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Research Article

A Study to Assess the Occurrence and Risk Factors of Phlebitis among Peripheral Intravenous Cannulated Patients admitted in Emergency Wards of SKIMS, Soura, Srinagar with a view to develop Phlebitis Prevention Protocol

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I N F O

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A B S T R A C T

Introduction: Almost half of the patients who are administered intravenous fluid infusion or blood transfusion via IV cannula insertion develop phlebitis. This study was conducted to assess the occurrence and risk factors of phlebitis among peripheral intravenous cannulated patients admitted in the emergency wards of SKIMS, Soura, Srinagar with a view to develop phlebitis prevention protocol.

Methodology: A non-experimental descriptive research design was used for the study. Convenient sampling technique was used for the selection of 250 patients. The prepared tool (semi-structured observation checklist) and phlebitis prevention protocol were validated by experts. Pre-testing and pilot study was conducted on patients other than the study sample. The data collected were analysed using descriptive and inferential statistics.

Results: The results of our study showed that phlebitis occurred in more than half of the patients (58%). Among these, grade-1 phlebitis was seen in most of the patients (32.8%) and grade 4 phlebitis was seen in only 0.4%. Most of the patients developed phlebitis within the first 48 hours (26.4%) and 72 hours (20.4%) of cannulation time. There was a significant association of phlebitis with age and gender, site of cannulation, disinfection of cannula site, size/ gauge of cannula, infusion of ionotropic drugs and blood and its products, mode of infusion of IV fluids potassium chloride, and phenytoin, administration of piperacillin/ tazobactam, vancomycin, metronidazole, and imipenem.

Conclusion: Staff nurses should be made aware of the various risk factors associated with phlebitis. Appropriate training and education programmes should be implemented.

Keywords: Phlebitis, Risk Factors, Occurrence of Phlebitis

Introduction

Intravenous therapy is a technical-scientific process eminently executed by the nursing staff in a hospital for intravenous fluid infusion or blood transfusion. Intravenous (IV) catheter is one of the most commonly used ways of treatment in patients admitted to hospitals.[1,2,3] These are about 50% of patients who develop phlebitis after IV cannula insertion.[4]

The peripheral venous access is performed by inserting a catheter in a peripheral vein. Peripheral venous access (PVA) is characterised as an invasive procedure due to the disruption of the skin and consequently leads to the communication of the venous system with the external environment.[5] The superficial veins of the upper extremities are preferred to those of the lower extremities for peripheral venous access because cannulation of upper extremity veins interferes less with patients' mobility and poses a lower risk for phlebitis.[5]

Phlebitis is the inflammation of the vein and is a common complication associated with the use of peripheral intravenous catheters. It can cause infection or thrombus formation. Symptoms develop in hours to days and resolve over days to weeks. According to the clinical signs present in the patient, phlebitis is classified into the following four degrees:[5,6]

- **Degree 1**: Erythema around the peripheral intravenous catheter with or without local pain
- **Degree 2:** Local pain with erythema and or swelling
- **Degree 3:** Local pain with erythema, hardening and palpable venous cord formation
- **Degree 4:** Local pain with erythema, hardening and palpable venous cord formation > 1 inch in length with purulent drainage

Objectives

- To assess the occurrence of phlebitis among the peripheral intravenous cannulated patients admitted in emergency wards of SKIMS, Soura, Srinagar
- To identify demographic variables (age, gender, area of admission) as the possible risk factors of phlebitis among the peripheral intravenous cannulated patients admitted in emergency wards of SKIMS, Soura, Srinagar
- To associate selected demographic variables (age, gender, area of admission) with the occurrence of phlebitis among the peripheral intravenous cannulated patients admitted in emergency wards of SKIMS, Soura, Srinagar
- To identify the risk factors of phlebitis and associate selected risk factors (use of hand rub, use of gloves, cannulation site away from joint, disinfection of cannula site, documentation, vein of cannulation, size/ gauge of cannula, fixation material, method of infusion, types of intravenous drugs and antibiotics given and any combination of intravenous infusion, drugs and antibiotics given) with the occurrence of phlebitis among the peripheral intravenous cannulated patients admitted in emergency wards of SKIMS, Soura, Srinagar

Methodology

Research Approach

In view of the nature of problem under study and to accomplish the objectives of the study, quantitative research approach was found to be appropriate.

