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ORIGINALES

Incidence of phlebitis and related factors in peripheral venous access in adults

Incidência de flebite e fatores relacionados em acesso venoso periférico de adultos

Incidencia de flebitis y factores relacionados en el acceso venoso periférico en adultos

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ABSTRACT:

Aim: The study aimed to characterize phlebitis in adults in a clinical hospitalization sector, in terms of incidence, related factors and grade.

Method: This is a cohort carried out in a clinical hospitalization department of a philanthropic hospital in the interior of the state of São Paulo, Brazil. The study included adults over 18 years old, hospitalized and using peripheral venous access; the invitation was made to each patient on their first day of hospitalization and those who accepted signed the informed consent form (ICF), were included, and evaluated daily for the occurrence of phlebitis, as well as its characteristics. A total of 49 people participated in the research, with a mean age of 61.29 years (sd: 20.692), mostly women (69.39%), white (65.30%).

Results: The incidence of phlebitis was 28.56%; age over 60 years (p=0.004) and use of anticoagulants (p=0.025) increased the risk of developing phlebitis. The use of intravenous anti-inflammatory drugs (p=0.008) was related to reduce the amount of phlebitis.

Conclusion: It was concluded that the incidence of phlebitis was related to age and use of anticoagulants; intravenous anti-inflammatory medications appear to be a protective factor.

Keywords: Nursing; Phlebitis, Nursing Care; Cohort studies

RESUMO:

Objetivo: O estudo teve como objetivo caracterizar a flebite em adultos em um setor de internação clínica, quanto a incidência, graduação e fatores relacionados.

Método: Trata-se de uma coorte realizada em um setor de internação clínica de um hospital terciário filantrópico do interior do estado de São Paulo, Brasil. No estudo foram incluídos adultos maiores de 18

anos, internados e em uso de acesso venoso periférico; o convite foi feito a cada paciente em seu primeiro dia de internação e aqueles que aceitaram assinaram o termo de consentimento livre e esclarecido (TCLE), foram incluídos e avaliados diariamente quanto a ocorrência de flebite, bem como, suas características. Participaram da pesquisa 49 pessoas, com média de idade de 61,29 anos (dp: 20,692), a maioria mulheres (69,39%), brancas (65,30%).
Resultados: Observou-se que a incidência de flebite foi de 28,56%; a idade superior a 60 anos (p=0,004) e o uso de anticoagulante (p=0,025) aumentaram o risco para o desenvolvimento de flebite. O uso de anti-inflamatórios (p=0,008) endovenosos demonstrou ser um fator que reduziu o número de flebites.
Conclusão: Conclui-se que a incidência de flebite esteva relacionada a fatores como idade, uso de anticoagulantes e anti-inflamatórios endovenosos.

Palavras-chave: Enfermagem; Flebite, Cuidados de enfermagem; estudos de coorte.

RESUMEN:
Objetivo: El estudio tuvo como objetivo caracterizar la flebitis en adultos en un sector de hospitalización clínica, en cuanto a incidencia, grado y factores relacionados.
Metodología: Se trata de una cohorte realizada en un sector de hospitalización clínica de un hospital terciario filantrópico en el interior del estado de São Paulo, Brasil. El estudio incluyó a adultos mayores de 18 años, hospitalizados y con acceso venoso periférico; la invitación se realizó a cada paciente en su primer día de hospitalización y quienes aceptaron firmaron el formulario de consentimiento libre informado (FCLI), fueron incluidos y evaluados diariamente para detectar la aparición de flebitis, así como sus características. Participaron de la investigación 49 personas, con una edad promedio de 61,29 años (de: 20.692), la mayoría mujeres (69,39%), blancas (65,30%).
Resultados: La incidencia de flebitis fue del 28,56%; la edad mayor de 60 años (p=0,004) y el uso de anticoagulantes (p=0,025) aumentaron el riesgo de desarrollar flebitis. El uso de antiinflamatorios intravenosos (p=0,008) resultó ser un factor que redujo el número de flebitis.
Conclusión: Se concluye que la incidencia de flebitis estuvo relacionada con factores como edad, uso de anticoagulantes; Los medicamentos antiinflamatorios intravenosos parecen ser un factor protector.

Palabras clave: Enfermería; Flebitis, Cuidados de enfermería; escuadrón de estudio.

INTRODUCTION

The use of peripheral venous access (PVA) has been the most frequently used invasive procedure in hospitalized patients as it is indicated for hemodynamic monitoring, fluid replacement or maintenance, medication administration, blood transfusions, parenteral nutrition, and administration of contrast agents [(1)].

The insertion of PVA requires accuracy from the health professional, mastery of specific knowledge and its complications and risks. In this sense, the nursing team has an important role during the use of Intravenous Therapies (IVT), since it is their role to insert the catheter, monitor the entire treatment, as well as preventing phlebitis from insertion to removal of venous access [(2)].

