Research article

Factors Contributing To Phlebitis Among Patients Admitted In Medical-Surgical Units At Tertiary Care

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LMRJ.2020:2(2)
DOI: 10.3810/LMRJ.2020.2.2.03
Received: 2 April 2020,
Revised:14 May 2020,
Accepted for publication 19 May 2020

Abstract

In the health care settings, there is a constant use of peripheral venous catheters for different purposes, however, its use is not risk-free. This study aimed to assess the risk factors and identify prevalence of phlebitis amongst adult patients admitted in the Medical-Surgical units at Liaquat University Hospital Hyderabad. A descriptive cross sectional study was conducted. Data was collected from Medical-Surgical units at Liaquat University Hospital Hyderabad in three months. Questionnaire was used as a data collection tool consisting of 25 questions for the different categories. A total of 246 subjects, having 59.8% male and 40.2% females with the average age of 75.77 years, participated in study. Phlebitis grade 2 & 3 appeared to be more common in age between 18 to 70 years with average percentage of 41.1and 40.2 respectively. Statistically, Hepatitis C virus and pyrexia found significantly associated with development of phlebitis. The study concluded that high rate of phlebitis grade II & III in the study population.

Keywords: Infusion, Risk Factors, Phlebitis, Short Peripheral Catheter

Introduction

Phlebitis is an intravenous infection and a significant public health issue with prevalence rate of 20% in Pakistan, 27.7% in India and 4% in United States of America. The use of peripheral venous catheters for various purposes is constant in health care settings. However, its use is not risk-free. Most common local complication reportedly include phlebitis, and its occurrence ranges from 4.5% to 60% depending on the different settings.[1] In patients with intravenous treatment, Phlebitis ranks third among in-hospital complications. This complication also causes functional impairment of the affected part presenting with pain, swelling, heat, flushing of the venous canal and adjacent tissues.2

The pathophysiology of phlebitis has had many hypotheses. The theory widely accepted is catheterization leading to vein pain, inflammation of tunica intima, and possible development of thrombus.3 A major role in developing phlebitis would be the catheter type, the insertion site, skin preparation method, site dressing, the method of fixing catheter, length of the catheter, frequency of exchange, irritating drugs, infusion rates, catheter fixation dressings, catheter placement procedures, and staff skills. Phlebitis clinical manifestations are pain, swelling, erythema and palpable catheterized vein thrombosis.4,5 Replacement of intravenous peripheral cannulas to reduce the phlebitis development in adult patients every 72 to 96 hours.6,7 A possible risk of infection includes manual dexterity, technical skills, expertise of pharmaceutical therapies, and familiarization with vascular system intravenous anatomy and physiology.8 The frequently catheter use puts patients at risk and expose to a series of complications. These intravenous catheterization risks and complications can affect the clinical condition, well-being and potential result of a patient who needs to have a peripheral catheter inserted in another location.9 Intravenous catheter replacement causes patient discomfort and can lead to permanent damage of affected veins, longer hospitalization, increased cost and treatment, and possible death if complications occur.10

The Visual Infusion Phlebitis Score (VIPS), which assesses presence, severity and location of phlebitis. A value of 0 means there are no phlebitis signs; 1, first probable sign of phlebitis; 2, early phlebitis stage; Scales 3, 4 and 5 show moderate phlebitis, advanced phlebitis/ thrombophlebitis or advanced thrombophlebitis.4,11 Many institutions in the country may not be use a scale to assess phlebitis. It is important to determine the phlebitis rate and the risks to facilitate the measurement.12

There is a dearth of information on studies of phlebitis factors in Pakistan. The study may help to assess and inform healthcare professionals about the factors that contribute to phlebitis. This data will be useful for healthcare systems to improve patient outcome and to reduce the length of stay of patient, reducing the costs for healthcare and subsiding the discomfort among patients that will ultimately decrease burden of disease. The objectives of the study were to assess the risk factors for phlebitis and to identify the prevalence of phlebitis among adult patients admitted in Medical-Surgical units at Liaquat University Hospital Hyderabad.

Materials and methods

A descriptive cross-sectional study was carried out at medical-surgical units I, II, III & IV at Liaquat University Hospital Hyderabad during October 1st to December 31st 2019. A total of 246 patients were selected by using a non-probability convenience sampling technique. Inclusion criteria was patients of both genders aged more than 18 years, being admitted within the medical and surgical units, undergoing any form of intravenous therapy, having catheter in situ in use or not. The exclusion criteria was medically compromised patients with no ability to give informed consent, being institutionalised (for example prisoners).

