

INCIDENCE OF PHLEBITIS ASSOCIATED WITH OSMOLARITY

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Abstract. Phlebitis is a condition where the veins (*tunica intima*) inflammation, characterized by pain in the affected area, swelling, erythema and palpable hard veins caused by internal and external factors. The incidence of phlebitis highest in Southeast Asia according to the CDC (2017) are in developing countries such as Malaysia (12.70%), Philippines (10.10%), and Indonesia (9.80%). This study aimed to determine incidence of phlebitis associated with osmolality in Pediatric's wards of hospitals in Banjarmasin. This cohort study used analytic observational with a sample of 80 people used consecutive sampling technique with predetermined criteria. The instruments used were observation sheet respondents and Visual Infusion phlebitis Scale (VIP Scale). Data were analyzed using chi square test. There was a significant association between osmolality with the incidence of phlebitis ($p < 0.05$). This study recommend that nurses and medical personnel need to consider the osmolality is given through a peripheral IV catheter

Keywords: Osmolality, Phlebitis, Visual Infusion Phlebitis Scale

1 Introduction

Phlebitis is a condition where the veins (*tunica intima*) inflammation, characterized by pain in the affected area, swelling, erythema and palpable hard veins. [1,2,3]. factors involved in the incidence of phlebitis, among others: internal factors and external factors (factors mechanical, chemical factors, bacterial factors). [2,4].

Several factors have been associated with the incidence of phlebitis, (1) chemical factors, caused by irritation of drugs or infusion; (2) mechanical factors, location and material catheter and insertion skills; (3) The bacterial factors, migration of organisms from the skin, along the catheter to edge or from contaminated areas; and (4) patient factors / internal, infections from other locations, nutritional status, state of the veins, age, and sex. [5,6].

Phlebitis become one of the complications that often occur in intravenous therapy. [7,8]. Percentage of phlebitis in Southeast Asia every year about 10%. Center for Disease Control and Prevention (CDC) report on 2017 the incidence of phlebitis highest in Southeast Asia such as Malaysia (12.70%), Philippines (10.10%), and Indonesia (9.80%). [7]. The incidence of phlebitis was underreported in studies on 2015 Nagpal et al about from 2.3 to 67%, Ministry of Health Indonesia reported on 2013 prevalence in public hospital 50.11% and private hospital 32.70%. [8,9,10].

Preliminary studies on February 2017 in a hospital at Banjarmasin based on March 2016's data reported prevalence of phlebitis rate is 6.9%. According to the standards of the Infusion Nurse Society (INS), the accepted phlebitis rates is 5%. [11]. However, research findings suggest that there is a significant discrepancy in reported incidence associated with quality of hospital services specifically morbidity and residential or outpatient duration of treatment. Longer duration of treatment impacted to individually, family, and management of hospital for hospital services quality.

2 Method

This cohort study used analytic observational with a sample of 80 people used consecutive sampling technique with predetermined criteria. The instruments used were observation sheet respondents and Visual Infusion phlebitis Scale (VIP Scale). Data collected between May to June 2017 throughout 24 hours by researcher or researcher assistant (Cohen's Kappa: 0.894).

2.1 Research Ethic

Research ethic and research permit approved by ethical review committee of hospital and education institution. This study objective and procedure explained to parent's sample.

2.2 Validity and Reliability

VIP scale is a scale most used but Many phlebitis scales exist, but none has been thoroughly validated for use in clinical practice. [1]. Confirmed validity and reliability of VIP scale by Gallat P (2009) and Nekuzad (2012) correlation coefficient is 0.93. [12,13,14,15].

3 Result

The results of this study enabled a number of analyses that may contributed to understanding incidence of phlebitis associated with osmolarity. The number of participants 80 people were observation with VIP scale and identification Intravenous fluid therapy type.

