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Original Article

The Effect of Aloe vera Compress in Reducing the Degree of Phlebitis among Hospitalized Children in Indonesia

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ABSTRACT

Background: Aloe vera is more effective than routine treatment in relieving the symptoms of phlebitis. However, few studies, to the best of our knowledge, have been conducted in Indonesia to explore the effectiveness of Aloe vera on phlebitis among hospitalized children from a wide age range. The present study aimed at evaluating the effectiveness of Aloe vera in reducing the degree of phlebitis among hospitalized children in Indonesia.

Methods: This study was quasi-experimental with a pretest-posttest design and a control group. The sample of this study was 42 children (21 respondents in both groups) with phlebitis who were admitted to a public health center in West Java, Indonesia from May to July 2019. The intervention and control groups were provided with an Aloe vera extract compress (5 ml) and compress of 70% Alcohol, respectively. Visual Infusion Phlebitis (VIP) scale was used as a monitoring tool in the present study. The Mann-Whitney test was used to evaluate the difference in the degree of phlebitis between the intervention and control groups. Wilcoxon test was also used to evaluate the differences before and after the intervention.

Results: The majority of respondents were in the neonatal period (45.23%) with normal nutrition status (54.76%). The average duration of hospitalization was seven days, and intravenous therapy solution non-electrolyte and antibiotics were received. The mean post-test scores decreased in both groups. There was a statistically significant difference between the phlebitis score both in the Aloe Vera and 70% baseline-specific experimental classes, during 8, 16, 32, 40, 48 hrs after treatment ($p < 0.05$). The average VIP score in the Aloe vera group is higher than that of 70% alcohol. It indicates that the VIP score in the Aloe vera group is further reduced.

Conclusion: This study found that Aloe vera could significantly reduce the degree of phlebitis compared to 70% alcohol. The findings of this study could be an alternative recommendation in managing phlebitis among hospitalized children.

Keywords: Aloe vera, Catheter, Intravenous infusion, Phlebitis

Introduction

Phlebitis is one of the most frequent complications in patients with intravenous therapy. The probability of occurring phlebitis during infusion using peripheral intravenous catheters is 31% (1). While a recent study in India reported that the prevalence of phlebitis was 31.4% (2). The highest prevalence of phlebitis was observed in developing countries including India (27.91%), Iran (14.20%), Malaysia (12.70%), Philippines (10.10%), and Indonesia (9.80%) (3). In Indonesia, the risk of phlebitis and the intensive care unit significantly increased 24 hrs after deployment (4). The recommended rate of phlebitis is 5% or less in the Infusion Nurses Society (5). Infiltration and phlebitis have been reported to be medical emergencies that lead to disability and negatively affect the quality of life (6). Phlebitis causes great physiological and psychological suffering to the patients and reduces the effectiveness of treatment and prolongs its process.

Many efforts have been made to reduce phlebitis and accelerate the healing process, including heparin sodium ointment and alcohol compresses (7) or applying warm or cold compresses at the site of phlebitis (8,9). Annisa

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(2017) in Indonesia evaluated the effect of warm water compared to 0.9% NaCl which indicated that warm water compress could reduce the degree of phlebitis but was not significant compare to 0.9% NaCl (10). Phlebitis is currently treating with 0.9% NaCl compresses at the top referral hospital in Indonesia and is being used continuously until the degree of phlebitis drops to zero. Applying 0.9% NaCl to wounds can induce an anti-inflammatory response and relieve pain, redness, and edema (11). However, using 0.9% NaCl bears a certain cost. The cost of a bottle of 0.9% NaCl may be relatively inexpensive; but, with the high prevalence of phlebitis, this price multiplies and becoming costly (11). There is an urgent need for developing new methods to prevent and alleviate infusion phlebitis.

Zheng et al. (12) stated that Aloe vera is more effective than routine treatment in improving symptoms of phlebitis including shortening the time to eliminate redness when relieving pain at the intravenous catheter site. Aloe vera contains 75 potentially active constituents including vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids, and amino acids some of which have several medicinal properties (12). It has been proven that fresh Aloe vera can promote the attachment and growth of normal human cells in vitro and heal wounded monolayers of cells (12). Using Aloe vera is beneficial as it is easily obtained without any extravasation due to the low concentration of electrolytes. Aloe vera inhibits venous inflammation by preventing Polymorphonuclear neutrophils (PMNs) from migrating to inflamed venous tissue (14). The quality of amino acids, glycoprotein, and Aloe-emodin in Aloe vera accelerates the development of new cells in the process of epithelial regeneration of the blood vessels (15). Additionally, it is less allergic to the skin of sensitive children (12).

