Incidence and Its Associated Factors of Phlebitis among Pediatric Patients with Peripheral Intravenous Cannula at Hiwot Fana Specialized University Hospital, Harar, Eastern Ethiopia

Maleda Tefera[1*], Shiferaw Letta[1], Asnake Ararsa[2], Masresha Leta[3] and Aklilu Abrham[1]

[1]School of Nursing and Midwifery, College of Health and Medical Sciences, Haramaya University, Ethiopia
[2]School of Public Health, College of Health and Medical Sciences, Haramaya University, Ethiopia
[3]Department of Midwifery, Harar Health Science College, Harar, Ethiopia

Abstract

Background: Phlebitis is one of the common complications of intravenous therapy, with incidence rate ranging from 3.2% to 71.25%. This study aimed to determine the incidence and associated factors of phlebitis, related to the insertion of peripheral intravenous cannula, among pediatric patients at Hiwot Fana Specialized University Hospital, Eastern Ethiopia.

Methods: Institution-based prospective observational study was employed in 380 pediatric patients admitted to the pediatric and neonatal intensive care units of Hiwot Fana Specialized University Hospital from March to September, 2017. Data were collected by using a structured observational checklist (Jackson's Visual infusion phlebitis; FLAC; CONSOL ability and face's pain rating scales). Patients were followed from the time of admission until discharge from the hospital or discontinuation of intravenous cannula. Data were analyzed using Statistical Package for the Social Sciences Version 20. Logistic regression analyses were performed and a P-value less 0.05 was considered as statistically significant.

Results: The incidence of phlebitis was 33.7% (95% CI: 29.1, 38.6). Joint involvement for peripheral intravenous administration (AOR=2.07; 95% CI: 1.18, 3.66), indwelling time of 48-72 hours (AOR=2.22; 95% CI: 1.098, 4.485), pain during and after intravenous cannula insertion (AOR=1.32; 95% CI: 1.20, 2.50), and need of extra peripheral intravenous cannula insertion (AOR=3.93; 95% CI: 2.35, 6.58) were the factors significantly associated with phlebitis.

Conclusion: The incidence of phlebitis was high. Its associated factors were joint involvement, indwelling time, pain during intravenous cannula insertion, and need for extra peripheral intravenous cannula. Therefore, nurses and other health care providers need to follow the standard protocol of the indwelling time of the catheter and exclude joint involvement. Regular assessment for early identification of symptoms and management of pain are also crucial.

Keywords: *Eastern Ethiopia; Incidence; Phlebitis; Pediatric & Neonatal Intensive Care Unit*

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Introduction

Peripheral Intravenous Cannula (PIVC) insertion is the most commonly carried out invasive procedure in health institutions. It is estimated that more than 80% of hospitalized patients are subjected to PIVC with the cannula remaining in place for a considerable time (Foster *et al*., 2002; Williams, 2009). Venous cannulation provides relatively easy and comfortable access for intravenous (IV) therapy such as drugs, solutions and blood products, and to monitor the hemodynamic status for hospitalized neonates and children. Despite its importance in sophisticated modern medical practice, the veins of the children are so fragile that the insertion of IV cannula is very difficult (Kaur *et al*., 2011; Bitencourt *et al*., 2018).

Phlebitis is characterized by pain, erythema, heat, edema, induration, palpable venous cord, and purulent exudates. It is one of the common complications of IV therapy. Among hospitalized patients, 3.2% to 71.25% of patients receiving IV therapy develop phlebitis (Nassaji-Zavareh and Ghorbani, 2007; Uslusoy and Mete, 2008; Nagpal *et al*., 2015; Waitt *et al*., 2004; Williams, 2009; Salgueiro-Oliveira *et al., 2012;* Serane and Kothendaraman, *2016;* Karadeniz *et al., 2003;* Parul, N. *et al*., 2015; Bitencourt *et al*., 2018).

