I Structured interviewing questionnaire:** It was developed by the researcher to assess bio-social characteristics. It was comprised of three parts as the following: **Part one:** patient's demographic data: It was comprised of six questions includes data related to patient's age, sex, marital status...etc. **Part two:** Medical data: It was comprised of seven questions about diagnosis, onset of disease, other chronic disease, and treatment regimen other than chemotherapy, site of previous cannulation, previous cannula's site complication, and difficulties during cannulation. **Part three:** chemotherapy regimen it was comprised of four questions about chemotherapy type, duration, cycle, and stage of disease.

#### Instrument II: Vein assessment scale:

It was developed by Webster, et al., (2007) to classify veins according to their level of intravenous insertion difficulty. A five point vein assessment scale used to assess the visibility and palpability of peripheral veins before and after the application of moist heat.

Characteristics of vein	Score
Vein neither visible nor palpable	1
Vein visible but not palpable	2
Vein is barely visible and palpable	3
Vein is visible and palpable	4
Vein is clearly visible and palpable	5

#### Instrument III Visual Analogue Pain Scale (VAS)

It was developed by Bain, Kuwahata, Raymod and Foster, (2005). To rate the subject's level of pain intensity. The measurement was from zero to ten

Characteristics of pain	cores
No pain	
Mild pain	1-3
Moderate pain	4-6
Severe pain	7-9
Worst pain	10

#### Content validity:

All instruments were tested for face and content validity by 5 experts in the field of Medical-Surgical Nursing Department Faculty of Nursing, Menoufia University. Modifications were done to ascertain relevance and completeness.

#### Reliability of the instruments:

All instruments were tested for reliability using test retest method to ascertain consistency: All instruments

were tested using Cronbach's alpha test. The period between each test was two weeks. It was ( $r= 0.97$ ) for instruments I, instruments II test retest reliability was ( $r= 0.84$ ), and it was ( $r=0.95$ ) for instruments III. So, it can be concluded that all instruments have adequate level of reliability.

**Written approval:** Permission to carry out the study was taken from responsible authorities after explanation of the purpose of the study.

### **Ethical Consideration**

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A written approval from ethical and research committee was obtained to carry out the study then an official letter from Menoufia faculty of nursing was delivered to the responsible authorities of Menoufia university hospital (oncology department) hospital administrators and the head nurses of oncology department to obtain written approval to conduct this study from them after explaining the aim of study. All patients were informed about the aim of the study and their rights that they were free to decide whether or not they would participate in the study. Then a written informed consent was obtained from each patient. Confidentiality was ensured by not sharing the information linked to the participants name with other individuals.

**Pilot study:** - A pilot study was conducted prior to data collection on 10% of the study sample (10 patients). This was performed to test the clarity and applicability of the instruments. Necessary modifications were done.

### **Field Work**

- Data were collected over a period of 2 months from August, 2020 to October, 2021

### **Procedure:**

- Patients who agreed to participate in the study and fulfilled the inclusion criteria were interviewed individually by the researcher on oncology department after their admission.
- A convenient sample of 100 adult patients of both sexes with chemotherapy treatment whose veins are neither visible nor palpable fulfilled the inclusion criteria were selected, randomly and alternatively divided into two groups; study group (I) exposed to moist heat application on peripheral veins along with routinely used methods of vein visualization such as application of a tourniquet, holding the arm lower than the level of the heart and asking the patient to make a fist and release several times, massaging, and tapping the vein with the tip of finger and control group (II) exposed only to routine hospital care. The researcher dealt with the control group (II) firstly then the study group (I) to avoid the contamination of data collection. The purpose of the study was explained to each subject in both the study and control group.
- The study was conducted on three phases: Assessment, implementation and evaluation phases as following:

### **Assessment phase:**

- This session took about 15-20 minutes for each patient.
- During this phase the researcher interviewed each subject of both groups immediately after admission to

oncology department to collect base line data by using all tools as follow:

- The researcher entered the patient's room, introduced herself to the patient and explained the purpose of the study, described the visual analogue pain scale for each patient prior to start data collection.
- The researcher assessed the bio-social characteristics by utilizing the first instrument part one, two and three.
- Peripheral veins of each subject were assessed by the researcher who used vein assessment scale (instrument II).
- All subjects of both groups were assessed for subjective estimates of pain experience using Visual Analogue Pain scale (instrument III).

### Implementation phase

- All intravenous cannulas insertion of both groups (intervention and control) were carried out by the researcher as follows:
- Patient was placed in semi fowler or sitting position during IV procedure.
- Routine PIV cannulation site care for both groups' subjects was carried out. It includes; checking doctor's written order for PIV cannulation, and careful site selection and assessment (edematous, injured, arm with mastectomy or inflamed sites were excluded).
- Hand hygiene and personal precautions was carried out prior to IV cannulation. Aseptic precautions were specifically considered during PIV cannula insertion for all studied subjects.
- The patient was asked about the preferred site of cannulation or non-dominant forearm used for peripheral intravenous cannulation with a cannula gauge size 18-20.
- Standard technique for PIV cannula placement was followed for both

group subjects which include: Tourniquet application to the arm 10 cm proximal to the selected site where the IV cannula was to be inserted, vein tapping and fist clenching.