A previous study conducted in Iran showed that 2% of Aloe vera cream can be effectively treating phlebitis caused by intravenous catheters and appropriately managing it. The positive effects of Aloe vera on phlebitis appear immediately after its usage (13). Aloe vera compress is safer for children because it lacks electrolytes that cause extravasation (12). Zheng et al. (12) also applied Aloe vera compresses in infants with phlebitis in the treatment room. The findings showed a significant change in the form of a decrease in the phlebitis level with a minimum of 0 and a maximum of 3. The previous meta-analysis concluded that the positive effects of external application of Aloe vera in preventing or treating infusion phlebitis should therefore be viewed with caution compared with no intervention or external application of 33% or 50% MgSO4 (12). However, few studies, to the best of our knowledge, have been conducted in Indonesia to explore the effectiveness of Aloe vera phlebitis among Hospitalized Children from a wide age range. The previous studies focused more on the infant stage instead of 70% alcohol. Therefore, this study aimed to evaluate the effectiveness of Aloe vera in reducing the degree of phlebitis among hospitalized children in Indonesia. In this study, we focus on comparing the effect of Aloe vera with usual care (70% alcohol).

Methods

This study was quasi-experimental with pretest-posttest design and a control group. At first, a pretest was performed on both groups, and the experimental group was received treatment. Then, a posttest was performed on both groups after the intervention. This study has been approved by the Ethics Committee of Cibabat Regional General Hospital, Indonesia with ethical code 445/1113/RS. This hospital is one of the referral hospitals in West Java, Indonesia.

The intervention and control groups were provided with a compress of extract Aloe vera (5 ml) and 70% Alcohol, respectively. The degree of phlebitis was measured before the intervention. Compression was applied for 20 mins at 8-hour intervals continuously for 2 days using gauze.

The study population was all pediatric patients with phlebitis in one of the public hospitals in West Java, Indonesia from May to July 2019. Inclusion criteria were; (1) Signing a written consent by the parents if willing to be a respondent; (2) being 1 month - 7 years; (3) receiving intravenous therapy; (4) having infusion-related phlebitis; (5) having full control of the mind. While the exclusion criteria in this study were having phlebitis with other complications such as deep vein thrombosis and pulmonary embolism as well as a history of allergy to alcohol or Aloe vera. A non-paired numerical analysis research formula was used to determine the sample size in this study. The following sample calculation is based on an unpaired numerical analytical research formula: $n_1 = n_2 = 2\left[\frac{(Z\alpha+Z\beta)S}{x_1-x_2}\right]^2$; whereas α is a

type I error that can be obtained by 1-5%, in this study α = 0.05, $Z\alpha$ = 1.96; β is an acceptable type II error of 5-20%, in this study β = 0.2, $Z\beta$ = 0.842; S is the combined standard deviation obtained from the literature of 1.1 (research results); X1 is the percentage decrease in the degree of phlebitis in the case group (Aloe vera compress), quoted from a previous study of 1,430 (4); X2 is the percentage decrease in the degree of phlebitis in the control group (70% alcohol compress), quoted from previous research, 1,002 (4). The subjects were 19 people in each group. A sample correction of 10% was performed to avoid the drop out of the sample. So that the number of samples reached 21 in each group. Purposive sampling with intervention and control groups was used in this study.

The demographic information form was completed via paper-and-pencil, which included the age of the participant, duration of hospitalization, type of intravenous therapy solution, and antibiotic medication. Nutritional status was measured using body mass index based on age. Criteria for underweight was - 3 SD to < - 2 SD, normal was -2 SD to +1 SD, and overweight was > + 1 SD to + 2 SD.

The outcome variable was the degree of phlebitis which was measured using the VIP scale. Phlebitis is inflammation of the vein after intravenous catheterization. The area of the catheter was examined daily for the symptoms of phlebitis. The area was monitored for up to 96 hrs following catheter removal. The VIP score was obtained from a previous study (16) as follows: 0= no symptom of phlebitis; 1= occurrence of one of the following symptoms: slight pain near the area, or slight redness; 2= occurrence of two of the following symptoms: pallor near the site, erythema, swelling; 3= occurrence of all following symptoms: pain along the path of the cannula, erythema, induration. 4= occurrence of all the following symptoms: pain along the path of the cannula, erythema, induration, palpable venous cord. 5= occurrence of all following symptoms: pain along the path of the cannula, erythema, induration, palpable venous cord, pyrexia (16). The VIP scale is a valid and reliable tool recommended by the RCN for monitoring infusion sites after catheter removal (16).