Research Design

In this study, a non-experimental research design was used for the overall research process as it was found to be the most suitable. A subtype of this design; descriptive research design was selected from this broad area and was implemented in this study. A semi-structured observational checklist and Infusion Nurses Society (INS) phlebitis scale (2006) were administered to peripheral intravenous cannulated subjects admitted through the emergency areas of SKIMS, Soura, Srinagar.

Setting of the Study

The present study was conducted in emergency wards of SKIMS, Soura, Srinagar from 12th September 2020 to 1st October 2020. The selection of setting was done on the basis of set criteria like problem statement, feasibility of conducting the research study, availability of the sample, study subjects, nature and purpose of research study, and familiarity of the researcher with the research setting.

Study Population

In the present study, the population consists of adult patients admitted through emergency wards of SKIMS, Soura, Srinagar.

Sampling Technique and Sample

Non-probability convenient sampling technique was used for the selection of study subjects during the study because the study was restricted by the short duration of time and it was not possible to get the list of patients who would get admitted from emergency areas. The sample size for the present research study comprised 250 adult patients admitted through emergency wards of SKIMS, Soura, Srinagar.

Criteria for Selection of Sample

The following criteria were set for the selection of study subjects in the research study:

Inclusion Criteria

The study subjects included in the research study were:

- In the adult age group, i.e. from 18 years onwards

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- Admitted through emergency wards of SKIMS, Soura
- Available for 72 hours after admission
- Conscious
- Willing to participate in the study

Exclusion Criteria

The study subjects were excluded in the research study on the basis of the following criteria:

- Admitted from paediatrics emergency
- Admitted through the outpatient department
- Available for less than 72 hours after admission
- Unconscious
- Not willing to participate in the study

Plan for Data Analysis

The data analysis was planned based on the objectives of the study. It was planned to organise, tabulate, analyse and interpret data by using both descriptive and inferential statistics. The following plan of analysis was developed with the opinion of experts:

- The collected data was coded and transferred to a master sheet for statistical analysis
- To describe the sample characteristics, occurrence and incidence rate of risk factors for the development of phlebitis were noted
- The phlebitis occurrence rate was analysed in terms of percentage
- The association of risk factors was calculated using Chi-square test
- The per cent agreement method was used to determine the inter-rater reliability of the tool
- The findings were interpreted and presented with the help of tables and graphs. The level of significance was set as the conventional level of $p \leq 0.05$

Ethical Consideration

In order to proceed with the research study, prior permission was obtained from the Principal of MMINSR SKIMS, Soura to conduct the research study. The ethical committee of SKIMS Soura, Srinagar has exempted some of the research from ethical approval and hence ethical clearance and permission were exempted in the case of the present study.

A letter was forwarded by Principal MMINSR, SKIMS to the cooperating department for permission to conduct the study at their department which here refers to the Medical Superintendent, SKIMS, Soura, Srinagar. The purpose of the study was informed and explained to the selected patients. Informed consent was individually obtained from them, prior to their inclusion as sample in the study. Privacy, confidentiality and anonymity were guarded.

Results

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to the data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Categorical variables were summarised as frequencies and percentages. Graphically, the data was presented by bar and pie diagrams. Chi-square test was applied to associate the selected risk factors with the occurrence of phlebitis.

Table 1.Frequency and Percentage Distribution of Occurrence of Phlebitis among Peripheral Intravenous Cannulated Patients

(N = 250)

Occurrence of Phlebitis	Frequency	Percentage
Yes	145	58.0
No	105	42.0
Total	250	100

The data presented in Table 1 depict that out of 250 peripheral intravenous cannulated patients, 145 (58%) developed phlebitis while 105 (42%) patients did not have phlebitis. Thus, the occurrence rate of phlebitis was 58% among 250 peripheral intravenous cannulated patients.

Table 2.Frequency and Percentage Distribution among Peripheral Intravenous Cannulated Patients with Phlebitis according to Grade of Phlebitis

(N = 145)

Grade of Phlebitis	Frequency	Percentage
1	82	32.8
2	49	19.6
3	13	5.2
4	1	0.4
Total	145	58.0

Table 2 shows that most (32.8%) of the patients with phlebitis developed Grade 1 phlebitis followed by Grade 2 in 19.6%, Grade 3 in 5.2% and Grade 4 in 0.4% of the subjects.