*Corresponding Author; Email: maledaifa.21@gmail.com
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The commonest factors associated with phlebitis are improper insertion, longer indwelling time, site of insertion, extra insertion, administration of highly viscous irritants such as drugs, a poor standard of infection control which allowing entry of infectious agents, type and frequency of intravenous medications, and intermittent intravenous infusion (Ben-Abdelaziz *et al*., 2017; Dougherty and Lister, 2015; Foster *et al*., 2002; Jacinto *et al*., 2014; Salgueiro-Oliveira *et al*., 2012). The complications associated with phlebitis can have even fatal consequences for patients (Reis *et al*., 2009). These include infection, thrombosis, and recurrent superficial thrombophlebitis. Septic thrombophlebitis is rare but it is one of the most serious complications of phlebitis (Higginson and Parry, 2011). Besides, complications arising from phlebitis can have long-term effects on patient care, satisfaction, length of hospital stay, and increase personal and financial cost to patients (Muchamad and Savitri, 2018).

Nurses are at the forefront in providing IV therapy, and their knowledge and skill can minimize infusion-related complications. They can significantly influence the quality of care provided by adopting the principles associated with the safe management and care of patients who have these device in situ (Li and Qin, 2016). Phlebitis is avoidable if the nurses adhere to simple hygiene and safety principles at every point of contact they made with each patient (Ademola and Tolulope, 2015; Salgueiro-Oliveira *et al.*, 2012; Salma *et al.*, 2019).

In developing countries, due to scarcity of resources, educated manpower, and economic problem, the incidence of PIVC complications including phlebitis is high (Cornely *et al*., 2002). To the best of our knowledge and extensive literature search, there is a little evidence in Ethiopia and in the study area in particular. Therefore, this study aimed to determine the incidence of phlebitis and its associated factors among admitted neonates and children receiving PIVC at Hiwot Fana Specialized University Hospital (HFSUH), Harar, Eastern Ethiopia.

Materials and methods

Study setting, design and period

The Harari Regional State is located 525 km east of Addis Ababa, capital of Ethiopia. The region has five hospitals (two public hospitals, one police hospital, and two private hospitals). Hiwot Fana Specialized Referral University Hospital (HFSUH) is one of the oldest public hospitals in Harar, the capital of the region. It provides service to people living in the eastern part of Ethiopia. It is a specialized teaching hospital and center for numerous medical and health science students. The hospital has six wards and six intensive care units. A prospective observational study was conducted in the pediatric ward and neonatal intensive care units for consecutive six months, from March to September, 2017.

Study participants, sample size, and sampling techniques

Neonates and children admitted to the pediatric ward and neonatal intensive care unit (NICU) with a PIVCs for the administration of intravenous therapy were included. The minimum sample size was determined by using a single population proportion formula considering the following assumptions: the incidence of phlebitis (50%) (Uslusoy and Mete, 2008), the margin of error (5%), and 95% confidence interval. Hence, the calculated sample size was 422, after adding a 10% non-response rate.

The past six-month admission record was analyzed and a total of 709 children and 178 neonates, received IV therapy, were admitted to HFUSH. The final sample size was proportionally allocated to the pediatric ward and NICU. A total of 337 children and 85 neonates with IV cannula were sampled using a systematic random sampling technique.

Data collection procedure

Data were collected by five BSc Nurses working in the pediatric ward and NICU using standard tools and a structured observation checklist which was developed through literature review. Sociodemographic variables (child's age, birth weight, gender), and clinical characteristics (the diagnosis, body mass index (BMI) for age) were extracted from the clinical records of the patients. Jackson's Visual Infusion Phlebitis Score (Jackson, 1998) and Neonatal Infant Pain Scale (Snipstad *et al*., 2017) assessment tool were used (Hudson-Barr *et al*., 2002). The face, legs, activity, cry, controllability (FLACC) pain scale was used for children aged 2 months to 1 year (Manworren and Hynan, 2003), and

faces pain scale for children aged 1year to 8 years, and numerical rating pain scale was also adopted for participants aged 8-18 years (Hicks *et al*., 2001).

Grade of phlebitis assessed using Jackson's Visual infusion phlebitis scale. Grade 0 had none of the typical symptoms of phlebitis such as pain, rash, and edema. Grade 1 described the early symptoms of phlebitis, such as slight pain at the site of IV cannula or redness near to IV site. Grade 2 phlebitis referred to mid-level disease: two of the following pain, erythema, and swelling, Grade 3 phlebitis is advanced phlebitis pain along the paths of the cannula, erythema, and induration. Grade in along the paths of the cannula, erythema induration, and palpable venous cord. Finally, grade 5 phlebitis described advanced thrombophlebitis. This grade included grade 4 symptoms as well as pyrexia (Nagpal *et al*., 2015).