- The vein was assessed using the vein assessment scale and the score was recorded on the data collection sheet for both groups.
- For the control subjects, single vein assessment for each patient was carried out following application of standard technique for PIV cannula placement then, the score was recorded in the data collection sheet.
- For the intervention subjects, moist heat was applied using a folded towel soaked in warm water at a temperature of 39-40° Celsius intermittently for 10 minutes on the selected vein before intravenous cannulation.
- The moist heat was applied to patient's arm by wrapping the towel from under the elbow to the fingers for 5 minutes continuously. Then towel was taken out again and dipped in warm water & reapplied for another five minutes.
- After 10 minutes the towel was removed, and skin was dried by using a dry towel. The tourniquet was applied to the arm proximal to the selected site, where the IV cannula was to be inserted.
- The selected patients' vein was reassessed after reapplying the tourniquet post warm compresses, using the vein assessment scale. The score was recorded in the data collection sheet.
- The VAS was used to measure subjects' level of pain intensity during cannula insertion time for both group subjects by using tool IV.
- The sessions were done during certain days (Sunday, Tuesday and Thursday)

and each session took about 15-20 minutes.

### Evaluation phase:

- Evaluation of all patients of both groups was carried out immediately after intervention using instrument II (vein assessment scale), instrument III (Visual Analogue Pain scale).
- A comparison between both groups was carried out to determine the effect of moist heat on vein's integrity and pain among patients receiving peripheral intravenous chemotherapy.

### Statistical analysis:

Data was fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, and standard deviation. Significance of the obtained results was judged at the 5% level .Two types of statistics were done:

**I. Descriptive statistics:** They were expressed as mean and standard deviation ( $X \pm SD$ ) for quantitative data or number and percentage (No & %) for qualitative data.

### II. Analytic statistics:

Pearson Chi-square test ( $\chi^2$ ): It is the test of significance used to study association between two qualitative variables. Student t- test (parametric test): is a test of significance used for comparison between two independent groups of normally distributed quantitative variables. Mann-whitney (non-parametric test): is a test of significance used for comparison

between two independent groups of not normally distributed quantitative variables. Paired sample t- test (parametric test): is a test of significance used for comparison between two related groups of normally distributed quantitative variables.

### Limitations of the Study:

No Limitation

### Results:

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**Table(1):** illustrated that the age of control group (n=50) ranged from 20 to 66 years with a mean of  $48.18 \pm 10.65$ , while in the study group it ranged from 25.0 to 61.00 years with a mean  $46.68 \pm 8.99$ . **Concerning Gender,** In the control & study group most of the sample were females with ( $p=0.532$ ). **Concerning marital status** most of control& study group were married, with ( $p=0.71$ ). **Concerning residence** in the control group 39 (78%) were from rural areas compared with 38 (76%) in the study group with ( $p=0.81$ ). **In relation to occupation**, only 15 (30%) of the control group were working compared with 18 (36%) in the study group with ( $p=0.52$ ). **Regarding level of education** the control group 13 (26%) were illiterate, 16 (32%) primary education, 13 (26%) secondary education and 8 (16%) high education; while in the study group 12 (24%) were illiterate, 12 (24%) primary education, 12 (24%) secondary education and 14 (28%) high education with ( $p=0.516$ ). There were no statistically significant differences between the study group and control group in relation to their Socio-demographic Characteristics.

**Table (2):** shows that **regarding to type of chemotherapy**, in the control group, 30 (60%) patient was on irritant chemotherapy compared with 21 (42%)

in the study group. In the control group, 7 (14%) patient was on exfoliate chemotherapy compared with 10 (20%) in the study group. Higher percentage of patients in the study group 8 (16%) were on vesicant chemotherapy compared with only 1 (2%) in the control group. In both groups 11 (22%) were on combination chemotherapy. ***Regarding chemotherapy duration***, less than a month: 1 (2%) vs 2 (4%) in control group and study group groups respectively; from 1 to 4 months 24 (48%) vs 27 (54%) respectively; from 5 to 6 months 15 (30%) vs 16 (32%) respectively; and more than 6 months 10 (20%) vs 5 (10%) respectively. ***regarding chemotherapy cycle***, in the control group, in 36 (72%) patients the chemotherapy cycle duration was every 21 days compared with 39 (78%) in the study group. There was no statistically significant difference in the overall distribution of chemotherapy as regard to (cycle, duration & type of chemotherapy between both groups).

**Table (3):** shows that all patients (100%) had history of cannulation. The overall distribution of site of previous cannulation showed no statistical significance between both groups ( $p=0.28$ ). All patients (100%) reported difficulty during previous cannulation. In the control group, previous cannulation resulted in complication(s) in 45 (90%) patients compared with 44 (88%) in the study group with no statistically significant difference ( $p=0.74$ ). In the control group, inflammation as a complication results from previous cannulation showed no statistical significance between both groups ( $p=0.55$ ).

**Table (4)** shows that the main VAS score in study and control group in First measure (pre- intervention) was ( $8.08 \pm 1.53$  &  $7.54 \pm 1.45$ ) respectively

with no statistical significant difference in the main VAS score between both groups before intervention ( $p=0.07$ ). While the main VAS score in study and control group in the second measure (post-intervention) was ( $3.32 \pm 0.95$  &  $7.50 \pm 1.48$ ) respectively with higher statistical significant difference ( $p < 0.001$ ).

There was an overall high statistically significant difference in the distribution of main pain score using VAS between pre& post-intervention in the study group ( $p=0.001$ ).

While in control group there was no statistically significant difference in the distribution of main pain score using VAS between pre& post-intervention ( $p = 0.64$ ).