Table 3.Frequency and Percentage Distribution among Peripheral Intravenous Cannulated Patients with Occurrence of Phlebitis according to Time Interval

(N = 145)

Grade of Phlebitis	Frequency	Percentage
1	82	32.8
2	49	19.6
3	13	5.2
4	1	0.4
Total	145	58.0

The data presented in Table 3 depict that most of the patients, i.e. 26.4%, developed phlebitis within 48 hours of

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cannulation followed by 20.4% of patients who developed phlebitis within 72 hours of cannulation, and 11.2% of patients developed phlebitis within 24 hours of cannulation. Thus, it can be reported that most patients developed phlebitis within the first 48 hours of cannulation.

The data presented in Table 4 depict that most of the patients (31.2%) were in the age group of (57-69) years, followed by 22.8%, 22.4%, 12.0% and 11.6% in the age group of 44-56, ≥ 70, 18-30, and 31-43 years respectively. The table also reveals that 56.0% of the patients were male and 44% were female. 74.4% of the patients were admitted from medical wards and 25.6% were admitted from surgical wards.

Table 5 reveals that a statistically significant association of phlebitis was seen with age (p = 0.001) and gender (p = 0.034), whereas no association of phlebitis was established with the area of admission (p = 0.152) among peripheral intravenous cannulated patients admitted in emergency wards.

Thus, it can be interpreted from the association table that age and gender can be responsible for the development of phlebitis.

Table 4.Frequency and Percentage Distribution among Peripheral Intravenous Cannulated Patients according to their Age, Gender and Area of Admission

(N = 250)

Demographic Variables		Frequency	Percentage
Age (years)	18-30	30	12.0
	31-43	29	11.6
	44-56	57	22.8
	57-69	78	31.2
	≥ 70	56	22.4
Gender	Male	140	56.0
	Female	110	44.0
Area of admission	Medical ward	186	74.4
	Surgical ward	64	25.6

Table 5.Association between Demographic Variables and Phlebitis among Peripheral Intravenous Cannulated Patients

(N = 250)

Variables		N = 250	Phlebitis (n = 145)		Chi-square Value	df	P Value	Result
			f	%				
Age (years)	18-30	30	10	33.33	31.5	4	0.001	S*
	31-43	29	19	65.51				
	44-56	57	40	70.17				
	57-69	78	50	64.10				
	≥ 70	56	16	28.57				
Gender	Male	140	73	52.1	4.481	1	0.034	S*
	Female	110	72	65.5				
Area of admission	Medical ward	186	103	55.4	2.053	1	0.152	NS*
	Surgical ward	64	42	65.6				

S*: Significant (P value ≤ 0.05) NS#: Non-significant (P value > 0.05)

The data presented in Table 6 depict that staff nurses performed hand rub only for 4 patients before performing cannulation among which 50% of patients developed phlebitis. 50.3% of the patients who were cannulated away from joint developed phlebitis and 40.4% of patients in whom cannula site was disinfected before performing cannulation developed phlebitis. The date and time of cannulation were not documented in any of the patients and hence association was not established.

A statistically significant association was established between the site of cannulation away from joint (p = 0.003) and disinfection of cannula site before performing

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cannulation (p = 0.007) with the development of phlebitis, whereas no association was found between the use of hand rub (p = 0.7), and use of gloves (p = 0.82) with development of phlebitis.

Thus, it can be interpreted from the findings that keeping the cannulation site away from joint and disinfection of cannula site before performing cannulation can play a significant role in the prevention of phlebitis.