Data related to the type of fluid, drug, infusion, number of injections per day, rate of IV infusion, the total amount of fluid per 24 hours, size of cannula, site of the cannula, joint involved, IV cannula indwelling time, number of trial mental status, nutritional status, type of glove used, and handwashing practice were collected through observation.

Enrollment and follow-up

Recruitment of study participants took place at the pediatric ward and NICU triage immediately after admission. Primarily, data collectors invited the parents or guardians to participate in the study on behalf of their neonates and children. Those who accepted the invitation were asked for their consent and assent for adolescents. Then identification code was given for records of enrolled participants and follow up was carried out until they discharged from the hospital or the intravenous cannula discontinued. During the follow-up, phlebitis and pain assessment scales were used.

Quality control

The observational checklist was pre-tested on 10% of the total sample size in Dilchora Hospital, Dire Dawa, and validated by the research team. Following the pretest, the necessary amendment was made accordingly. Three days of training on the objective of the study and the importance of data quality was given for the data collectors who were selected from respective ward and unit. The assessment of the sign of phlebitis, grades of phlebitis pain and other related complications for about a maximum duration of stay of a child using adapted standard guideline (Nagpal *et al*., 2015). The principal investigators monitored the entire data collection process.

Data processing and analysis

Data were checked, coded and entered into EpiData software Version 3.2 and exported into SPSS Version 21 for analysis. The descriptive analysis was conducted to describe frequency distribution and proportion. Tables and graphs were used to present the results of the analyzed data. The outcome variable was dichotomized as having and not having phlebitis (Yes/ No) and graded based on the phlebitis scale. Birth weight was categorized as normal birth weight (2.5- 4 kg), low birth weight (1.5-2.5), and very low birth weight (<1.5kg) (UNICEF, 2004), and nutritional status was classified as undernutrition (SD score and <-2 BMI < 18.5) and normal nutritional status (SD score and 2 to -2 and BMI 18.5–24.9) (WHO, 2010). Logistic regression analysis was used to assess the factors associated with the incidence of phlebitis. Those variables with a p-value of less than 0.2 in the bivariable analysis were included in the multivariate analysis. In multivariable analysis, the variables with $p< 0.05$ at 95 % confidence interval were considered as a statistical significant.

Operational definition

Pain level classification

Neonatal infant pain scale has a total pain score range from 0-7. Accordingly, pain level classification, 0-2 = mild to no pain; 3-4 = mild to moderate pain and >4 = severe pain (Snipstad *et al*., 2017).

FLACC pain scale has a total pain score range from 0-10. Accordingly, pain level classification, 0 = Relaxed and comfortable; 1-3=Mild discomfort; 4-6 = Moderate pain and 7-10 = Severe discomfort/pain (Manworren and Hynan, 2003).

Mental status classification:

Conscious: Is the state or quality of awareness, or, of being aware of an external object or something within oneself (Letta, S.2016)

Confusion: Disorientation and impaired thinking and responses to stimuli (Letta, S.2016)

Irritability: increased proneness to anger and showing no interest in anything (Letta, S.2016)

Lethargic: alternatively, sleepiness or drowsiness

Comatose: Inability to be aroused and no response to stimuli (Letta, S.2016)

Ethical consideration

Ethical approval for the study was secured from the Institutional Research Ethics Review Committee (IRERC) of the College of Health and Medical Sciences, Haramaya University. A letter of permission was submitted to the hospital officers before the commencement of data collection. All the study participants' families and caregivers were informed about the purpose of the study and participation was fully voluntary. They were also informed about the right to refuse and withdraw from the study at any time. The written consent/assent was also obtained from the study subjects and family/caregivers. Confidentiality was ensured through employing anonymity. Ethical conduct was maintained during data collection and throughout the research process. The staff has provided information to parent/guardian, appropriate strategy for preventing phlebitis and managing the identified symptoms of inflammation.

Results

Socio-demographic characteristics of study participants

A total of 422 study participants admitted to the NICU and pediatrics ward of HFSUH were included in this study; however, 42 participants lost from follow-up. Therefore, 380 participants were included in the analysis. More than three-fourth of the participants were admitted to the pediatric ward. Many of the study subjects were male (59.7%). The mean and the standard deviation (SD) of the age of the neonates were four days (±1day) whereas the mean and the SD of the age of the children were 37 months (±13day). Over two-third of the participants had normal weight whereas 64.4% were in undernutrition (Table 1).

