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PREVALENCE OF CATHETER-RELATED PHLEBITIS AND RELATED FACTORS IN CAN THO UNIVERSITY OF MEDICINE AND PHARMACY HOSPITAL

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ABSTRACTS

Background: *Peripheral intravenous catheters (PIVCs) are widely used for medication, fluid, and transfusion administration; however, they are frequently associated with complications, particularly phlebitis. Phlebitis can cause pain, local inflammation, catheter failure, and may lead to treatment interruption and prolonged hospitalization, highlighting the need for reliable and systematic monitoring. The Visual Infusion Phlebitis (VIP) score offers a validated and standardized method for early detection and assessment of catheter-related phlebitis.* ***Objectives:*** *This study aimed to determine the prevalence of phlebitis and related factors among patients at Can Tho University of Medicine and Pharmacy Hospital.* ***Materials and methods:*** *A cross-sectional descriptive study was conducted among 307 inpatients at Can Tho University of Medicine and Pharmacy Hospital. Eligible participants were aged 18 years or older and had a PIVC in place for at least 24 hours. Data collection included demographic and clinical information obtained through structured survey forms, direct observation of catheter sites, and review of medical records. Phlebitis was assessed according to the VIP scale.* ***Results:*** *Among 307 patients, the majority were over 50 years of age (67.8%), female (54.1%). Most catheters were inserted in the upper extremities (95.4%) for transfusion purposes (96.7%). The overall prevalence of phlebitis was 27.4%. Among the 84 patients with phlebitis, 95.2% were classified as grade 1, while grades 2 and 5 accounted for 3.6% and 1.2%, respectively. No cases of grade 3 or 4 were observed. Prolonged catheter dwell time (≥3 days), use of an open infusion system, and non-specialized dressings were significantly associated with an increased risk of phlebitis.* ***Conclusion:*** *Phlebitis remains a common complication of PIVCs, although most cases were mild (grade 1). Enhanced monitoring using the Visual Infusion Phlebitis (VIP) scale, avoiding prolonged catheter dwell time, employing a closed infusion system, and adhering to standardized dressing changes are essential to minimize complications.*

Keywords: *Peripheral intravenous catheter, phlebitis, Visual Infusion Phlebitis score, catheter-related complications.*

I. INTRODUCTION

Peripheral intravenous catheter (PIVC) insertion is among the most common invasive procedures in healthcare, providing vital access for medication, fluid, and therapy administration. An estimated 60%–90% of hospitalized patients require a PIVC [1]. However, complications are frequent; Thompson et al. reported a 36% PIVC failure rate, with phlebitis accounting for 12% of cases. PIVC-associated bloodstream infections

(PVCA-BSIs) markedly increase mortality (12.21% vs. 4.53%) and prolong hospital stays by 62% compared with non-infected patients [2].

Several studies have investigated the prevalence of phlebitis using the Visual Infusion Phlebitis (VIP) scale. Chu Thi Quy et al. reported a 25.9% incidence among patients with PIVCs, mostly grades 1 and 2 [3]. Similarly, Vo Thi Phuong Anh et al. observed a 7.9% rate of local inflammation, predominantly grade 1 [4]. Rosenthal reported a phlebitis incidence of 2.65 per 1,000 catheter-days, highlighting the clinical significance of catheter-related complications [2]

Reliable monitoring is essential for early detection of PIVC complications. The Visual Infusion Phlebitis (VIP) score demonstrates excellent inter-observer reliability (ICC = 0.906, $p < 0.001$) and effectively guides clinical assessment [5]. Regular use of the VIP score with preventive measures significantly reduces catheter-related complications [6]. Given the widespread use of PIVCs, this study aimed to determine the prevalence of catheter-related phlebitis and related factors among patients at Can Tho University of Medicine and Pharmacy Hospital, thereby providing reliable evidence to inform effective interventions to reduce phlebitis risk, improve the quality of care and enhance patient safety.

II. MATERIALS AND METHODS

2.1. Study design and setting

A cross-sectional descriptive study was conducted among inpatients at Can Tho University of Medicine and Pharmacy Hospital.

- Study population: Eligible participants were inpatients aged ≥18 years who had a peripheral intravenous catheter (PIVC) in place during hospitalization. Patients with a PIVC dwell time of less than 24 hours at the time of assessment were excluded.

- Sample size: The sample size was calculated using the formula $N = Z^2_{1-\alpha/2} \frac{p(1-p)}{d^2}$ where N is the minimum sample size, Z = 1.96 at $\alpha = 0.05$, d = 5%, and p = 26.7% based on Vu Thi Dao [7]. The required sample size was 301 patients.