Table 6.Frequency and Percentage Distribution of Risk Factors (Use of Hand Rub, Use of Gloves, Cannulation Site away from Joint, Disinfection of Cannula Site, Documentation) among Peripheral Intravenous Cannulated Patients and their association with Phlebitis

(N = 250)

Variables		N = 250	Phlebitis (n = 145)		Chi-square Value	df	P Value	Result
			f	%				
Use of hand rub	Yes	4	2	50.0	0.107	1	0.7	NS#
	No	246	143	58.1				
Use of gloves	Yes	2	1	50.0	0.053	1	0.82	NS#
	No	248	144	58.1				
Cannulation site away from joint	Yes	149	75	50.3	8.894	1	0.003	S*
	No	101	70	69.3				
Disinfection of cannula site	Yes	47	19	40.4	7.339	1	0.007*	S*
	No	203	126	62.1				
Documentation	Yes	0	0	-	-	-	-	-
	No	250	145	58.0				

S*: Significant (P value ≤ 0.05) NS#: Non-significant (P value > 0.05)

Table 7.Frequency and Percentage Distribution of Risk Factor (Vein of Cannulation) in Peripheral Intravenous Cannulated Patients and its association with Phlebitis

(N = 250)

Variables	N = 250	Phlebitis (n = 145)		Chi-square Value	df	P Value	Result
		f	%				
Cephalic vein	66	38	57.6	8.253	4	0.083	NS#
Medial cubital vein	31	22	71.0				
Basilic veins	23	18	78.3				
Dorsal metacarpal veins	87	45	51.7				
Accessory cephalic veins	43	22	51.2				
Total	250	145	58.0				

NS#: Non-significant (P value > 0.05)

Table 8.Frequency and Percentage Distribution of Risk Factor (Size/ Gauge of Cannula) in Peripheral Intravenous Cannulated Patients and its association with Phlebitis

(N = 250)

Size/ Gauge of Cannula	N = 250	Phlebitis (n = 145)		Chi-square Value	df	P Value	Result
		f	%				
16G	9	7	77.8	8.023	3	0.045	S#
18G	30	20	66.7				
20G	125	78	62.4				
22G	86	40	46.5				
Total	250	145	58.0				

S*: Significant (P value ≤ 0.05)

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Table 7 shows that phlebitis developed in majority (78.3%) of patients in whom basilic veins were cannulated, in 71.0% of patients in whom medial cubital vein was cannulated, and in 57.6% of patients in whom cephalic vein was cannulated. Similarly, phlebitis developed in 51.7% of patients in whom dorsal metacarpal veins were cannulated and in 51.2% of patients in whom accessory cephalic veins were cannulated.

No statistically significant association was found between phlebitis and vein of cannulation (p = 0.083).

Thus, it can be interpreted from the findings that the most common vulnerable veins for phlebitis can be basilic veins. However, the vein of cannulation may not have a major role in the development of phlebitis.

The data presented in Table 8 depict that majority (77.8%) of patients in whom 16G cannula was used developed phlebitis, 66.7% of patients in whom 18G cannula was used, 62.4% of patients in whom 20G cannula was used, and 46.5% of patients in whom 22G cannula was used developed phlebitis.

A statistically significant association was found between phlebitis and size/ gauge of cannula (p = 0.045).

Thus, it can be interpreted from the findings that the size/ gauge of cannula can have an important role in the development of phlebitis. The rate of phlebitis increases with a decrease in the gauge of cannula. A 16-gauge cannula is more likely to cause phlebitis.

The data presented in Table 9 show that an almost equal number (64.1% and 61.0%) of patients in whom paper tape and adhesive were used to fix cannula developed phlebitis. 51.6% of patients in whom Dynaplast was used and 44.1% of patients in whom Tegaderm was used to fix the cannula developed phlebitis.

No statistically significant association was found between phlebitis and fixation material (p = 0.228).

Thus, it can be interpreted from the findings that fixation material may not have a role in the development of phlebitis. However, Tegaderm is less likely to cause phlebitis.

The data presented in Table 10 show that all patients (100%) who received bolus infusion, 76.0% of the patients who received continuous infusion, and 45.3% of patients who received intermittent infusion developed phlebitis.

A statistically significant association was found between phlebitis and mode of infusion (p ≤ 0.001).

Thus, it can be interpreted that the method of infusion can have a role in the development of phlebitis with bolus method being the most potent cause of phlebitis.