Data was collected following clearance approval from research ethics committee of LUMHS (DOC#LUMHS/REG/ACD/28274/75). Data

was collected from the sample population receiving some form of intravenous therapy within the medical-surgical units of Liaquat University Hospital. The patients were presented with a data sheet and informed consent was obtained. Using the VIP scale, patients at catheter placement sites were examined from the bedside for any phlebitis signs and reported the presence and severity of phlebitis.

Using the patient notes and charts, patient- related characteristics leading to phlebitis, including demographic details, medical diagnosis and current medical history, were reported on the clinical audit

form. On examination, catheter characteristics were noted, and the patient was asked to explain the dates of catheter insertion and removal of the catheter. Using the patient's notes, drug chart and fluid balance sheets, infusion-related features leading to phlebitis were observed.
The data was analyzed in Statistical Package for social sciences (SPSS) version 23. Frequencies and percentages were calculated for qualitative variables and were presented in bar charts. Means and SD+ were calculated for continuous variables. The Chi-square test was used to analyze qualitative categorical data among risk factors association with phlebitis. P-value <0.05 was set as significance.

Results

Phlebitis was often found to be elevated in medical units relative to surgical units. 26% (n=64) of those admitted to the Medical Ward # III developed phlebitis in the participants, 15.4% (n=38) were in Medical-IV, 14.6% (n=36) were in Medical-I and 9.8% (n=24) were in Medical-II. The percentages of phlebitis in all surgical units were significantly different, with 10.2% (n=25) in Surgical-IV, 9.3% (n=23) in Surgical-I and 7.3% (n=18) in each Surgical II & III unit being observed as indicated in Figure 1.
Figure 2 shows that in 41.1% and 40.2% of cases, the majority of participants had Level II & III phlebitis, while 10.6% had Level IV, 6.5% had Level I and 1.6% had Level V. The Mean= 2.60, SD= 0.826, Min: = 1, Max: = 5, Mode = 2. Grade II and III were the most severe grades observed. Phlebitis stages II & III and IV & V that require catheter re-setting and possible treatment.

Ninety-nine (37.8%) participants had infection and 124 (81.7%) participants of those without infection had phlebitis stage II & III, while 75 (80.7%) of those infections had phlebitis stage II and III, but there was no significance (p = 0.916). Table 1 shows. There were no comorbidities in 5 (10.9 percent) participants, while 41 (89.1%) participants had 1 or more comorbidities. There were II, III & IV phlebitis stages in 200 out of 219 participants without comorbidities, while 26 (96.2%) of those with 1 or more comorbidities had II, III & IV phlebitis stages. The co-morbidity is not significant (p = 0.615) associated with the development of phlebitis, similar to medical diagnosis.

Only 7.3% of participants were unknown about their HBV status, 85.8% of participants were HBV negative but 82.0% of participants developed stage II & III phlebitis, while 6.9% of participants were HBV positive and 82.4% developed stage II & III phlebitis. The frequent development of phlebitis is not significant (p = 0.675). 66.7% of participants were HCV negative, but 82.4% of participants developed phlebitis in stage II & III, while 26.4% of participants were HBV positive and 80.0 percent developed phlebitis in stage II & III and 7.3 percent of participants were unaware of their HBV status. 76.50% developed phlebitis in stage II & III. HCV is a significant difference that leads to phlebitis (p = 0.015). Of the 48 (19.5%) who had diabetes mellitus, all had phlebitis, but 79.3% had phlebitis in stages II & III. 55.7% of participants had pyrexia, 82.5% of them had phlebitis in stage II & III; 44.3% of participants had no pyrexia, but 79.8% of participants developed phlebitis in stage II & III. Pyrexia leads to the statistically significant development of phlebitis (p= 0.044) as shown in Table 2.