Data were analyzed using a descriptive statistic to describe the characteristics of the patients and degree of phlebitis. The difference in demographic characteristics between the intervention and control groups was evaluated using the chi-square test. The normality test showed that data were not normally distributed ($p<0.005$). Therefore, the Mann-Whitney test was used to evaluate the difference in the degree of phlebitis between the intervention and control group. Wilcoxon test was also used to evaluate the difference before and after the intervention. The 5% significance level was used to determine the differences in the critical variable score before and after the intervention. All statistic was analyzed using SPSS 22.

Results

Table 1. shows the characteristics of the participants in both intervention and control groups. There were no differences between intervention and control groups in terms of age, nutritional status, duration of hospitalization, intravenous therapy solution, and antibiotic medication. The majority of children who experienced phlebitis were infants (45.24%), with normal nutrition status (54.76%), and the average

Table 1. Characteristics of patients (n=42)

Variable	Intervention group (n=21)	Control group (n=21)	p-value
	n (%)	n (%)	
Age			
Infant	10 (47.62)	9 (48.86)	0.135[a]
Toddler	6 (28.57)	7 (33.33)	
Preschool	5 (23.81)	6 (28.57)	
Nutrition status			
Underweight	5 (23.81)	4 (19.5)	0.076[a]
Normal	11 (52.38)	12 (57.14)	
Overweight	6 (28.57)	5 (23.81)	
Duration of hospitalization (day)	7.43±1.76	7.13±1.06	0.564[b]
Intravenous therapy solution			
Non-electrolyte	11 (52.38)	12 (57.14)	
Electrolyte	9 (42.86)	8 (38.10)	
Antibiotic Medication			
No	3 (14.29)	4 (19.05)	0.375[c]
Yes	19 (90.48)	17 (80.95)	

Note: [a] Statistic analysis using Chi-Square test; [b] Statistic analysis using Mann-Whitney test; Statistic analysis using Fisher's Exact test

Table 2. The severity of phlebitis based on the VIP score of participants in both groups (n=42)

Severity of plebitis	Group		Chi-square (x^2)	p-value
	Intervention group, n (%)	Control group, n (%)		
0 (No phlebitis)	0 (0)	0 (0)		
1 (Possible first sign/very mild)	10 (47.6)	9 (42.8)		
2 (Early stage/Mild)	4 (19.1)	6 (28.6)		
3 (Medium stage/Moderate)	5 (23.8)	4 (19.1)	4.90	0.272
4 (Advanced phlebitis/severe)	2 (9.5)	2 (9.5)		
5 (Advanced Thrombophlebitis /Very severe)	0 (0)	0 (0)		

Table 3. Effectiveness of Aloe vera and 70% alcohol compresses on phlebitis severity (n=21)

Variables	Pre-score		Post-score		WST	p-value
	Mean±SD	Rank	Mean±SD	Rank		
Aloe vera group(n=21)	1.19±0.40	2.80	0.14 ± 0.36	1.89	-3.24	0.014
70% alcohol group (n=21)	1.29±0.64	2.54	0.86 ± 1.01	1.58	-3.50	0.001

Note: p (<0.05) *, WST (Wilcoxon Sign Test).

Table 4. Comparison of the effectiveness of Aloe vera and 70% alcohol compress on phlebitis with baseline score

Differences	Aloe vera group		70% alcohol group		MWU	p-value
	Mean±SD	Mean Rank	Mean±SD	Mean Rank		
Baseline vs 8 hrs	0.44 ± 0.10	17.40	0.23 ±0.18	14.56	114	0.012*
Baseline vs 16 hrs	0.40± 0.33	18.16	0.36 ± 0.32	16.88	194	0.035*
Baseline vs 24 hrs	0.45 ± 0.19	21.62	0.36 ± 0.27	18.60	140	0.001*
Baseline vs 32 hrs	0.88 ± 0.14	25.76	0.40 ± 0.21	19.14	117	0.001*
Baseline vs 40 hrs	1.00 ± 0.54	26.80	0.39 ± 0.20	19.65	89	0.001*
Baseline vs 48 hrs	1.05 ± 0.23	29.21	0.43 ± 0.14	20.76	123	0.024*

Note: p (<0.05) *; MWU—Mann-Whitney U Test.

duration of hospitalization was 7 days and most of them were on antibiotic medication.