Table 9.Frequency and Percentage Distribution of Risk Factor (Fixation Material) in Peripheral Intravenous Cannulated Patients and its association with Phlebitis

(N = 250)

Fixation Material	N = 250	Phlebitis (n = 145)		Chi-square Value	df	P Value	Result
		f	%				
Adhesive	146	89	61.0	4.33	3	0.228	NS#
Tegaderm	34	15	44.1				
Dynaplast	31	16	51.6				
Paper tape	39	25	64.1				
Total	250	145	58.0				

NS*: Non-Significant (P value ≤ 0.05)

Table 10.Frequency and Percentage Distribution of Risk Factor (Method of Infusion) in Peripheral Intravenous Cannulated Patients and its association with Phlebitis

(N = 250)

Method of Infusion	N = 250	Phlebitis (n = 145)		Chi-square Value	df	P Value	Result
		f	%				
Bolus	4	4	100	25.604	2	< 0.001	S*
Continuous	96	73	76.0				
Intermittent	150	68	45.3				
Total	250	145	58.0				

S*: Significant (P value ≤ 0.05)

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Table 11.Frequency and Percentage Distribution of Risk Factors (Types of Intravenous Drugs) in Peripheral Intravenous Cannulated Patients and their association with Phlebitis

(N = 250)

Types of Intravenous Drugs		N = 250	Phlebitis		Chi-square Value	df	P Value	Significance
			f	%				
Ionotropic drugs	Yes	13	11	84.6	3.863	1	0.047	S*
	No	237	134	56.5				
Blood and blood products	Yes	15	13	86.7	4.083	1	0.043	S*
	No	235	132	56.2				
Potassium chloride	Yes	27	22	81.5	6.946	1	0.008	S*
	No	223	123	55.2				
Phenytoin	Yes	25	23	92.0	13.182	1	< 0.001	S*
	No	225	122	54.2				

S*: Significant (P value ≤ 0.05)

The data presented in Table 11 exhibit that 84.6% of patients who received ionotropic drugs, 86.7% of patients who received blood and blood products, 81.5% of patients who received potassium chloride, and 92% of patients who received phenytoin developed phlebitis.

A statistically significant association was established between phlebitis and ionotropic drugs (p = 0.047), blood and blood products (p = 0.043), potassium chloride (p = 0.008), and phenytoin (p ≤ 0.001).

Thus, it can be interpreted that ionotropic drugs, blood and blood products, potassium chloride, and phenytoin can have a role and can be equally potent in the development of phlebitis.

The data presented in Table 12 reveal that maximum (93.8%) patients who received metronidazole developed phlebitis. 85.0% of patients who received imipenem, 74.4% of patients who received vancomycin, 64.4% of patients who received ceftriaxone, 55.4% of patients who received levofloxacin, and 48.5% of patients who received piperacillin/ tazobactam developed phlebitis.

Table 12.Frequency and Percentage Distribution of Risk Factors (Antibiotics) in Peripheral Intravenous Cannulated Patients and their association with Phlebitis

(N = 250)

Administration of IV Antibiotics		N = 250	Phlebitis (n = 145)		Chi-square Value	df	P Value	Result
			f	%				
Piperacillin/ tazobactam	Yes	132	64	48.5	10.394	1	0.001	S*
	No	118	81	68.6				
Levofloxacin	Yes	121	67	55.4	0.665	1	0.415	NS#
	No	129	78	60.5				
Ceftriaxone	Yes	59	38	64.4	2.596	1	0.273	NS#
	No	191	107	56.0				
Vancomycin	Yes	39	29	74.4	5.076	1	0.024	S*
	No	211	116	55.0				
Imipenem	Yes	20	17	85.0	6.506	1	0.011	S*
	No	230	128	55.7				
Metronidazole	Yes	16	15	93.8	8.968	1	0.003	S*
	No	234	130	55.6				

S*: Significant (P value ≤ 0.05) NS#: Non-significant (P value > 0.05)

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Table 13.Frequency and Percentage Distribution of Risk Factors [Any Combination of Intravenous Infusion, Drugs and Antibiotics (Blood, Blood Products, Continuous Infusion, KCL, Phenytoin, Inotropes and Antibiotics)] in Peripheral Intravenous Cannulated Patients and their association with Phlebitis

(N = 250)

Any Combination of Blood, Blood Products, Continuous Infusion, KCL, Phenytoin, Inotropes and Antibiotics	N = 250	Phlebitis (n = 145)		Chi-square Value	df	P Value	Result
		f	%				
Yes	90	76	84.4	40.371	1	< 0.001	S*
No	160	69	43.1				
Total	250	145	58.0				

S*: Significant (P value ≤ 0.05)

A statistically significant association was found between phlebitis and piperacillin/ tazobactam (p value < 0.001), between phlebitis and vancomycin (p value < 0.024), between phlebitis and imipenem (p value < 0.011), and between phlebitis and metronidazole (p value < 0.003).