2.2. Data collection and analysis

Data were collected using a structured survey form through convenient sampling. The form included demographic information, clinical characteristics, and the Visual Infusion Phlebitis (VIP) score developed by Jackson [8] to assess phlebitis. The VIP score is a standardized clinical tool widely used in practice and research to detect early signs of infusion-related phlebitis and to guide timely catheter management. It provides an objective framework for systematic assessment of PIVC sites based on observable local inflammatory signs. In this study, PIVC sites were assessed by direct inspection and gentle palpation under adequate lighting conditions. The assessment focused on the presence of pain or tenderness at or along the cannula site, erythema, swelling, induration, palpable venous cord, and systemic manifestations such as fever. Evaluations were performed by trained nursing staff to ensure inter-rater consistency, and findings were documented immediately on the data collection form. The VIP score consists of six graded levels of phlebitis severity, defined as follows:

- Score 0 - No signs of phlebitis.
- Score 1 - One of the following: slight pain or slight redness near the IV insertion site.
- Score 2 - Two of the following: pain at the IV site, redness, or swelling.
- Score 3 - Pain along the path of the cannula, redness around the insertion site, and swelling.

- Score 4 - Pain along the path of the cannula, redness around the insertion site, swelling, and a palpable venous cord.

- Score 5 - Pain along the path of the cannula, redness around the insertion site, swelling, a palpable venous cord, and pyrexia.

- Statistical analysis: Data were analyzed using SPSS version 20.0. Descriptive statistics were used to summarize patient characteristics and the prevalence of phlebitis. Associations were determined using Chi-square or Fisher's exact tests, odds ratios (OR), and 95% confidence intervals (CI).

- Ethical approval: The study protocol received ethical approval from the Ethics Committee in Biomedical Research at the University of Medicine and Pharmacy (Approval No. 23.065.GV/PCT-HDDD, dated Dec 25th, 2024).

III. RESULTS

A total of 307 inpatients were included in the study. The majority were admitted to surgical departments (57.6%), followed by medical departments (27.4%) and other departments (15.0%). More than half of the participants had a hospital stay of fewer than five days (56.7%), while 30.3% remained for five to ten days and 13.0% for more than ten days. Most patients were over 50 years of age (67.8%), 23.8% were between 30 and 50 years, and 8.4% were under 30 years. Females comprised a slightly higher proportion of the sample (54.1%) compared with males (45.9%). Most catheters were inserted for transfusion (96.7%), while 2.3% had no specified indication. The upper extremities were the predominant insertion site (95.4%), with a small proportion in the lower extremities (3.6%) and other sites (1.0%).

3.1. Prevalence of phlebitis among patients

Table 1. Prevalence of phlebitis according to the VIP score (N = 307)

Phlebitis	N	%
No	223	72.6
Yes	84	27.4
Total	307	100.0

Among the 307 patients with peripheral intravenous catheters, the incidence of phlebitis was 27.4%.

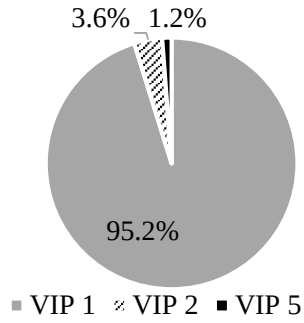

Figure 1. Distribution of phlebitis by VIP score (n = 84)

Among 84 patients with phlebitis, 95.2% were classified as grade 1, while grades 2 and 5 accounted for 3.6% and 1.2%, respectively. No cases of grade 3 or grade 4 phlebitis were recorded.

3.2. Related factors of phlebitis in patients

Table 2. Factors related to the occurrence of phlebitis among patients

Characteristics		Phlebitis n (%)	Non-phlebitis n (%)	P*	OR
Age (years)	<30 (reference)	9 (34.6%)	17 (65.4%)		
	30 – 50	17 (23.3%)	56 (76.7%)	0.263	0.573 (0.217 – 1.520)
	>50	58 (27.9%)	150 (72.1%)	0.475	0.730 (0.308 – 1.730)
Sex	Male	37 (26.2%)	104 (73.6%)	0.685	1.110 (0.670 – 1.839)
	Female	47 (28.3%)	119 (71.7%)		
Department	Medical (reference)	35 (41.7%)	49 (58.3%)		
	Surgical	33 (18.6%)	144 (81.4%)	<0.001	0.321 (0.180 – 0.570)
	Others	16 (34.8%)	30 (65.2%)	0.443	0.747 (0.351 – 1.574)
Length of stay (days)	< 5	34 (19.5%)	140 (80.5%)	<0.001	2.481 (1.485 – 4.145)
	>5	50 (37.6%)	83 (62.4%)		

* *Fisher exact test*

Phlebitis showed no association with age or sex but occurred less frequently in surgical departments. A hospital stays exceeding five days increased the risk by 2.48 times.