Regarding VAS category (pre-intervention) revealed that study group (26) 52% while in control group (29) 58% had the higher percentage of patients with severe pain which was not significant ( $p=0.27$ ). While (post-intervention) revealed that study group had the higher percentage of patients with mild pain (33) 66% compared with control group ( $p < 0.001$ ). On the other hand, control group had statistically significantly higher percentage of patients with severe pain (29) 58% compared to study group ( $p < 0.001$ ).

**Table (5):** shows that before intervention, in both groups there were no overall statistically significant difference in the distribution of grades of vein assessment before intervention ( $p=0.19$ ).

After intervention, there were overall statistically significant difference in the distribution of grades of vein assessment after intervention ( $p=0.001$ ).

Post-intervention revealed that study group had statistically significantly lower percentage of patients with vein neither visible nor palpable ( $p<0.000$ ); and also had statistically significantly lower percentage of patients with vein is visible but not palpable ( $p<0.000$ ). Also, study group had statistically significantly higher percentage of patients with vein is visible and palpable ( $p<0.000$ ); and had statistically significantly higher

**Figure (2):** This figure presents the mean VAS score having a positive correlation with patients who had history of complications in previous cannulation.

**Figure (3):** This figure presents the mean VAS score having a positive

percentage of patients with vein is clearly visible and palpable ( $p<0.000$ ).

**Table (6):** In this study there was no significant ( $P$  value 0.06) association between vein assessment score of the study group and their baseline VAS score.

**Figure (1):** This figure presents the mean VAS score having a positive correlation with the duration of disease among study group patients.

**Figure (4):** This figure presents the mean vein assessment score having a positive correlation with the stage of disease.

**Table (1):** Distribution of studied subjects according to their socio-demographic characteristics.

Demographic characteristics	Studied groups				$\chi^2$	P value
	Study group (n=50)		Control group (n=50)			
	No.	%	No.	%		
<b>Age (years):</b>						
Mean±SD	46.68±8.99		48.18±10.65		t- test =	0.44
Range	25.0 – 61.0		20.0 – 66.0		0.76	NS
<b>Gender:</b>						
Male	16	32.0	20	40.0	0.69	0.40
Female	34	68.0	30	60.0		NS
<b>Marital status:</b>						
Single	3	6.0	2	4.0	1.34	0.71
Married	34	68.0	39	78.0		NS
Widowed	12	24.0	8	16.0		
Divorced	1	2.0	1	2.0		
<b>Residence:</b>						
Rural	38	76.0	39	78.0	0.05	0.81
Urban	12	24.0	11	22.0		NS
<b>Occupation:</b>						
Work	18	36.0	15	30.0	0.40	0.52
Not work	32	64.0	35	70.0		NS
<b>Education level:</b>						
Illiterate	12	24.0	13	26.0		0.51
Primary	12	24.0	16	32.0	2.28	NS
Secondary	12	24.0	13	26.0		
University	14	28.0	8	16.0		

n: number of specimens

t: student's t test

$\chi^2$ : chi square test

**Table (2):** comparison between Study and Control group regarding Characteristics of chemotherapy.

	Studied groups				$\chi^2$	P value		
	Study group (n=50)		Control group (n=50)					
	No.	%	No.	%				
<b>Type of chemotherapy:</b>								
Natural	0	0.0	1	2.0	8.56	0.07		
Irritant	21	42.0	30	60.0		NS		
Exfoliate	10	20.0	7	14.0				
Vesicant	8	16.0	1	2.0				
Combination	11	22.0	11	22.0				
<b>Duration of chemotherapy:</b>								
Less than a month	2	4.0	1	2.0	2.20	0.53		
From 1 to 4 months	27	54.0	24	48.0		NS		
From 5 to 6 months	16	32.0	15	30.0				
More than 6 months	5	10.0	10	20.0				
<b>Chemotherapy cycle duration:</b>								
Every 15 day	11	22.0	12	24.0	2.16	0.33		
Every 21 day	39	78.0	36	72.0		NS		
Others	0	0.0	2	4.0				

**Table (3):** comparison between Study and Control group regarding history of previous cannulation.

	Studied groups				$\chi^2$	P value		
	Study group (n=50)		Control group (n=50)					
	No.	%	No.	%				
<b>History of previous cannulation:</b>								
Yes	50	100.0	50	100.0	NA	NA		
No	0	0.0	0	0.0				
<b>Site of cannulation:</b>								
Veins of both hands	11	22.0	5	10.0	3.81	0.28		
Veins of both arms	4	8.0	3	6.0		NS		
Both hands and arms	19	38.0	27	54.0				
One arm and hand	16	32.0	15	30.0				
<b>Difficulty during cannulation:</b>								
Yes	50	100.0	50	100.0	NA	NA		
No	0	0.0	0	0.0				
<b>Complications of previous cannulation:</b>								
Yes	44	88.0	45	90.0	0.10	0.74		
No	6	12.0	5	10.0		NS		
<b>What complications:</b>								
Inflammation	14	31.8	13	28.9	2.06	0.55		
Pain	10	22.7	11	24.4		NS		
Occlusion	8	18.2	13	28.9				
Extravasation	12	27.3	8	17.8				