Thus, it can be interpreted that intravenous infusion of piperacillin/ tazobactam, vancomycin, imipenem, and metronidazole through a peripheral intravenous cannula can have a role in the development of phlebitis with metronidazole and imipenem more likely to cause phlebitis.

The data presented in Table 13 shows that 84.4% of patients who received any combination of blood, blood products, continuous infusion, KCL, phenytoin, inotropes and antibiotics developed phlebitis and 43.1% of patients who didn't receive any combination of blood, blood products, continuous infusion, KCL, phenytoin, inotropes and antibiotics developed phlebitis.

Table 13 depicts a statistically significant association between phlebitis and any combination of blood, blood products, continuous infusion, KCL, phenytoin, inotropes and antibiotics (p value < 0.001).

Thus, it can be interpreted that patients receiving any combination of intravenous infusion, drugs and antibiotics through peripheral intravenous cannula have more chances of developing phlebitis.

Discussion

The present study revealed that more than half (58%) of the patients (N = 250) developed phlebitis and 42% had no phlebitis. Thus, the incidence rate of phlebitis is 58%, which is more than the accepted rate of phlebitis (5%) given by the Infusion Nurses Society (2006).

The above findings are further supported by a prospective observational study conducted by Abdul-Hak CK et al.[7] to assess the incidence of phlebitis among peripheral cannulated patients in a medical clinical unit at a regional hospital in Brazil among 100 admitted patients. The findings of the study revealed that 60 patients developed phlebitis with an incidence rate of 60%.

The study revealed that similar percentages of patients developed phlebitis within 48 hours (26.4%) of cannulation and 72 (20.4%) hours of cannulation while 11.2% of patients developed phlebitis within 24 hours of cannulation. Thus, according to the current study, most of the subjects develop phlebitis within the first 48 and 72 hours of cannulation time.

The above findings are comparable with the findings of a descriptive cross-sectional study conducted by Erdogan BC et al.[8] to investigate the development of phlebitis and infiltration in patients with peripheral intravenous cannula in Neurosurgery Clinic of Education and Research Hospital in the capital of Turkey, among 325 patients. The findings of the study revealed that 14.2% of the patients developed phlebitis within 24 hours of cannulation followed by 11.1% in 25-48 hours and 32.9% in 49-72 hours.

The study revealed that in the age group of 44-56 years, 70.17% of patients developed phlebitis followed by 65.51% of patients in the age group of 31-43 years, 64.10% of patients in the age group of 57-69 years, 33.33% of patients in the age group of 18-30 years, and 28.57% of patients in the age group of 70 years and more developed phlebitis. A statistically significant association was seen between phlebitis and age.

The above findings are comparable with the results of a prospective observational study conducted by Singh R et al.[9] among 230 adult patients admitted in Kathmandu University Teaching Hospital.

The study revealed that among 140 male patients, 73 (52.1%) developed phlebitis and among 110 female patients, 72 (65.5%) developed phlebitis. A statistically significant association was seen between phlebitis and gender. Thus, it can be said that females have an increased risk of developing phlebitis.

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The above findings are supported by a prospective, observational study conducted by Mandal A et al.[10] in the medical and surgical division at Air Force Hospital, Kalaikunda, West Bengal among 150 patients. The aim of the study was to investigate the incidence of phlebitis and to evaluate factors contributing to the development of phlebitis. The findings of the study revealed that female gender is associated with a high risk of development of phlebitis (OR 1.21).