Clinical related characteristics of study participants

One hundred forty-eight (38.9%) of the admitted neonates and children had more than one illness and 148 (29.9%) had a co-morbid illness of respiratory system disorders and 57 (28.9%) neonates were diagnosed for sepsis. More than half (237 (62.4%)) of them were conscious (Table 2).

Table 1: Socio-demographic characteristics of neonates and children admitted to the NICU and Pediatric ward of Hiwot Fana Specialized University Hospital, 2016.

Variables	Frequency	Percentage (%)
Unit		
Pediatric Ward	304	80.0
NICU	76	20.0
Sex (N=380)		
Male	227	59.7
Female	153	40.3
Age of Neonate (n=76)		
1-7 days	61	80.0
>7 days	15	20.0
Age of Child (n=304)		
1-6 months	72	24.0
7-12 months	73	24.0
13-24 months	54	18.0
25 months & above	105	34.0
Birth weight of Neonate (n=76)		
Normal	52	68.4
Low birth Weight	18	23.6
Very low birth weight	6	8.0
Nutritional status (Child) (n=304)		
Normal	109	35.6
Under nutrition	195	64.4

Table 2: Clinical related characteristics of neonates and children admitted to the NICU and pediatric ward of Hiwot Fana Specialized University Hospital, 2016.

Variables	Frequency	Percentage (%)
Reason for admission of children (n=495)		
RS Disorders	148	29.9
GIS Disorders	115	23.2
Neurological Disorders	53	10.7
CVS Disorders	40	8.1
GUS Disorders	27	5.5
Acute Febrile Illness	50	10.1
Others*	62	12.5
Reason for admission of neonates (n=197)		
Sepsis	57	28.9
Anemia	54	27.4
Hypothermia	34	17.3
LBW and VLBW	24	12.2
Preterm	19	9.6
Congenital Malformations	9	4.6
Mental Status		
Conscious	237	62.4
Confused	22	5.8
Irritable	60	15.8
Lethargic	48	12.8
Comatose	13	3.4

NB: *LBW: Low birth weight, VLBW: Very Low Birth Weight, RS: Respiratory system, GIS: Gastro-Intestinal System, GUS: Genito Urinary System, CVS: Cardio-Vascular System.*
** Others include: skin infection, human immunodeficiency virus (HIV) and diabetes mellitus (DM)*

Cannulation related characteristics

In this study, 346 (91.1%) of the study participants used 24 gauges of cannula size. Of the two hundred twenty-eight (60%) of the IV cannulas inserted into the veins of dorsal hands, 209 (55%) had parallel calculations in both hands. More than half insertion sites did not involve joint areas (57.9%) and the majority of the cannulas placed into the vein of the first trial of insertion (58.4%) (Table 3).

Trends of peripheral intravenous cannulation

A total of 76 neonates and 304 pediatric patients had received at least one cannula. More than half of pediatrics (53.6%) received the second cannulas. However, successive cannulation continued in decreasing trend from the second cannula to the fifth cannula (Figure 1).

Applied infection prevention strategies and medication-related characteristics

Almost all the nurses (374 (98.9%)) did not maintain handwashing before cannulation. Three hundred fifty eight (90%) of the cannulation was carried out by donning disposable gloves. Most of the neonates and the children received dual antibiotics (91.8%). The predominant means of infusion or administration of medications (211 (55.5%)) were carried out via dry cannula. More than three-fourth of the children and the neonates (293 (77.1%)) received IV medication one to two times a day (Table 4).

Table 3: Cannulation related characteristics of neonates and children admitted to the pediatric ward and NICU of Hiwot Fana Specialized Hospital, 2016.

Variables	Frequency	Percentage
Size of cannula		
24 gauge	346	91.1
22 gauge	34	8.9
Site of IV cannula insertion		
Dorsal of hands	231	60.8
Antecubital vein	99	26.1
Scalp vein	21	5.5
Others (legs and foot dorsal)	29	7.6
Concurrent insertion of the cannula		
Yes	209	55
No	171	45
Joint involvement		
Yes	160	42.1
No	220	57.9
Number of trials for insertion		
One time	222	58.4
Two to three times	143	37.6
Four to six times	15	3.9