**Table (4):** comparison of Pain assessment using VAS before and after intervention among studied groups.

VAS score	Studied groups				Test of sig.	P value		
	Study group (n=50)		Control group (n=50)					
	Mean±SD Range	Mean±SD Range						
<b>VAS score:</b>								
First measure (pre- intervention)	8.08 ± 1.53 5.0 – 10.0		7.54 ± 1.45 5.0 – 10.0		t- test =1.80	0.07 NS		
Second measure(post- intervention)	3.32± 0.95 2.0 – 6.0		7.50± 1.48 5.0 – 10.0		t= 16.70	<0.001 HS		
<b>Paired t test</b>	27.18		0.46					
<b>P value</b>	<0.001 HS		0.64 NS					
<b>VAS category (pre- intervention):</b>	NO %		NO %		$\chi^2$ =	0.27		
Mild pain	0 0.0		1 2.0		3.88	NS		
Moderate pain	10 20.0		13 26.0					
Severe pain	26 52.0		29 58.0					
Extreme pain	14 28.0		7 14.0					
<b>VAS category (post- intervention):</b>					68.12	<0.001 HS		
Mild pain	33 66.0		0 0.0					
Moderate pain	17 34.0		15 30.0					
Severe pain	0 0.0		29 58.0					
Extreme pain	0 0.0		6 12.0					

**Table (5):** comparison of Vein assessment score before and after intervention among studied groups.

Vein assessment score	Studied groups				Test of sig.	P value		
	Study group (n=50)		Control group (n=50)					
	NO.	%	NO.	%				
<b>Vein assessment scale (pre- intervention):</b>								
Vein neither visible nor palpable	26	52.0	17	34.0	$\chi^2$ = 3.30	0.19 NS		
Vein is visible but not palpable	16	32.0	22	44.0				
Vein is barely visible and palpable	8	16.0	11	22.0				
<b>Vein assessment scale (post- intervention):</b>					68.02	<0.001 HS		
Vein neither visible nor palpable	0	0.0	17	34.0				
Vein is visible but not palpable	2	4.0	22	44.0				
Vein is barely visible and palpable	14	28.0	11	22.0				
vein is visible and palpable	18	36.0	0	0.0				
vein is clearly visible and palpable	16	32.0	0	0.0				

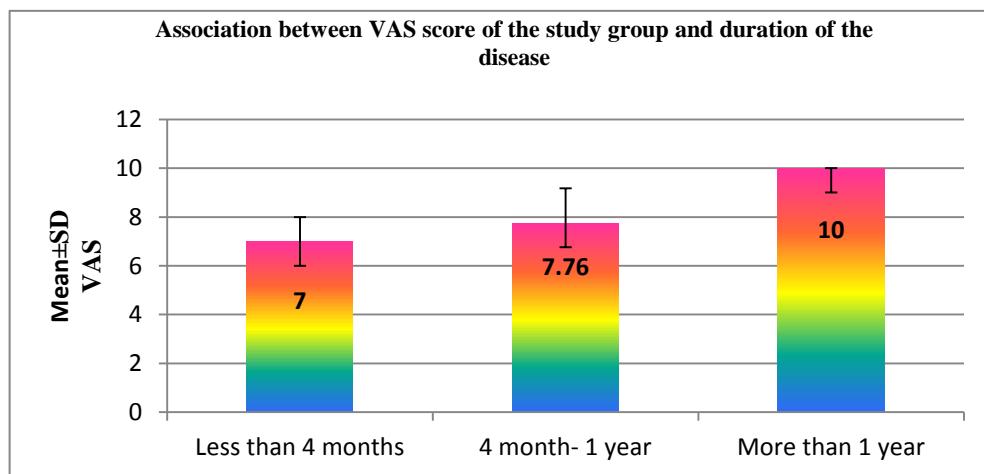
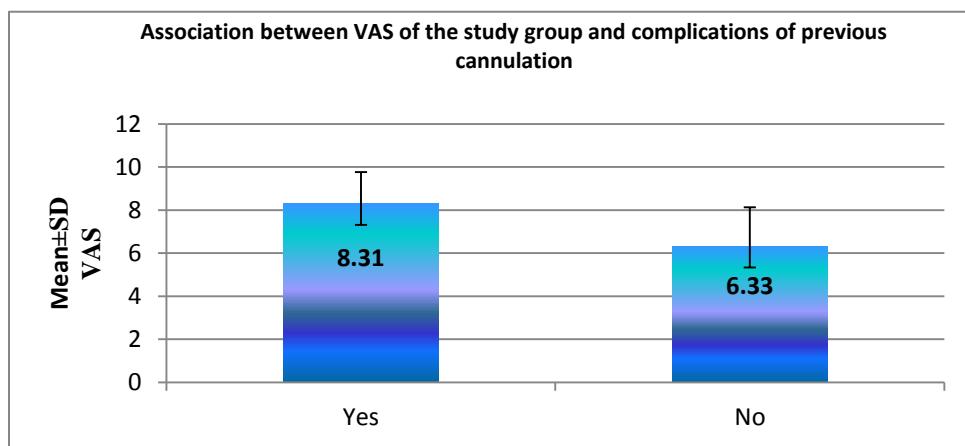
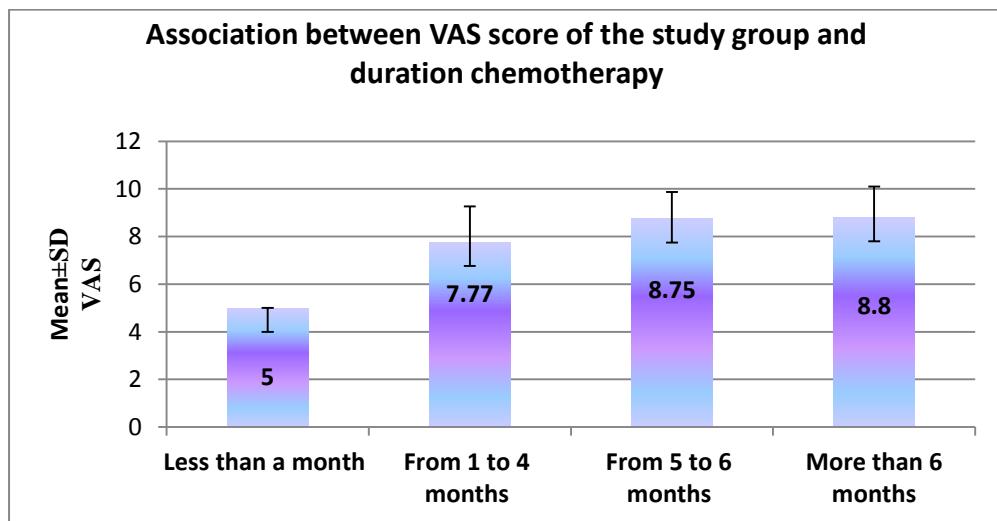