The study revealed that among 186 patients from emergency medical wards 103 (55.4%) and among 64 patients from emergency surgical wards, 42 (65.6%) developed phlebitis. Statistically, no significant association was seen between phlebitis and the area of admission. These findings are related to a prospective observational study conducted by Neopane A[11] among 100 admitted patients in the in-patient ward of the Department of Medicine of a Medical College located in Kathmandu, Nepal. The aim of the study was to find the risk-reducing role of handwashing in the incidence of phlebitis. The findings of the study revealed that among 77 patients cannulated from wards, 61 developed phlebitis and among 23 patients cannulated from emergency, 18 developed phlebitis. Statistically, no significant association was seen between phlebitis and the area of cannulation ($p = 0.912$).

The study revealed that staff performed hand rub only for 4 patients before performing cannulation among whom 2 (50%) patients developed phlebitis and out of the remaining 246 patients, 143 (58.1%) developed phlebitis; similarly, 50% of the patients who were cannulated using sterile gloves developed phlebitis and 58.1% of those who were cannulated without using sterile gloves developed phlebitis. No statistically significant association of phlebitis was seen with the use of hand rub and the use of sterile gloves. The findings are compatible with a prospective observational study conducted by Safro SK et al.[12] among 200 patients in the outpatient department of a multispecialty hospital in College of Health Sciences, Dhahran, Kingdom of Saudi Arabia. The aim of the study was to estimate the risk factors of phlebitis in intravenous cannulated patients. The results of the study revealed that statistically no significant association was seen between phlebitis and hand wash ($p = 0.96$) and phlebitis and use of sterile gloves ($p = 0.84$).

The study showed that ionotropic drugs were given to only 13 subjects out of whom 11 (84.6%) subjects developed phlebitis and 134 (56.5%) subjects out of the remaining 237 subjects who were not given inotropic drugs developed phlebitis. A statistically significant association was seen between phlebitis and infusion of inotropic drugs through a peripheral intravenous cannula.

The above findings are contradicted by a prospective observational study conducted by Kaur P et al.[13] among 200 patients in the Emergency Medical and Surgical Outpatient Department of Nehru Hospital, Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh. The aim of the study was to assess the risk factors leading to phlebitis amongst peripheral intravenous cannulated patients. The findings revealed that among patients who developed phlebitis, 17 (15%) had received ionotropic drugs. Statistically, no significant association was seen between phlebitis and infusion of ionotropic drugs.

The findings of the present study revealed that blood and blood products were given to 15 subjects out of whom 13 (86.7%) subjects developed phlebitis and 132 (56.2%) subjects out of the remaining 235 subjects who were not given blood or blood products developed phlebitis. A statistically significant association was seen between phlebitis and infusion of blood and blood products through peripheral intravenous cannula.

These findings are compatible with a prospective observational study conducted by Atay S et al.[14] among 317 patients with 532 peripheral intravenous catheters patients at the internal disease clinic of a state hospital in Turkey.

The present study showed that 81.5% of the subjects who received potassium chloride developed phlebitis, and 55.2% of the subjects who didn't receive potassium chloride developed phlebitis. A statistically significant association was seen between phlebitis and infusion of potassium chloride through peripheral intravenous cannula.

92.0% of the subjects of the present study who received phenytoin developed phlebitis, and 54.2% of subjects who didn't receive phenytoin developed phlebitis. The study also showed a statistically significant association between phlebitis and phenytoin.

The above findings are related to the findings of a randomised controlled study conducted by Jamerson BD et al.[15] at the University Hospital Clinical Research Unit in the USA among 12 healthy volunteers. The study revealed that phenytoin was associated with a significantly higher degree of pain at the infusion site in all subjects and a significant degree of phlebitis in 8 patients ($p < 0.05$).

The study showed that 48.5%, 55.4%, 64.4%, 74.4%, 85.0% and 93.8% of subjects who received piperacillin/ tazobactam, levofloxacin, ceftriaxone, vancomycin, imipenem and metronidazole respectively developed phlebitis. Also, 68.8%, 60.5%, 56.0%, 55.0%, 55.7% and 55.6% of subjects who didn't receive piperacillin/ tazobactam, levofloxacin, ceftriaxone, vancomycin, imipenem, and metronidazole respectively developed phlebitis. It also shows a statistically significant association between phlebitis and piperacillin/ tazobactam; between phlebitis and vancomycin; between phlebitis and imipenem; and between phlebitis and metronidazole.