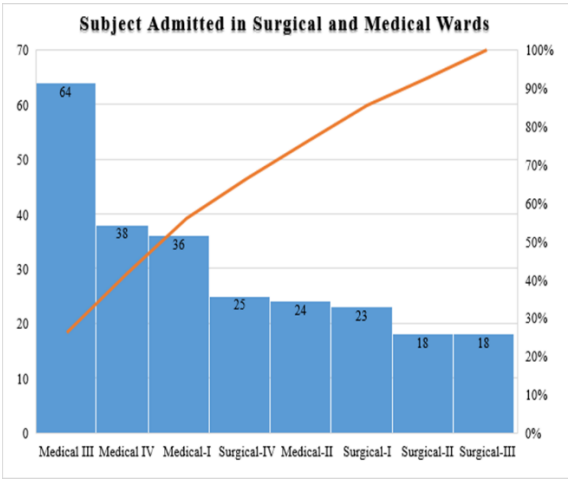

Figure 1: Distribution of Subjects Admitted in Surgical and Medical Units

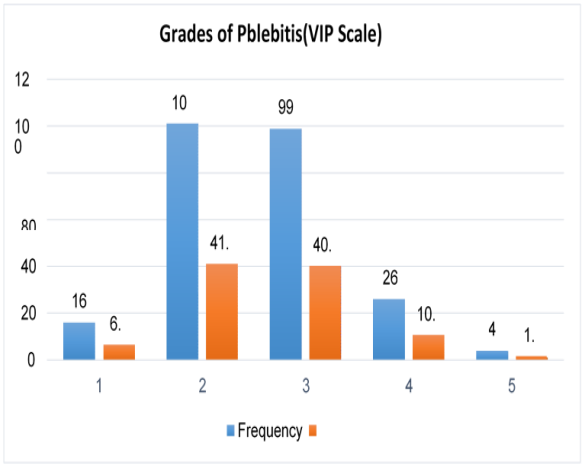

Figure 2: Grades of Phlebitis (VIP Scale) of the Subjects

Table 1: Distribution of diagnosis and Co- morbid medical conditions of the Subjects

	n	%	Grades of phlebitis Frequency					P Value
			1 n (%)	2 n (%)	3 n (%)	4 n (%)	5 n (%)	
Medical/Surgical diagnosis of the subjects								
Infectious diseases	93	37.8	7 7.5%	38 40.9%	37 39.8%	9 9.7%	2 2.2%	0.961
Non-infectious diseases	153	62.2	9 5.9%	63 41.2%	62 40.5%	17 11.1%	2 1.3%	
Total	246	100						
Co-morbid medical conditions of the subjects								
None	219	89.02	15 6.8%	93 42.5%	88 40.2%	19 8.7%	4 1.8%	0.615
1 or more	27	10.98	1 3.7%	8 29.6%	11 40.7%	7 25.9%	0 0.0%	
Total	246	100						

Table 2: Distribution of HBV, HCV, DM

	n	%	Grades of phlebitis Frequency					P value
			1 n (%)	2 n (%)	3 n (%)	4 n (%)	5 n (%)	
HBV status								
Unknown	18	7.3	3 16.67%	7 38.9%	6 33.3%	2 11.1%	0 0.0%	0.675
Negative	211	85.8	11 5.2%	88 41.7%	85 40.3%	23 10.9%	4 1.9%	
Positive	17	6.9	2 11.8%	6 35.3%	8 47.1%	1 5.9%	0 0.0%	
Total	246	100						
HCV Status								
Unknown	17	6.9	3 17.6%	7 41.2%	6 35.3%	1 5.9%	0 0.0%	0.015
Negative	164	66.7	12 7.3%	68 41.5%	67 40.9%	16 9.8%	1 0.6%	
Positive	65	26.4	1 1.5%	26 40.0%	26 40.0%	9 13.8%	3 4.6%	
Total	246	100						
Diabetes Mellitus								
No	198	80.5	14 7.1%	80 40.4%	82 41.4%	20 10.1%	2 1.0%	0.473
Yes	48	19.5	2 4.2%	21 43.8%	17 35.4%	6 12.5%	2 4.2%	
Total	246	100						
Pyrexia (> 38.5 C)								
No	109	44.3	9 8.3%	52 47.7%	35 32.1%	13 11.9%	0 0.0%	0.044
Yes	137	55.7	7 5.1%	49 35.8%	64 46.7%	13 9.5%	4 2.9%	
Total	246	100						

Discussion

The present study represented the incidence of phlebitis, with 41.1% grade II phlebitis and 40.2% grade III phlebitis, followed by 10.6% grade IV phlebitis, 6.5% grade I phlebitis, and 1.6% grade V phlebitis, the highest percentage. The rates of phlebitis grade II in studies were 35.1% and higher rates were 53.6%, while the grade III rate (23.7%) was contrary to this research in another study.[13–15]