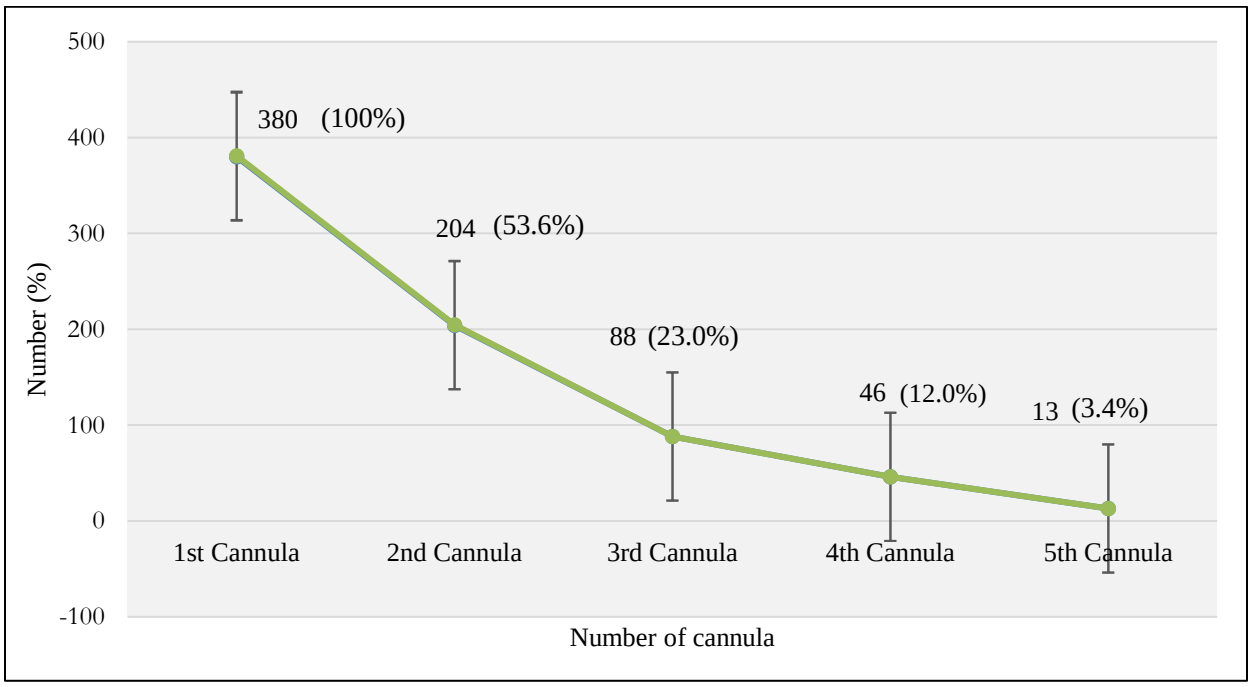

Figure 1: Trends of the cannula insertion among neonates and children admitted to the pediatric ward and NICU of Hiwot Fana Specialized University Hospital, 2016.

Table 4: Applied infection prevention strategies and medication-related characteristics among neonates and children admitted to the pediatric ward and NICU of Hiwot Fana Specialized Hospital, 2016.

Variables	Frequency	Percentage
Hand washing before the procedure		
Yes	4	1.1
No	374	98.9
Types of glove used		
Disposable	358	94.2
Surgical	22	5.8
IV Medications' administered		
Dual antibiotics	349	91.8
Other drugs*	31	8.2
Mode of infusion/administration		
Dry cannula	211	55.5
Continuous	90	23.7
Intermittent	79	20.8
Number of injections per day		
One to two times	293	77.1
Three to four times	84	22.1
More than four times	3	0.8

**Other drugs: diuretic drugs, anti-emetic drugs, anticonvulsant drugs, and anti-pain*

Incidence of phlebitis and related characteristics

The incidence of phlebitis in the present study was 33.7% (95% CI: 29.1%, 38.6%). Forty-eight (37.5%) of the study participants developed phlebitis in indwelling time at 72-96 hrs. More than half of the 73 (57%) developed phlebitis in the first cannula insertion. Near to one-third of the study participants, 111 (29.2%), experienced pain at various degrees and just about half experienced moderate pain (Table 5).