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The above findings are compatible with a prospective, observational study conducted by Mandal A et al.[10] in the Medical and Surgical Division at Air Force Hospital, Kalaikunda, West Bengal among 150 patients. The aim of the study was to investigate the incidence of phlebitis and to evaluate factors contributing to the development of phlebitis. The findings of the study revealed that the administration of intravenous antibiotics substantially increases the risk of phlebitis (37.93% OR 2.70).

The study shows that 84.4% of subjects who received any combination of blood and blood products, continuous infusion, high osmolarity electrolytes, vesicants and antibiotics developed phlebitis. These findings are consistent with those of a descriptive study conducted by Furtado L[16] in the General Surgery Department of Divino Espirito Santo Hospital at Delgada Azores, Brazil among 171 admitted patients. The aim of the study was to determine the incidence of phlebitis related to peripheral cannula and its predisposing factors. The results of the study revealed that phlebitis is more associated with the administration of intravenous hypertonic solutions or vesicant and irritating drugs (p = 0.002).

Nursing Implications

The study findings have several implications in nursing. They can be categorised under the following headings:

Nursing Practice

- Nurses with adequate knowledge and skill can reduce the occurrence rate of phlebitis, thereby improving standards of health care. They should be adept in aseptic techniques like hand washing/ hand rub, use of sterile gloves, and disinfection of cannula site
- Nurses have the responsibility to use a standardised scale for the assessment and grading of phlebitis and to take decisions to improve patient care processes and patient outcomes
- Nurses should always document the date and time of cannulation of clients to help in maintaining continuity of care and to safeguard themselves from legal implications
- The study helps nurses to develop insight into various factors that are associated with the development of phlebitis so that they can use their knowledge and skill in the prevention of phlebitis, in recognising early symptoms of phlebitis and taking necessary action for the prevention of complications of phlebitis

Nursing Education

- Nurse educators working in hospital settings should start an in-service education programme regarding the occurrence and prevention of phlebitis, phlebitis assessment scales and actions needed to prevent the complication of phlebitis
- Information booklets containing information regarding phlebitis assessment scales, occurrence of phlebitis, risk factors of phlebitis, prevention and management guidelines should be distributed among nurses

Nursing Administration

Nursing administrators are key persons to plan, organise and conduct in-service education programmes. Education materials such as information booklets and pamphlets should be made available to nurses. Nursing educators should encourage staff to take part in conferences, workshops, and other in-service education programmes to update their knowledge and develop skills needed to meet the challenges of care. Nursing administrators' support should be necessary to conduct and evaluate in-service education programmes. The nursing administrator should take part in the making of health policies, development of protocols, and standing orders with respect to the prevention and management of phlebitis.

Nursing Research

The present study revealed that phlebitis continues to be a big clinical problem with an occurrence rate of 58%. Therefore, initiatives should be taken to conduct research to assess various risk factors and treatment modalities of phlebitis. The study helps the nurse researcher to develop insight into the development of phlebitis prevention protocol and for improving knowledge and management of phlebitis. The findings of the present study along with other related studies can be used to develop evidence-based practice guidelines regarding phlebitis.

Limitations

The limitations recognised in the study were:

- The study was limited to a small size (250), which imposes a limitation on generalisation
- The sample was selected only from SKIMS, Soura, Srinagar, hence generalisation can only be made for the sample studied
- The researcher used non-experimental descriptive research design. Hence the researcher had observed and described what has come to the fore. The same was correlated with previously done studies
- The researcher observed cannula only up to 72 hours after cannulation so it was not possible to assess phlebitis after 72 hours of cannulation
- The researcher didn't include post-infusion phlebitis in the study

Conclusion

There is a high incidence (58%) of phlebitis among patients admitted in emergency wards of SKIMS Soura, among which the grade 1 is the highest and most cases occur within the first 48 hours. A significant association of phlebitis was seen

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with age and gender. The following risk factors like site of cannulation and its disinfection, size of cannula and its fixating material, infusion of ionotropic drugs, antibiotics, blood and its products, KCL, phenytoin and their mode of administration were identified to have a significant association with phlebitis development. Therefore, staff nurses should be educated about these risk factors by the development of a phlebitis prevention protocol which they can implement in day to day practice.

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