In current Study, the average number of catheters was 1.30±0.49. There was a higher percentage of grade II & III phlebitis 86.3% and Pyrexia status of the Subjects in patients who had one catheter in situ compared to those who had two simulation catheters 68.7%; however, there were phlebitis grade IV & V (22.4%) in patients who had 2 simulation catheters. Similarly to this study results, a study indicated the chances of phlebitis chances of developing phlebitis with more than one coexisting SPC were significantly higher. The frequency also rises when inserting the catheters into the same arm is repeated.16,17

In the present study, HBV was not found significant (p = 0.615), while HCV and Pyrexia (>38C) were found significant (p = 0.015) and (p = 0.044), respectively to develop phlebitis. However, the results were

not found to compare the results with this study findings, though in a study chronic diseases (p = 0.005) and infections (p = 0.007) found significant to develop phlebitis.15

As observed in this study, placement of the catheter at the joint sites of the wrist's dorsal aspect had a higher proportion of phlebitis grade II 51.9% right wrist dorsal aspect, 44.6% right forearm, 50.0% left forearm, 30.2% left wrist dorsal aspect and III 36.5% right wrist dorsal aspect, 39.3% right forearm, 30.0% left forearm, 45.3% left wrist dorsal aspect. One study showed only the forearm's threat.16 Another study indicated that phlebitis grade I, 46.1% was related to the hand veins and grade II, III and IV with the forearm veins 85.0%, 81.8% and 69.2%, respectively, these findings were higher than this present study.13

The current study reported that the most frequently catheter gauge 22 was used with incidence of phlebitis grade II 43.7%, which was higher than a study findings 29.3%, whereas grade III was 38.0% as compared to other study findings 52.1% which were higher. The phlebitis grade II and III was reported 38.5% each as compared to a study results 18.9% and 54.2%, respectively, the grade III reported findings were higher than the current study.18 Many other authors stressed that using smaller size catheters allows the circulation of blood in adjacent tissue, thus avoiding vein injuries.7,19,20

The present study showed that 80.5% catheters were in current use and developed phlebitis grade II (44.4%) and III (37.9%), while 14.6% catheters were in situ with regular flushing. Catheter flushing found significant (p= 0.022) as a risk factor to develop phlebitis and no similarly result found in other studies. A study presented that the saline were not flushed in patients, they developed more than 10 times higher risk of incidence of phlebitis.1 In this study, the phlebitis grade II (41.7%) and grade III (39.1%) developed in patients who received antibiotics IV therapy. The similar results found in other studies, grade II and III of phlebitis were the most common in patients receiving intravenous antibiotics.8,21

This study showed that 51.2% and 26.4% of subjects received continuous infusion and reported most common phlebitis grade II and III. It is evident that there is a strong link (p = 0.015) between phlebitis development and the form of infusion and similarly a study highlighted continuous infusion to be a predictor of phlebitis and found more statistically significant (p = 0.006), while another study reported a higher risk of phlebitis in SPCs with intermittent infusions .22–24

Conclusion

The catheter flushing, infusion system, HCV and pyrexia variables were statistically significantly linked to the development of phlebitis, while the catheter gauge was the least significant. This study concluded that there was a high prevalence of phlebitis and the highest percentage of grade II & III phlebitis was found, followed by grade I, grade IV, and grade V phlebitis.

Conflict of Interest

Authors declare no conflict of interest related to publication of this article.

Grant Support Financial Disclosure: None

References

1. Oliveira ADSS, Basto ML, Braga LM, Sena CA, Melo MN, Parreira PMDSD. Nursing practices in peripheral venous catheter: Phlebitis and patient safety. Texto e Context Enferm. 2019;28.

2. Johann DA, Danski MTR, Vayego SA, Barbosa DA, Lind J. Risk factors for complications in peripheral intravenous catheters in adults: Secondary analysis of a randomized controlled trial. Rev Lat Am Enfermagem. 2016;24(March 2017).

3. Lee Y, Lee E. Factors associated with development of early symptoms of phlebitis in hospitalized patients in general wards: A retrospective study. Korean J Adult Nurs. 2019;31(2):136–45.

4. Sarı D, Eşer İ, Akbıyık A. Phlebitis associated with peripheral intravenous catheters and nursing care. J Hum Sci. 2016;13(2):2905.

5. Webster J, McGrail M, Marsh N, Wallis MC, Ray-Barruel G, Rickard CM. Postinfusion Phlebitis: Incidence and Risk Factors. Nurs Res Pract. 2015;2015:1–3.

6. Dwivedi R, Singh AK, Gaharwar APS. Thrombophlebitis at infusion sites in surgical ward: a clinical study. Int Surg J. 2018;5(6):2103.