Factors associated with the incidence of phlebitis

In the bivariate analysis, having pain, cannula size of 22 gauge, joint involvement, need extra insertion, and indwelling time were associated with the outcome variable. The following variables showed a statistically significant association in multivariable analysis. Those patients who needed extra cannula insertion were four times (AOR=3.93; 95% CI: 2.35, 6.58) more likely to develop phlebitis. Similarly, the study subjects whose cannulation involved the joints were 2 times (AOR=2.07: 95% CI: 1.18, 3.66) more likely to develop phlebitis compared to those without cannula over their joints. Those participants with indwelling time of 48-72 hours (AOR= 2.22: 95% CI: 1.10, 4.49) and 72-96 hours (AOR=1.51; 95% CI: 1.30, 3.99) were more likely develop phlebitis than those with indwelling time of >120hrs.The incidence of phlebitis was 1.32 times (AOR=1.32; 95% CI: 1.20, 2.50) more likely in those who had pain than those had no pain (Table 6).

Discussion

The incidence of phlebitis in the present study was 33.7 %, more than half of phlebitis were grade two and above and developed it on the first cannula. The need for extra cannula, insertion involved joints, indwelling time and having pain were factors identified to be associated with the incidence of phlebitis.

Literature witnessed that phlebitis is a common and painful complication of peripheral intravenous cannulation. The incidence of phlebitis in this study is consistent with the one found by a study conducted in Brazil (34% among children aged from 0 to 2 years) (Bitencourt1 *et al*., 2018). However, it is lower than the findings from Turkey (67.24%) and India (71.25%) (Uslusoy and Mete, 2008; Nagpal *et al*., 2015). But, it is greater than 5% of the accepted level of incidence by the clinical guideline (O'grady *et al.*, 2011) and a study conducted in Austria (1.5%), Portugal (11.09%), Curitiba (Brazil) (17%) and Iran (26%) (Nassaji-Zavareh and Ghorbani, 2007; Salgueiro-

Oliveira *et al.*, 2012; Danski *et al*., 2016; Malyon *et al*., 2014). This discrepancy might be due to the difference in sample size, study population and infection prevention practice. A strict application of infection prevention strategies such as hand hygiene procedures, use of surgical gloves and disinfectants showed a relationship with a low incidence of phlebitis (O'grady *et al.*, 2011). However, in the current study, almost all cannulas were inserted without hand hygiene and using disposable gloves.

Table 5: phlebitis and related characteristics among Neonates and children admitted to the pediatric ward and NICU of Hiwot Fana Specialized Hospital, 2016.

Variables	Frequency	Percentage
Phlebitis		
Yes	128	33.7
No	252	66.3
Time between indwelling cannula and phlebitis development		
<48 hrs.	6	4.6
48-72 hrs.	28	21.8
72-96 hrs.	48	37.5
96-120 hrs.	34	26.6
>120 hrs.	12	9.4
Incidence of phlebitis per cannula (n=128)		
Cannula 1	73	57
Cannula 2	41	32
Cannula 3	14	11
Degree of phlebitis		
Grade I	56	43.8
Grade II	51	39.8
Grade III	16	12.5
Grade IV	5	3.9
Pain		
Yes	111	29.2
No	269	70.8
Degree of pain (n=111)		
Mild	55	49.9
Moderate	56	50.1

The present study demonstrated that the indwelling time of 48-72 hours and 72-96 hours had association with the incidence of phlebitis. This agrees with the ones reported from Italy and India developed phlebitis after 48 hours of indwelling (Nagpal *et al.*, 2015, Bagnasco *et al.*, 2011) and with another finding of a study conducted in India, which indicates that there is a higher risk of phlebitis if the IV cannula remains in veins for 72-96 hours (Saini *et al*, 2011). In addition, the medication load had a great impact on the occurrences of phlebitis (Nagpal *et al*., 2015).

This study presented that phlebitis was more common in those study participants with joint involvement site. This is similar to a finding by a study conducted in India (Saini *et al*., 2011). This might be because of there is the underlying movement of the joints, causing the cannula to be in direct contact with the intimae of the vein, damaging it, and resulting in phlebitis (Furtado, 2011). This study also identified the presence of pain as a predictor of phlebitis. This is in line with a study finding in Canada (Wagan, 2014; Boyce and Yee, 2012).

Pain is one of the symptoms of phlebitis that could be presented at any insertion site with various degrees. It could also be caused by extrusive tissue trauma, infiltration infused fluid, medication into interstitial space

and joint involvement (Ying-yi, 2012; Uslusoy and Mete, 2008).

