

# Peripheral venous thrombophlebitis risk and the role of hand washing

*Neopane A<sup>1\*</sup>*

<sup>1</sup>*Department of Medicine, Kathmandu Medical college Teaching Hospital, Kathmandu, Nepal*

## ABSTRACT

**Background:** Thrombophlebitis is an important complication of peripheral vein cannulation. Various factors are known to increase the risk of thrombophlebitis and have been studied by different authors. Regarding factors leading to risk reduction of thrombophlebitis aseptic measures taken during insertion has been an important factor. However handwashing and its role in reducing the incidence of thrombophlebitis have not been studied. The objective of this study was to find the risk reducing role of hand washing in incidence of thrombophlebitis

**Methods:** A prospective observational hospital based study was designed and conducted among patients admitted for intravenous medication or infusion and needed cannulation. They were followed and evaluated for various risk factors and onset of thrombophlebitis. Results expressed as relative risk and odds ratio.

**Results:** Hand washing is the single most important risk reducing factor for development of peripheral vein thrombophlebitis in patients in whom peripheral vein cannulation is done. The odds ratio of developing thrombophlebitis in hand washing group was only 0.25 (95% CI .07-.82) and RR was 0.78 (95% CI.64-.94) with  $p=.017$ .

**Conclusion:** Six step hand washing was the single most useful factor for reducing the risk of thrombophlebitis.

**Keywords:** Peripheral vein cannulation; thrombophlebitis; sepsis; hand washing,

### \*Corresponding Author:

Dr Arpana Neopane  
Associate Professor  
Department of Medicine  
Kathmandu Medical College  
Sinamangal, Kathmandu  
Email: arpana.neopane@gmail.com

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### Background:

Intravenous cannulation is used for the administration of intravenous medication, fluids, blood and forms integral part of medical inpatient ward.<sup>1</sup> But very often it is complicated by thrombophlebitis which is self limiting inflammation and thrombosis of superficial veins characterized by pain redness and swelling and venous obstruction.<sup>2</sup> It is most

common cause of fever and prolonged hospital stay after the recovery from the primary disease. It has both patient-related implications like sepsis and economic consequences like extra nursing time. Thus adds to the morbidity and economic burden to the patients. Studies show that the incidence of thrombophlebitis in hospitalized patients is quite high and the rate varies from 5.3% to 77.5%.<sup>2,3</sup> Although various studies have highlighted the importance of

following strict asepsis before insertion to decrease the risk of thrombophlebitis<sup>5,6</sup> none have addressed the role of six step hand washing. Hence a prospective study was designed to evaluate the effect of hand washing in decreasing the risk of peripheral vein thrombophlebitis. As various factors are known to increase the incidence of thrombophlebitis<sup>7-9</sup> this study was also done to evaluate the role of factors like site and place of catheter insertion, cannula material, drugs used, duration of catheterization and associated co morbidity like diabetes.

**Methods:** Prospective observational study was carried out. The study was conducted in the in- patient ward of department of medicine of a Medical college located in Kathmandu, Nepal. A total of 100 patients were enrolled in the study done in the month of June 2011.

Patients to be admitted to the medical wards needing intravenous cannula were cannulated randomly at the emergency (ER) or the ward as the clinical situation demanded. All the cannulating nurses were detailed about the nature of the study almost one week before case collection and were asked to follow strict aseptic precautions in the following sequence: shaving the area, then six step hand washing, cleaning with spirit, then betadine. The cannula used was not standardized and depending on the availability, two types were used: B Braun and BD venflon as brought by the patient party. The adhesive dressing was also not specified and used as per availability. Then duty doctors involved in the study entered the patient in the performa prepared and made detailed record of the following variables: Age, Sex, Diagnosis, cannula type, size of cannula, ward or ER insertion and aseptic precautions before insertion: shaving of the area, hand wash, spirit cleaning, betadine cleaning, adhesive used, site of cannula insertion without making the inserter biased on a particular site. Then two medical officers responsible for the follow up inspected and palpated the insertion site every day to pick the signs of thrombophlebitis. Appearance of phlebitis was defined as: appearance of redness, pain and tenderness with or without swelling at the site of cannula insertion and along the vein, with or without fever and blockage of the intravenous flow. Every day evaluation was done for redness, tenderness, swelling, fever, and obstruction at the insertion site and noted as appearance on d1 (24hrs), d2 (48hrs) etc. Cannulation was maintained on heparin lock or with fluid infusion. Type of infusate and medication given were also noted. Data was analyzed using SPSS version 17. Risk of developing thrombophlebitis was expressed as Odds Ratio (OR) and Relative (RR). Different variables were compared

with chi squared test with p value <0.05 taken as significant.

**Results:** Mean age of the study cohort was 47.46±21.28. Females outnumbered the males and ratio was 1.3:1. A significant number of patients (79%) developed thrombophlebitis highlighting the severity of the problem in our setting. Females developed significantly more (p=0.06) thrombophlebitis than the male. Shaving the site of insertion was only done in 2 cases. Spirit cleaning was done in all. Betadine cleaning was done in 23% and hand washing was only done in 58%, inspite of strict instruction to do it before each cannulation. The most significant measure of asepsis to decrease the risk of thrombophlebitis was hand washing (p=0.017) as shown in Table 1.