Phlebitis is one of the complications related to IVT, in which inflammation occurs inside a vein after trauma, immobilization and insertion of catheters for a long period. It is considered multifactorial and may be related to the medications and fluids infused, the type of catheter used and its location, as well as factors associated with the patient such as age, sex, and problems in the circulatory system [(3)].

During IVT there is a high possibility of developing phlebitis and this causes physiological, mechanical, and consequently integumentary complications as well as the removal of the catheter, discomfort, and stress, making therapy difficult and increasing the costs resulting from the need for numerous punctures [(4)].

This complication can be of four types that vary according to the cause of the operation, they are: mechanical, which occurs due to the friction movement generated within the vein; chemical ones, which are directly associated with the type of medication infused through the catheter (factors such as pH, blood concentration and osmolarity); as bacteria, which are an inflammatory response to the entry of bacteria into the vein; and there is also post-infusion phlebitis, which appears 28 to 96 hours after removing the catheter. Therefore, bacterial phlebitis has the highest morbidity and mortality rate as it presents a risk of developing septicemia [3].

Analyzing the incidence of phlebitis in a clinical sector is an arduous task. The phlebitis is an adverse event of epidemiological relevance with an incidence ranging from 25.8% to 55.6% [5].

For its evaluation, the Infusion Nursing Society (INS) developed a scale for classifying phlebitis, the Infusion Nurses Society Phlebitis Scale[6], in which there are five degrees of classification. Grade 0 refers to the absence of signs of phlebitis; in the first degree there is erythema, with or without pain at the puncture site; in the second degree, there is pain and there may be edema or erythema at the puncture site; in the third degree, there is pain, erythema and persistence at the puncture site, with the formation of a palpable venous cord; in the fourth and final degree, there is pain, erythema, a palpable venous cord measuring more than 1 centimeter and a purulent union at the puncture site [6].

Despite the wide use of PVA and the subsequent range of research carried out to identify, characterize and prevent phlebitis, there is still a gap between the various institutional standards in its use and knowledge about the risks, types, prevention, and the treatment of phlebitis. This distance occurs since each institution adopts a scale to identify phlebitis and different protocols, which makes it difficult to establish accurate standards and diagnoses regarding the characterization and incidence of phlebitis [1].

Therefore, investigating the incidence and factors related to phlebitis associated with the use of peripheral venous catheterization is extremely important as it causes damage to the client's health. Thus, collecting data and providing evidence contributes to increasing existing knowledge in the area, to the development of more effective Operational Protocols and therefore to reducing incidence rates, in addition to contributing to progress regarding minimizing factors risk, prevention, and treatment of this complication [7].

In this context, the present study aimed to characterize phlebitis in adults in a clinical hospitalization department, regarding incidence, related factors, and degree.

METHODOLOGY

This is a quantitative, cohort-type study, in which a certain group is followed for a period with the purpose of monitoring, observing, and evaluating incidences so that at the end of the research relevant results on the topic can be obtained [8].

The research project was approved by the Human Research Ethics Committee after the consent of those responsible for the institution defined as the study location (opinion number 5,320,670 of 2022). Participants were only approached ethically, with

the research purposes being explained and their consent affirmed through the Informed Consent Form (ICF) and following all the ethical precepts determined by Brazilian´s Resolution 466/12 [9].

The study was carried out in a clinical hospitalization department of a philanthropic hospital in the interior of the state of São Paulo from April to August 2022. This department has 24 beds that care for adult patients with clinical conditions from all specialties. The study included adults over 18 years of age hospitalized in the sector and who required the insertion of a peripheral venous access or had a venipuncture coming from other sectors within 48 hours of insertion. Participants who presented with phlebitis at the time of the initial assessment were excluded from inclusion in the research.

Data collection was carried out by two researchers, previously trained to identify phlebitis and its stages. Initially, eligible participants were invited to participate in the research, explaining the risks and benefits regarding data collection and presenting the informed consent form (ICF). In case of acceptance, the collection instrument was completed.