This study also revealed that the need for extra insertion of the cannula had an association with phlebitis. This is contrary to the finding by a study conducted in Australia which indicates the need for extra insertion of the cannula was not associated with phlebitis (Wallis *et al*., 2014). The discrepancy might be due to the hospital setting, infection prevention policy, the experience of the health professionals and subsequent care given for the patient after insertion of the cannula.

The strength of this study is that it was an observational study with a follow-up. However, the study was conducted in one hospital and specific to certain age groups is its limitation. Hence, this study might not be generalizable to all ages. Moreover, future research is required by considering a quite large sample size from diverse hospitals and age groups to get the full picture of phlebitis and associated factors.

Table 6: Factors associated with phlebitis among neonates and children admitted to the NICU and Pediatric ward of Hiwot Fana Specialized Hospital, 2016.

Variables	**Phlebitis**		**COR (95% CI)**	**AOR (95% CI)**
	Yes N (%)	**No** N (%)		
Sex				
Male	81 (35.7)	146 (64.3)	0.79 (0.52, 1.24)	0.62 (0.46, 1.63)
Female	47 (30.7)	106 (69.3)	1	1
Cannula's size				
22 Gauge	17 (50.0)	17 (50.0)	0.47 (0.23, 0.96)	0.16 (0.10, 1.53)
24 Gauge	111 (32.1)	235 (67.9)	1	1
site of vein punctured				
Scalp	6 (28.6)	6 (71.4)	2.03 (0.62,6.72)	1.04 (0.24, 1.41)
Antecubital	24 (24.2)	75 (75.8)	2.54 (1.07,6.03)	2.07 (0.61, 7.11)
Dorsum of hands	85 (36.8)	146 (63.2)	1.40 (0.64, 3.04)	1.92 (0.72, 5.15)
Others (legs and foot)	13 (44.8)	16 (55.2)	1	1
Extra insertion				
Yes	99 (77.30)	29 (22.7)	4.41 (2.72, 7.14)	3.93 (2.35, 6.58) *
No	110 (43.6)	142 (56.3)	1	
Joint involvement				
Yes	72 (45)	88 (55)	2.39 (1.55, 3.70)	2.07 (1.18, 3.66) *
No	56 (26)	164 (74)	1	1
Indwelling time in hours				
<48	6 (9.7)	56 (90.3)	0.39 (0.13, 1.12)	2.59 (0. 89, 7.50)
48-72	28 (57)	21 (43)	0.45 (0.22,0.91)	2.22 (1.10, 4.49) *
72-96	48 (52.7)	43 (48.3)	1.855 (1.01, 3.39)	1.51 (1.30,3. 99) *
96-120	34 (27.6)	89 (72.4)	0.79 (0.43, 1.47)	1.26 (0.68, 2.33)
>120hr	12 (21.8)	43 (78.2)	1	1
Pain in insertion of a cannula				
Yes	58 (52.3)	54 (47.7)	3.16 (1.99,5.011)	1.32 (1.20,2.50) *
No	69 (25.7)	199 (74.3)	1	1

**Statistically significance with p<0.05*

Conclusion

In this study, there is a high incidence of phlebitis at the NICU and pediatrics ward of Hiwot Fana Specialized University hospital. It is more than stated as accepted in clinical guideline. More than half of phlebitis were grade two and above and occurred in the first cannula. Joint involvement for intravenous administration, indwelling time of 48-72 and 72-96 hours, the presence of pain during intravenous cannula insertion, and need extra peripheral intravenous cannula insertion were identified as predictors of phlebitis. Therefore, health professionals working at the NICU and pediatric ward of the hospital should strictly apply aseptic techniques during the insertion of the peripheral intravenous cannula, consider replacement of IV cannula every 48–96 hours, and exclude joints to minimize the risk of phlebitis. Strict cautions need to follow by health professional to reduce pain associated with tissue trauma and to avoid extra insertion. Besides, the nurses/health professional working on the child care in the hospital need to timely assess the symptoms of phlebitis, manage accordingly and monitor it in order to prevent further complications.

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Competing interests

We declare that authors have no competing interests

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Authors' contributions

MT designed, conceived, analyzed the data and prepared the first draft of the manuscript. SL and A*A* involved in data analysis, drafting of the manuscript and advising the corresponding author during the entire process. AA and ML were involved in critically reviewing the design, literature, interpretation of the analysis and report writing, and provides constructive comments and guidance for the corresponding author.

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