**Table1: Relation of Patient characteristics, material and technique to thrombophlebitis**

Characteristics		N=100	Thrombophlebitis present(N=79)	P value
Sex	Female	56	48	0.063
	Male	44	31	
Diagnosis	Diabetic	22	17	0.822
	Non diabetic	78	62	
Cannula	B Braun	88	70	0.71
	BD	12	9	
Cannula size	18	6	6	0.315
	20	92	71	
	22	2	2	
Site of insertion of cannula	At and above the elbow	20	16	0.903
	Below the elbow	80	63	
Place of insertion	Ward	77	61	0.912
	Emergency	23	18	
Hand washing: Done	Done	58	41	0.017
	Not done	42	38	
Betadine cleaning: Done	Done	23	16	0.206
	Not done	77	63	
Adhesive used	Type 1(easyfix)	67	52	0.67
	Adhesive tape	33	27	

The odds ratio of developing thrombophlebitis in hand washing group was only 0.25 (95%CI = 0.07-0.82) and RR was 0.78 (95% CI = 0.64-0.94). The RR of thrombophlebitis

being absent in hand washing group was 3.1(95%CI = 1.1-8.4). Other risk factors for thrombophlebitis are shown in Table 2.

**Table 2: Risk of developing thrombophlebitis**

Variables	Odds Ratio (95% CI)	Relative Risk (95% CI) Thrombophlebitis present	Relative Risk (95% CI) Thrombophlebitis absent
Sex	2.5(.94-6.8)	1.2 (.98-1.5)	.48(.2-1.1)
Cannulation site Aboveelbow/ below elbow	.72(.28-1.8)	.93(.76-1.1)	1.3(.60 -2.8)
Place of cannulation (Ward/ER)	1.1 (.34-3.2)	1.01(.8-1.3)	.96(.4-2.6)
Type of cannula BB/BD	1.3 (.32-5.3)	1.1 (.75-1.5)	.82 (.28-2.4)
handwashing Yes/No	.25 (.07-.82)	.78(.64-.94)	3.1(1.1-8.4)
Betadine cleaning Yes/ NO	.51(.18-1.5)	.85(.64-1.1)	1.7(.77-3.6)
Adhesiveused Type 1/Type 2	.77 (.27-2.3)	.95 (.77-1.2)	1.2(.5-2.9)
Allmethodsof asepsis done Yes/No	.58 (.14-2.5)	.87(.58-1.3)	1.5(.53-4.2)
Diabetes Yes/No	.88 (.28-2.7)	.97(.76-1.3)	1.1(.46-2.7)

Regarding signs of thrombophlebitis, fever was present in 38%, redness and tenderness in 74.7%, swelling with tenderness and redness in 57 %, and obstruction leading to removal of the cannula 12.7 %. Surprisingly the thrombophlebitis was detected even after 24 hours though the maximum cases were detected after 48 hours. The incidence decreased after the 72 hrs. The site of the cannula insertion showed that insertion at and above the elbow (cubital fossa) was associated with less risk of thrombophlebitis than below elbow RR = 1.3 (95%CI = 0.60 -2.8).The odds of developing thrombophlebitis with cannula at (cubital fossa) and above elbow was only 0.72(95%CI = 0.28-1.8) and the RR was 0.93 (95%CI = 0.76-1.1). Regarding the infusate used, dextrose based fluid (not shown in table) was associated with increased incidence of thrombophlebitis (p=0.067). Heparin lock and drugs used did not seem to

affect the incidence of thrombophlebitis. Diabetes was not associated with significant increase in incidence of thrombophlebitis.

**Discussions:** Thrombophlebitis is a very common condition in our setting. Measures to decrease its incidence will save a lot of time and money for the patient and the health care institution both. A simple process of asepsis followed before cannulation leads to decrease in the incidence of thrombophlebitis.<sup>10-12</sup> Our study is unique as it has studied and has shown the positive role of six step hands washing before cannula insertion in decreasing the incidence significantly. However the lack of motivation on the part of the nurses for handwashing, was worrying. Similar results regarding non interest for hand washing was shown in other studies.<sup>13,14</sup> This shows that inspite of handwashing being the single most important method to decrease any type of health care associated infection; we have not been able to highlight the importance of hand washing to our staffs.

Different studies have shown various other risk factors for thrombophlebitis<sup>1</sup> Duration of cannulation is a very important risk factor <sup>15,16</sup> and the incidence rises after 48 hrs. Our study however has shown that although the risk sharply rises after 48 hrs, it also can occur within 24 hrs if the aseptic method is not proper. Size of cannula and the type of cannula were not very significant, though the risk of phlebitis was more with a particular cannula type as also shown by other studies.<sup>16,17</sup> Various studies have shown effect of regular change of cannula,<sup>15,16</sup> infusate used,<sup>18,19</sup> length of the cannula, site of cannulation on thrombophlebitis.<sup>20-22</sup> We have also evaluated the some of these risk factors. Interestingly our study also showed that the female gender was predisposed to develop thrombophlebitis as shown by previous studies.<sup>23,24</sup> However the most significant risk reducing factor was hand washing. Drawback of our study was that we have not shown the combined effect of all factors on risk of phlebitis. We also have not calculated the cannula survival time with various variables.

**Conclusion:** Hand washing before insertion of intravenous cannula is the single most important factor that reduces the risk of thrombophlebitis significantly.

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**Conflict of interest: none**

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