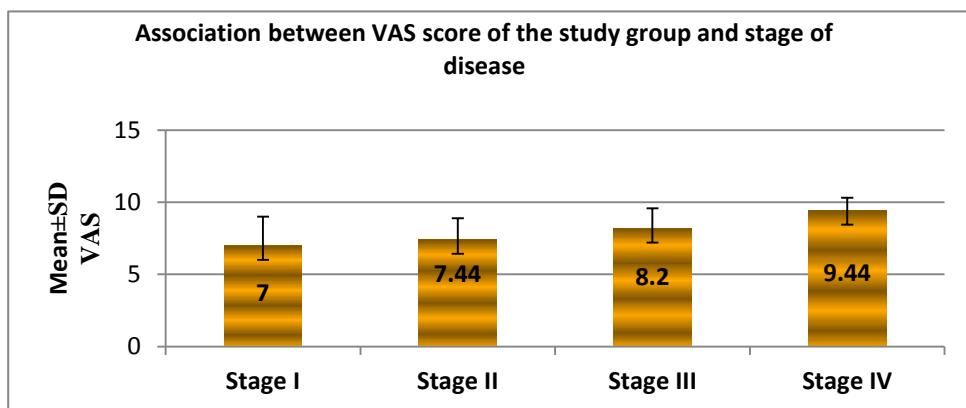
Figure (I): Association between VAS score of the study group and duration of the disease.



**Figure (2):** Association between vein assessment score of the study group and complication of previous cannulation.



**Figure (3):** Association between VAS score of the study group and duration of chemotherapy.



**Figure (4):** Association between VAS score of the study group and stage of disease.

**Table (6):** association between vein assessment scale of the study group and their baseline VAS score.

	Study group (n=50)	Test of sig.	P value
<b>Vein assessment scale:</b>			
Vein neither visible nor palpable	8.50±1.44	F=2.86	0.06
Vein is visible but not palpable	7.87±1.20		NS
Vein is barely visible and palpable	7.12±2.03		

## Discussion

The current study aimed to determine the effects of moist heat on venous integrity (visibility and palpability of peripheral veins) before peripheral venous cannulation for patients undergoing chemotherapy. The study also examined moist heat's effects on patients' pain related to IV insertion.

**Socio-demographic characteristics:** the present study presented that there were no significant statistical differences between studied groups in their socio-demographic Characteristics at the beginning of the study and this is consistent with Sarsar et al. (2019) studied the Effect of Moist Heat Therapy on Ease of Peripheral Venous Cannulation and Samra& Kumar. (2018) studied the Effectiveness of moist heat therapy on visibility, palpability, pricks and pain experienced while undergoing peripheral intravenous cannulation, showed that both groups were homogeneous with respect to sample characteristics and clinical variables. **Concerning gender,** the current study found that the majority of the studied patients were females but this is different from the results of Bayram&Caliskan. (2016) studied the "Effects of local heat application before intravenous catheter insertion in chemotherapy patient" and Sarsar et al. (2019) with "Study to Assess the Effect of Moist Heat Therapy on Ease of Peripheral Venous Cannulation among Patients Admitted in Selected Hospital of Ambala" mentioned that the majority of the studied groups were males.

The present study presented that **the mean age** of studied group and control group was 50, 48 years old respectively and this was in the same line with Simarpreeet et al. (2018) studied the "Effect of moist heat therapy on the

visibility and palpability of veins before Peripheral intravenous cannulation of patients undergoing chemotherapy" found that the mean age of the experimental group and control group was 48 years old. Conversely Kaur et al. (2011) studied the "Effect of 'Moist Heat Therapy' on the visibility and palpability of peripheral veins before peripheral venous cannulation of patients undergoing chemotherapy" observed that the mean age of their study and control groups was 51&60 years old. Regarding marital status, more than half of the present sample was married, which consistent with Sharaf. (2018) "The Effects of Local Warm Compresses on Peripheral Intravenous Cannulation of Patients Undergoing Chemotherapy." found that most of the participants were married.