Table 2. shows that moderate phlebitis was observed in 19 (45.2%) participants from both groups who scored "1" among them 47% and 42.8% were in Aloe vera and 70% alcohol groups, respectively. About 10 (23.8%), 9 (21.4%), 4 (9.5%) of patients had mild, moderate, or severe phlebitis, respectively.

Table 3. depicts the average, standard deviation, and score range from pre- to post-score. The discrepancy between pre-and post-score is therefore recognized as important. The average for the post-test score decreased in both groups.

Table 4. demonstrates that there is a statistically significant difference in phlebitis score of both experimental groups after comparing baseline at 8, 16, 32, 40, 48 hrs after intervention ($p<0.05$). The mean VIP score in the Aloe vera group is higher than that of the 70% alcohol group. It shows that there is a further decrease in VIP score in the Aloe vera group.

Discussion

The present study acknowledges that Aloe vera could significantly reduce the degree of phlebitis compared to 70% alcohol. This finding supports other studies investigating the effect of Aloe vera on the degree of phlebitis (12,13, 17-19). Nurjanah (18) indicates the same results that Aloe vera can reduce the degree of phlebitis in the third 8 hrs after giving a compress. Treating simultaneously with 70% alcohol compress can also reduce the degree of phlebitis to a lesser extent. So it can be concluded that Aloe vera reduces the degree of phlebitis faster than 70% alcohol. Other studies conducted in China showed that Aloe vera compresses were 1.24 times more effective in reducing the degree of phlebitis than other substances such as MgSO4, NaCl, and 70% alcohol (12). The previous meta-analysis suggested that Aloe vera could prevent severe to moderate phlebitis, but most cases in the present study were low to moderate degrees of phlebitis. This could be affected by the different duration of hospitalization and nutritional status which can influence the wound healing process (19). Aloe vera is proven to be effective in controlling phlebitis in children (20). Economically, these interventions are cost-effective to be implemented in hospitals. Therefore, it is shown that Aloe vera could be an alternative for controlling phlebitis in hospitalized children.

The chemical composition of Aloe vera inhibits the degree of phlebitis through various mechanisms. Aloe vera contains 75 pharmacologically active constitutes such as vitamins, enzymes, lignin, sugars, saponins, salicylic acids, amino acids (15). Additionally, it contains secondary metabolites of Aloe-emodin and chrysophanol (14) which act as an immune booster, moisturizing, anti-aging, and anti-septic.

Aloe vera also contains carboxypeptidase that inactivates bradykinin in vitro, salicylates to prevent vasoconstriction (12, 14). C-glucosyl chromone is also an anti-inflammatory substance in Aloe vera (14, 21) by releasing cyclooxygenase and suppressing the production of prostaglandin E2 (22). Decreasing the inflammatory process is shown by reducing the degree of phlebitis from grade 3, which is characterized by pain along the path of the cannula, erythema, and induration to grade 1, which is marked by no symptom of induration, pain, or erythema. However, several factors affect the speed of wound healing including nutritional status, disease status, medications, and radiation exposure (23). Therefore, considering these factors is also important in controlling phlebitis in hospitalized children.

One of the nursing cares for pediatric patients with phlebitis is providing mild therapy to reduce or eliminate discomfort caused by phlebitis. Pure Aloe vera extract is used in its compress without mixing other chemicals. Aloe vera extract is simply processed to have minimal side effects. However, limitations of this study are the small sample size of the public hospitals in West Java that could not be generalized to other hospitalized children with phlebitis. Moreover, this study also failed to consider other factors or variables such as disease status and radiation exposure that could affect the healing process of phlebitis.

Conclusion

In conclusion, this study indicated that Aloe vera could reduce the degree of phlebitis in hospitalized children. Taking operational procedures in hospitals is important for using Aloe vera in controlling phlebitis. In addition, it is hoped that nurses will be able to provide direct instruction to families on using Aloe vera in phlebitis during hospital discharge. So that using Aloe vera can be run optimally by nurses and families. The results of this study can be used as a basis for further research on phlebitis using more accurate methods with follow-up, large sample size, and other variables, or comparing the decrease of phlebitides by their type or degree.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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