Table 3. Association between catheter characteristics and phlebitis

Characteristics		Phlebitis n (%)	Non-phlebitis n (%)	P	OR
Purpose of catheter placement	Infusion	80 (26.9%)	217 (73.1%)	0.470**	1.808 (0.497 – 6.575)
	Prophylaxis/Not specified	4 (40%)	6 (60%)		
Insertion site	Upper extremities	78 (26.6%)	215 (73.4%)	0.183*	2.067 (0.695 – 6.147)
	Others	6 (42.9%)	8 (57.1%)		
Catheter system	Close	45 (20.5%)	175 (79.5%)	<0.001*	3.160 (1.851 – 5.393)
	Open	39 (44.8%)	48 (55.2%)		
Catheter dwell time (days)	1 – 2 (reference)	35 (17.9%)	160 (82.1%)		
	3 - 4	45 (42.1%)	62 (57.9%)	<0.001*	3.318 (1.953 - 5.638)
	> 5	4 (80%)	1 (20%)	0.010**	18.286 (1.983 - 168.635)
Dressing	Specialized (reference)	52 (26.4%)	145 (73.6%)		
	Non-specialized	5 (62.5%)	3 (37.5%)	0.040**	4.647 (1.073 - 20.132)
	Specialized film	27 (26.5%)	75 (73.5%)	0.989*	1.004 (0.584 – 1.726)

* *Chi square;* ** *Fisher exact test*

Phlebitis was not associated with the purpose or site of catheter insertion. Use of an open system increased the risk more than threefold ($p < 0.001$). Catheter dwell time ≥3 days and use of non-specialized dressings significantly elevated the risk ($p < 0.05$).

IV. DISCUSSION

4.1. Prevalence of phlebitis among patients

Our study found a relatively high phlebitis prevalence of 27.4% based on the VIP scale, most cases (95.2%) were classified as grade 1. This aligns with previous research reporting the predominance of mild phlebitis. Lam Thi Nhung et al. observed a 30.4% incidence with 70.1% grade 1 cases [9], while Chu Thi Quy et al. reported 25.9% [3]. In contrast, Vo Thi Phuong Anh et al. noted a lower rate of 7.9%, with most cases also being grade 1 [4].

In international contexts, studies have shown wide variations in the prevalence and severity of PIVC-related phlebitis. Marsh et al. reported a prevalence of 12% [10], and Simões et al. documented 6.1% [11], both lower than in our study. Simões et al. found grade 2 phlebitis most common (48.7%), followed by grade 3 (11.3%) [11]. In contrast, Marimuthu et al. reported a much higher prevalence of 68.7% among patients with Venflon catheters, mostly grade 1 (80.3%) [6], while a study in Ethiopia found 70%, with grades 3 and 4 accounting for 51% and 33%, and grade 5 for 1.5% of cases [12]

Despite varying reports, phlebitis remains clinically significant, potentially prolonging hospitalization and worsening outcomes [1]. The high incidence in our study emphasizes the need for improved catheter care and monitoring. While grade 1 phlebitis predominated and typically required only observation, inadequate management may lead to progression.

4.2. Related factors of phlebitis in patients

Our study found no significant association between PIVC-related phlebitis and patients' age or sex. This contrasts with Vo Thi Phuong Anh et al., who reported a higher risk among patients aged over 70 years [4], possibly due to differences in age classification. Our findings align with Simões et al. regarding sex but differ from Lulie, who found a higher incidence of phlebitis in females ($p = 0.002$) [11, 12]. Furthermore, the findings showed that the use of an open catheter system increased phlebitis risk more than threefold compared with a closed system. In contrast, Galang et al. [13] found no significant difference, whereas López et al. [14] reported similar results, underscoring the importance of closed systems in minimizing inflammation and infection. The present study also showed that a catheter dwell time of $\geq$3 days significantly increased phlebitis risk, consistent with findings by Lulie and Bach Thi Hoa [12, 15]. Therefore, nurses should closely monitor catheter sites and replace catheters promptly to reduce this risk. Overall, these results suggest that device- and procedure-related factors, rather than patient demographics, play a more crucial role in the development of PIVC-related phlebitis.

V. CONCLUSION

This study found a 27.4% incidence of phlebitis among patients with PIVC, predominantly of mild severity. The identified risk factors included the use of an open catheter system, catheter dwell time of $\geq$3 days, use of non-specialized dressings, and hospital stay of more than five days. Enhanced monitoring using the VIP scale, the use of closed catheter systems, regular catheter replacement, and adherence to standardized dressing protocols are essential to reduce the risk of PIVC–related phlebitis.

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