**Concerning residence and occupation,** the majority of the subjects of the present study were living in rural area without work .These results came in the same line with Kaur et al. (2011) and Simarpreeet et al. (2018) while in contrast with the finding of Hassanein&Deif (2020) studied the "Effect of customized venipuncture nursing technique on selected responses and insertion difficulty among patients with blood disorders" mentioned that the main subjects were housewife living in urban area and Lalnunpuii et al. (2020) with "A Study to Assess the Effectiveness of Moist Heat Therapy before Intravenous Cannulation among Patients in A Selected Hospital" found that about half of the sampled patients had sedentary work. **Regarding the educational level,** the present study revealed that about one third of the studied participants had primary education. In this regard, Sharaf. (2018) "The Effects of Local Warm Compresses on Peripheral Intravenous Cannulation of Patients Undergoing Chemotherapy" found that about half of the studied participants read and write.

While, Samra& Kumar. (2018) showed that most of the intervention and control groups were having secondary education.

**Regarding previous cannulation,** the present study revealed that all of the studied participants had history of previous cannulation with almost half of them had no preferred site of cannulation this was in the same line with Lalnunpui et al. (2020) with “A Study to Assess the Effectiveness of Moist Heat Therapy Before Intravenous Cannulation Among Patients in A Selected Hospital” concluded that the most previous cannulation site was divided between cephalic and basilic of both hands and arms in contrast with Sarsar et al. (2019) who studied the “Effect of Moist Heat Therapy on Ease of Peripheral Venous Cannulation among Patients Admitted in Selected Hospital” who concluded that more than half of the patients were cannulated on the right arm on cephalic vein. **Regarding perceived difficulty and complication** from previous cannulation, the present study revealed that all of participants had previously perceived difficulty during cannulation and most of them experienced complications such as inflammation and extravasation this was in the same line with Sharaf. (2018) who studied “The Effects of Local Warm Compresses on Peripheral Intravenous Cannulation of Patients Undergoing Chemotherapy.” stated that about half of patients had experience of repeated attempts of cannulation. **Regarding chemotherapy type,** the present study showed that more than half of the studied groups were having irritant chemotherapy this was in the same line with Bayram&Caliskan. (2016) “Effects of local heat application before intravenous catheter insertion in chemotherapy patients” and Simarpreeet et al. (2018) who studied “Effect of moist heat therapy on the visibility and palpability of veins before Peripheral

intravenous cannulation of patients undergoing chemotherapy” showed that near half of subjects were receiving Paclitaxel and Carboplatin as a chemotherapy regimen. **Regarding duration of chemotherapy**, the present study showed that about half of the studied groups were between one and four months it was in the same line with Kaur et al. (2011) in contrast with Simarpreeet et al. (2018) who express that less than two third of subjects were getting chemotherapy with duration 1-11 21months. **Regarding chemotherapy cycle**, the present study showed that more than half of the studied group had a cycle every 21 day this was in contrast with Simarpreeet et al. (2018) showed that near to half of subjects were receiving chemotherapy cycle between 1-6.

The result of the current study had shown that there were highly statistically significant differences between pre and post-intervention **regarding pain** in study group. Pain significantly decreased with the use of moist heat on peripheral veins. Pain scores after PIV cannulation were decreased with moist heat and there was statistically significant differences between pre and post-intervention regarding pain. The results of the present study were going with the results of fink et al. (2009) studied “The impact of dry versus moist heat on peripheral IV catheter insertion in a hematology-oncology outpatient population” who illustrated that pain significantly decreased with the use dry heat. Pain scores after cannulation were lower with moist heat compared to previous cannulation without moist heat. Also, it was similar to the previous studies using heat modality to relief pain during cannulation by Hassanein&Deif et al. (2020) who studied “the effect of customized venipuncture nursing technique on selected responses and insertion difficulty among patients with

blood disorders” concluded the effectiveness of applying moist heat on peripheral veins to eliminate pain during cannulation. In congruence with the current finding Ahmed & Ali (2016) who “studied Best practices nursing guideline in phlebotomy for patient safety and quality improvement” reported that comfortable measure enhances accessibility to the venipuncture, which promotes patient comfort. The results of this study showed that a moist heat is an effective method for controlling pain associated with peripheral intravenous cannulation for chemotherapy patients. The recent results came in the same line as Sharaf et al. (2018). “The Effects of Local Warm Compresses on Peripheral Intravenous Cannulation of Patients Undergoing Chemotherapy.” concluded that there was a significant decrease in the pain scores in the patients in the intervention group as compared to those who did not receive warm compresses. In contrast Robinson – Reilly (2016) who studied “Venous access: the patient experience” found a little significant difference in pain scores between the two groups during cannula placement.

**In relation to improving vein visualization before peripheral intravenous cannulation in chemotherapy patients,** the current study hypothesized that Patients who had received moist heat application (study group) had more visible and palpable peripheral veins than patients who received routine cannulation (Control group). The result of the current study had shown that there were highly statistically significant differences between pre and post-intervention regarding vein score (visibility & palpability) in study group. This result were supported by Fink et al. (2009) studied “The impact of dry versus moist heat on peripheral IV catheter insertion in a hematology-oncology outpatient

population”. reported that in moist heat group the mean pre warming vein status was  $3\pm1.4$  and the mean status was  $3.8\pm1.2$  after the warming ( $t=4.88$ ,  $p=0.001$ ). In contrast study done Sharp et al. (2018) studied “The effect of oral hydration and localised heat on peripheral vein diameter and depth” concluded that localized heat has an inconsistent effect on vein diameter and depth. Another study by Yamagami et al. (2017) “Tourniquet application after local forearm warming to improve venodilation for peripheral intravenous cannulation in young and middle-aged adults”: showed that the combination of local warming for 15 min increased blood flow while the tourniquet application increased local vein stagnation. This overall caused higher vasodilation than conventional pressure alone. It was revealed that both the groups were statistically homogenous as per vein assessment scale ( $p=0.192$ ). The result of the current study had shown that there were highly statistically significant differences between study and control groups per interventional vein assessment score among study and control group.