Table. 1 Characteristics of subjects

Variable	Frequency (%)
• Age	
Infant	20(25)
Toddler	23(28.8)
Preschool	11(13.8)
School age	20(2.5)
Adolescents	6(7.5)
• Sex	
Male	43(53.8)
Female	37(46.2)

Table 1 showed the characteristics of subjects. The most age of participants was toddler 1-3 years old (28.8%). The majority of participants was male (53.8%).

Table. 2 Osmolarity of Intravenous fluid therapy and incidence of phlebitis

Variable	Frequency (%)
• Osmolarity infusion	
Isotonic	37(46.3)
Hypertonic	43(53.7)
• Incidence of phlebitis	
No	68(85)
Yes	12(15)

Table 2 showed Osmolarity of Intravenous fluid therapy and incidence of phlebitis. The majority of participants has hypertonic fluid solution (53.7%). The number of incidence phlebitis is 12 (15%).

Table. 3 The Relationship Osmolarity of Intravenous fluid therapy and incidence of phlebitis

Variable	Frequency of incidence phlebitis		P Value
	Yes	No	
• Osmolarity Infusion			
Isotonic	1(2.7)	36(97.3)	0,011 ^a
Hypertonic	11(25.6)	32(74.4)	

^a Continuity Correction Test

Based on bivariate analysis p value of osmolarity is < 0.011 showed in table 3 about the relationship osmolarity of Intravenous fluid therapy and incidence of phlebitis. $p < 0.011$ ($p < 0.05$) stated there was a significant association between osmolarity with the incidence of phlebitis.

4 Discussion

Based on the statistical analysis stated there was a significant association between osmolarity with the incidence of phlebitis ($p < 0.011$). Result of bivariate showed participants has intravenous isotonic fluid therapy that has phlebitis 1(2.7%) while participants has intravenous hypertonic fluid therapy that has phlebitis 11(25.6%). a sufficient ground of explanation the tolerance osmolarity of peripheral venous about 250-350 mOsm/L, osmolarity less than 250 mOsm/L lead to cell rupture, osmolarity more than 600 mOsm/L lead to phlebitis. [16,17,18].

Researcher found infant and toddler has D10% (555 mOsm/L) and D5½ NS (406 mOsm/L) for Intravenous fluid therapy. Both of them are hypertonic fluid solution, hypertonic fluid solution injure wall of venous and increase risk of phlebitis. Hypertonic fluid solution has higher concentration than other fluid solution, higher osmolarity than plasma serum made fluid transported out from the cell and the cells shrink.

According to results of studies Zohaib J *et al* (2019), Jacinto AKL *et al* (2014), and Gomes *et al* (2011) discovered there was a significant association between osmolarity with the incidence of phlebitis, fluid solution has higher osmolarity than other fluid solution increase risk of phlebitis. [22,23,24]. Salma *et al* reported on 2019 participants used potassium chloride (KCL) kind of hypertonic fluid solution has phlebitis. [19]. Hypertonic fluid solution considered harm venous endothelium lead to the incidence of phlebitis. [20]. Similarities with results of studies Park SM *et al* (2016) and Doellman D *et al* (2009) stated phlebitis caused by high osmolarity in that its lead to venous wall traumatic. [16,25]. In contrast to studies by Enes SMS *et al* (2016), Benaya A *et al* (2015), and Fang L *et al* (2011) stated there was not a significant association between osmolarity with the incidence of phlebitis. [26,27,28].

Knowledge about phlebitis is fundamental knowledge for nurse to prevent phlebitis in deliver nursing care. Nurse must know about risk factors of phlebitis, prevention action, intravenous care. Nurse and other medical personnel have responsibility to ensure the safe monitoring and management of patient's IV line stated by Pankaj Punjot *et al* (2018), it is act of prevention intravenous complications. [29].

5 Conclusion

This study recommend that nurses and medical personnel need to consider the osmolarity is given through a peripheral IV catheter. It is important because kind of osmolarity fluid therapy given through IV catheter potential lead to intravenous complications, each one of it is phlebitis.

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