7. Yu X, Yue S, Wang M, Cao C, Liao Z, Ding Y, et al. Risk Factors Related to Peripherally Inserted Central Venous Catheter Nonselective Removal in Neonates. Biomed Res Int. 2018 May 30;2018:1–6.

8. Urbanetto J de S, Peixoto CG, May TA. Incidência de flebites durante o uso e após a retirada de cateter intravenoso periférico. Rev Lat Am Enfermagem. 2016;24(0).

9. Chang WP, Peng YX. Occurrence of Phlebitis: A Systematic Review and Meta-analysis. Nurs Res. 2018;67(3):252–60.

10. Rojas-Sánchez L, Parra D, Camargo- Figuera F. Incidence and factors associated with development of phlebitis: results of a pilot study cohort. Rev Enferm Ref. 2015;IV Série(No 4):61–7.

11. Urbanetto J de S, Freitas APC de, Oliveira APR de, Santos J de CR Dos, Muniz F de OM, Silva RM da, et al. Fatores de risco para o desenvolvimento da flebite: revisão integrativa da literatura. Rev Gauch Enferm. 2018;38(4):e57489.

12. Qamar, Zonobia & Azfal, Muhammad & Kousar, Robina & Waqas, Ali & Gilani S. Assess Nurses Knowledge and Practices towards Care and Maintenance of Peripheral Intravenous Cannulation in Services Hospital Lahore, Pakistan. Saudi J Med Pharm Sci. 2017;3(6B):622–30.

13. Nobre A, Martins M. Prevalence of peripheral intravenous catheter- related phlebitis: associated factors. Rev Enferm Ref. 2018 Mar 31;IV Série(No16):127–38.

14. Jamal Z, Umair M, Zubair R, Zafar N, Rauf F, Affif M. Peripheral Intravenous Catheter related Thrombophlebitis- Incidence and Risk Factors A Cross Sectional Study. J Rawalpindi Med Coll. 2019;23:22–7.

15. Enes SMS, Opitz SP, de Faro ARM da C, Pedreira M da LG. Phlebitis associated with peripheral intravenous catheters in adults admitted to hospital in the Western Brazilian Amazon. Rev da Esc Enferm. 2016 Apr;50(2):261–9.

16. Osei-Tutu E, Tuoyire DA, Debrah S, Ayetey H. Peripheral intravenous cannulation and phlebitis risk at Cape Coast Teaching Hospital. Postgrad Med J Ghana. 2015;4(1):11–8.

17. Heng SY, Yap RT-J, Tie J, McGrouther DA. Peripheral Vein Thrombophlebitis in the Upper Extremity – a Systematic Review of a Frequent and Important Problem. Am J Med. 2019;

18. Simin D, Milutinović D, Turkulov V, Brkić S. Incidence, severity and risk factors of peripheral intravenous cannula-induced complications: An observational prospective study. J Clin Nurs. 2019 May 17;28(9– 10):1585–99.

19. Marsh N, Webster J, Mihala G, Rickard CM. Devices and dressings to secure peripheral venous catheters to prevent complications. Cochrane database Syst Rev. 2015 Jun 12;(6):110–70.

20. Oliveira A, Costa P, Graveto J, Costa F, Osório N, Cosme A, et al. Nurses' practices in intravenous catheterization: a descriptive study. Rev Enferm Ref. 2019 Jun 28;IV Série(No 21):111–20.

21. Salma U, Sarker MAS, Zafrin N, Ahamed KS. Frequency of peripheral intravenous catheter related phlebitis and related risk factors: A prospective study. J Med. 2019 Jan 1;20(1):29– 33.

22. Lee S, Kim K, Kim JS. A model of phlebitis associated with peripheral intravenous catheters in orthopedic inpatients. Int J Environ Res Public Health. 2019 Sep 14;16(18):3412.

23. Heng SY, Yap RT-J, Tie J, McGrouther DA. Peripheral Vein Thrombophlebitis in the Upper Extremity: A Systematic Review of a Frequent and Important Problem. Am J Med. 2019 Oct;30(2):32–9.

24. Parreira P, Serambeque B, Costa PS, Mónico LS, Oliveira V, Sousa LB, et al. Impact of an innovative securement dressing and tourniquet in peripheral intravenous catheter- related complications and contamination: An interventional study. Int J Environ Res Public Health. 2019 Sep 2;16(18):3301.