The results were in the same line with Kaur et al. (2011) “Effect of 'Moist Heat Therapy' on the visibility and palpability of peripheral veins before peripheral venous cannulation of patients undergoing chemotherapy” illustrated that before intervention none of the patients had visible and palpable veins. After the intervention 40% subjects had clearly visible and easily palpable peripheral veins. One third had visible and palpable veins. Lenhardt et al. (2002) “Study to Assess the Effectiveness of Moist Heat Therapy Before Intravenous Cannulation Among Patients” reported that 70% patients in active warming and 30% patients in passive insulation groups were having vein assessment score  $> 3$  which shows significant difference

between visibility and palpability score of vein in both the groups ( $p \leq 0.0001$ ) and Simarpreet et al. (2018) "Effect of moist heat therapy on the visibility and palpability of veins before Peripheral intravenous cannulation of patients undergoing chemotherapy" and Sarsar et al. (2019) with "A Study to Assess the Effect of Moist Heat Therapy on Ease of Peripheral Venous Cannulation among Patients Admitted in Selected Hospital" supported the results.

In the same line of our results a study by Simón-López et al. (2021) studied the "Benefits of the application of heat and pressure on peripheral venous cannulation in adults" concluded that application of dry heat for 7 min what resulted in 1.92 times more effective than other methods.

### **Conclusions:**

Based on the findings of this study, it can be concluded that: Moist heat have a high significant effect on improving peripheral vein's integrity (visibility & palpability) among study group compared to control group undergone peripheral IV cannulation for chemotherapy administration. The pain score have been significantly improved among study group compared to control group after application of moist heat on peripheral veins before cannulation for chemotherapy administration.

### **Recommendations:**

Based on the findings of the present study, the following recommendations are derived and suggested:

#### **A. Recommendations for patients:**

- The moist heat can be used as a non-pharmacological management to improve vein visualization.
- The moist heat can be used as a non-pharmacological management to

alleviate pain sensation during cannulation.

- Practicing moist heat before peripheral cannulation can reduce the time, effort and cost of frequent cannulation.

#### **B. Recommendation for further researches:**

- The study should be replicated on larger samples at different settings to validate and generalize the findings.
- The same technique should be conducted on other targeted groups that could be compared with other interventions.
- The moist heat should be used across patients with different age groups and different diagnoses which requires frequent vein penetration.

### **References**

- Ahmed, H& Ali, L. (2016).** Best practices nursing guideline in phlebotomy for patient safety and quality improvement. IOSR J Nurs Health Sci 5:01–16.
- Ajibola, O., Fagbolagun, K&Folorunso, O. (2018).** Design and fabrication of a moist heat therapy device for treating nonspecific low back pain. The West Indian Journal of Engineering. 41 (1): 55-64.
- Arbaee, I. (2016).** Nurses knowledge and practice towards care and maintenance of. Qualitative Research, 1(3), 385–405.
- Bayram, S &Caliskan, N. (2016).** Effects of local heat application before intravenous catheter insertion in chemotherapy patients. Journal of Clinical Nursing; 25(10):1740-7.
- Bian, G., Kuwahata, H ., Raymond, B., & Foster, R. (2005).** Tea

tree/hydrogel dressing used in wound care .Rural Industries Research and Development Corporation. Available at  
<http://www.rirdc.gov.au/reports/TTO/05-114.pdf>

**Doellman, D., Hadaway, L., Bowe Geddes, L., LeDonne, J., Papke O'Donnell, L., Pettit, J., Schulmeister , L &Stranz , M. (2009).** Infiltration and extravasation. The Art and Science of Infusion Nursing; 32(4):203–211

**Farrell C, McCulloch E, Bellhouse S et al (2017)** Peripheral cannulae in oncology: nurses' confidence and patients' experiences. Cancer Nursing Practice. 16, 3, 32-38.

**Fink, R., Hjort, F., Wenger, B., Cunningham, M., Orf, A., Pare, W&Zwink, J. (2009).** The impact of dry versus moist heat on peripheral IV catheter insertion in a hematology-oncology outpatient population. OncolNurs Forum 36:198–204.

**Hassanein, S&Deif, H. (2020).** Effect of customized venipuncture nursing technique on selected responses and insertion difficulty among patients with blood disorders. Egypt Nurs J.17:23-35

**Ichimura, M., Sasaki, S&Ogino, T. (2020).** Tapping enhances vasodilation for venipuncture even in individuals with veins that are relatively difficult to palpate. ClinAnat 33:440–445.

**Kaur, M., Kaur, S& Pate, F. (2011).** Effect of 'Moist Heat Therapy' on the visibility and palpability of peripheral veins before peripheral venous cannulation of patients undergoing chemotherapy. Nursing and

Midwifery Research Journal, Vol-7, No. 3; 99:105.

**Keleekai, N., Schuster, C., Murray, C., King, M., Stahl, B., Labrozzi, L & Glover, K. (2016).** Improving nurses' peripheral intravenous catheter insertion knowledge, confidence, and skills using a simulation-based blended learning program: a randomized trial. Simul Healthcare 11:376.

**Lalnunpuii, R., Chetia, P &Iawim, R. (2020).** A Study to Assess the Effectiveness of Moist Heat Therapy Before Intravenous Cannulation Among Patients in A Selected Hospital, Guwahati, Assam. Int J Recent Sci Res. 11(02), pp. 37534-37537. DOI: <http://dx.doi.org/10.24327/ijrsr.2020.1102.5129>

**Leipheimer, J., Balter, M., Chen, A., Pantin, E., Davidovich, A., Labazzo, K&Yarmush M. (2020).** First-in-human evaluation of a hand-held automated venipuncture device for rapid venous blood draws. Technology 7:1–10.

**Lenhardt, R., Seybold, T., Kimberger, O., Stosier, B&Sessler, D. (2002).** Local warming and insertion of peripheral venous cannulation. BMJ. August. 325: 409-10.

**Osti, C., Khadka, M., Wosti, D., Gurung, G& Zhao, Q. (2019).** Knowledge and practice towards care and maintenance of peripheral intravenous cannula among nurses in Chitwan Medical College Teaching Hospital, Nepal. Nursing Open. 6:1006–1012.  
<https://doi.org/10.1002/nop2.288>

- Osti, C., Wosti, D., Pandey, B., & Zhao, Q. (2017).** Ventilator-associated pneumonia and role of nurses in its prevention. *Journal of Nepal Medical Association*, 56(208), 461–468. <https://doi.org/10.31729/jnma.3270>
- Pan, C., Francisco, M., Yen, C., Wang, S&Shiue, Y. (2019).** Vein pattern locating technology for cannulation: a review of the low-cost vein finder prototypes utilizing near infrared (NIR) light to improve peripheral subcutaneous vein selection for phlebotomy. *Sensors* 19:3573.
- Ray-Barruel, G., Carr, P., Frost, S., Inwood, S., Alexandrou, E., Higgins, N., Lin, F., Alberto, L., Mermel, L& Rickard, C. (2015).** International prevalence of the use of peripheral intravenous catheters. *Journal of Hospital Medicine*; 10(8):530-3.
- Robinson-Reilly, M., Paliadelis, P& Cruickshank, M. (2016).** Venous access: the patient experience. *Supportive Care in Cancer*; 24(3):1181–7.
- Rodriguez-Calero, M., Fernandez-Fernandez, I., Molero-Ballester, L., Matamalas-Masant, C., Moreno-Mejias, L., DePedro-Gomees,J., Blanco-Mavillard, I., & Morales-Asencio, J. (2018).** Risk factors for difficult peripheral venous cannulation in hospitalized patients. Protocol for a multicentre case-control study in 48 units of eight public hospitals in Spain. *BMJ Open*. 8, 10; 1:6.
- Sharp, R., Childs, J., DipSon, G., Bulmer, A& Esterman, A. (2018).** The effect of oral hydration and localised heat on peripheral vein diameter and depth: A randomised controlled trial. *Applied Nursing Research*. 42: 83–88
- Samra, A & Kumar, C. (2018).** Effectiveness of moist heat therapy on visibility, palpability, pricks and pain experienced while undergoing peripheral intravenous cannulation of patients. *International Journal of Health Sciences and Research*; 8(7):192-9
- Sarsar, A., Kumari, V., Sharma, T& Sarin, J. (2019).** An Experimental Study to Assess the Effect of Moist Heat Therapy on Ease of Peripheral Venous Cannulation among Patients Admitted in Selected Hospital of Ambala, Haryana. *International Journal of Health Sciences & Research*; Vol.9; Issue: 1:104-5
- Sharaf, A. (2018).** "The Effects of Local Warm Compresses on Peripheral Intravenous Cannulation of Patients Undergoing Chemotherapy." *Journal of Nursing and Health Science (IOSR-JNHS)*, vol. 7, no. 06, pp. 01-13.
- Simarpreet, K., Ruchika, R., Prabhjot, S., & Jasbir, K. (2018).** Effect of moist heat therapy on the visibility and palpability of veins before Peripheral intravenous cannulation of patients undergoing chemotherapy. *International Journal of Advanced Research*; 6(2): 230-236
- Simón-López, L., Luquero-Bueno, S., Ovejero-Benito, M., Cuesta-Lozano, D., Goodman-Casanova, J .,Vargas-Castrillón, E „Mazarro, D „, Miguel-Cáceres, A „Posada-Moreno, P „, Zaragoza-García, I &Ortuño Soriano, I. (2021).** Benefits of the application of heat and pressure on peripheral venous cannulation in adults: A randomized controlled trial. *J AdvNurs*. 77:1533–1545.
- Sou V, McManus C, Mifflin N, Frost SA, Ale J, Alexandrou E. A clinical pathway for the management of difficult venous access. BMC. 2017; 16(1):1–7.**

**Urbanetto Jde, S., Peixoto, C., & May, T.** (2016). Incidence of phlebitis associated with the use of peripheral IV catheter and following catheter removal. *Revista Latino-Americana De Enfermagem*, 24,e2746.<https://doi.org/10.1590/15188345.0604.2746>

**Webster, J., Morris, H., Robinson, K& Sanderson, U.** (2007). Development and Validation of a Vein Assessment Tool (VAT) *Australian Journal of Advanced Nursing*; 24(4): 5-7

**Yamagami, Y., Tomita, K., Tsujimoto, T., & Inoue, T.** (2017). Tourniquet application after local forearm warming to improve venodilation for peripheral intravenous cannulation in young and middle-aged adults: A single-blind prospective randomized controlled trial. *International Journal of Nursing Studies*, 72, 1–7. <https://doi.org/10.1016/j.ijnurstu.2017.01.016>