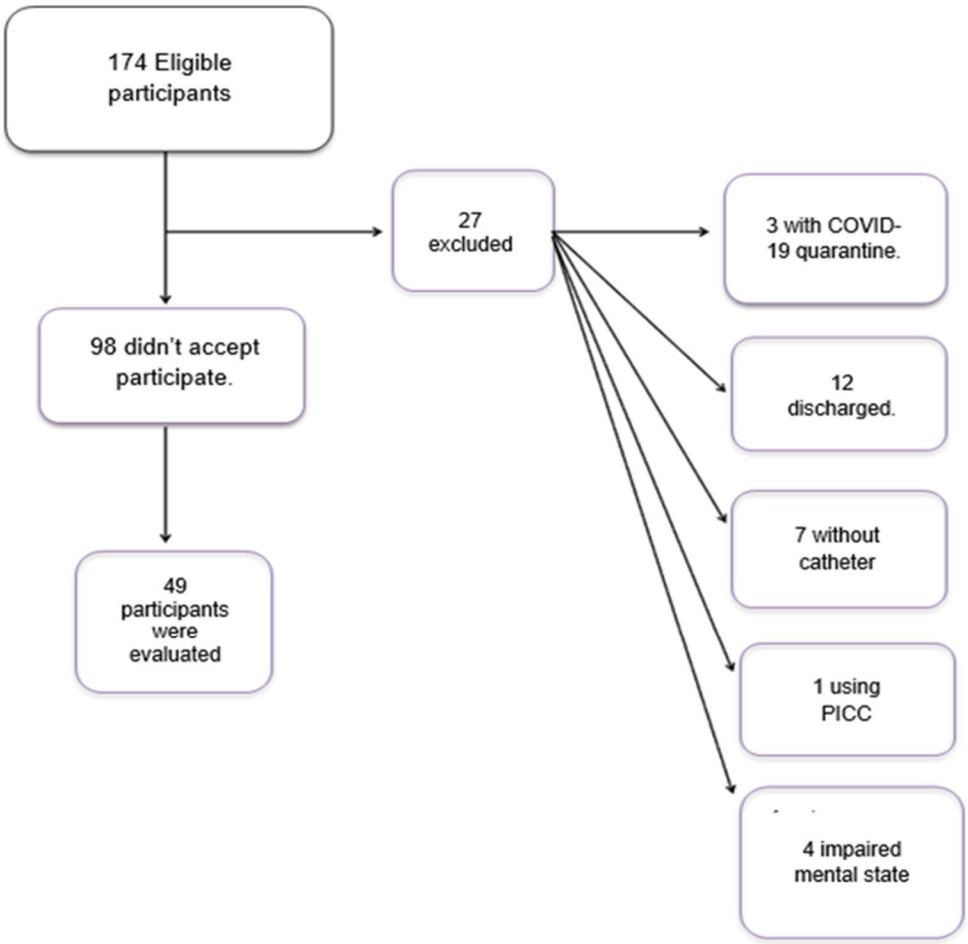
The data collection instrument was previously prepared and contained sociodemographic information (age, sex, and education level), clinical information (drinker, smoker, Body Mass Index, pre-existing diseases, diagnosis upon admission) and information related to venous access (place and date of puncture, catheter caliber, length of stay, medications in use and signs of phlebitis). The venous access site was evaluated daily for signs of phlebitis, classifying them using the Infusion Nurses Society Phlebitis Scale, [6] with each puncture being evaluated individually.

The collected data were entered into Microsoft Excel® spreadsheets with double entry, forming a database. The variables were initially analyzed with descriptive statistics and then the incidence value of phlebitis was determined (Number of new cases of phlebitis/total punctures x100). The correlation of clinical variables with the existence of phlebitis and its different degrees was carried out using the *Student's t test* and ANOVA for continuous variables and the *Chi-square* test for dichotomous variables. The software IBM SPSS Statistics 22® was used for the analyses, considering a significance level (α) of 5%.

RESULTS

A total of 174 participants were eligible for the research and 49 were included in the end, according to Figure 1.

Figure 1: Flowchart of screening, inclusion, and exclusion of research participants. 2022.



The sociodemographic analysis showed that of the 49 patients, 69.39% (n=34) were women and 30.61% (n=15) men, with a mean age of 61.29 years (sd: 20.692), with the maximum age 99 years old, the minimum 19 years old and the median 63 years old. Regarding race, 65.30% (n=32) considered themselves white, 20.40% (n=10) considered themselves mixed race and 14.28% (n=7) black. Regarding the level of education, 4.08% (n=2) of the participants have higher education, 38.77% (n=19) completed secondary education, 44.89% (n=22) did not complete basic education and 4.08% (n=2) are not literate. The analysis of the body mass index (BMI) showed an average of 26.60 (sd: 5.609). Regarding habits, alcoholic patients represent 8.16% of the sample (n=4), while smokers represent 16.33% (n=8).

Regarding comorbidities, 16.32% (n=8) have Diabetes Mellitus (DM), 28.57% (n=14) SAH (Systemic Arterial Hypertension), 6.12% (n=3) reported having some heart disease, 16.32% (n=8) other comorbidities and 46.93% (n=23) reported no comorbidities.

Regarding medications for continuous use, it was observed that 2.04% (n=1) use Haloperidol, 6.12% (n=3) Metformin, 4.08% (n=2) Clonazepam, 8, 16% (n=4) Losartan, 4.08% (n=2) Prolopa, 4.08% (n=2) use Acetylsalicylic acid, 4.08% (n=2)

Captopril, 2.04% (n= 1) Simvastatin, 8.16% (n=8) Furosemide, 4.08% (n=2) Insulin, 4.08% (n=2) Atenolol, 6.12% (n=3) propranolol, 26, 53% (n=13) use other medications and 57.14% (n=28) do not use any continuous medication.

The clinical and PVA-related characteristics are described in Table 1.

Table 1: Description of the clinical characteristics of the participants and data related to venous access. 2022.

	n	%
Reason for hospitalization		
Immediate postoperative period	14	28,57
Pneumonia	3	6,12
Urinary tract infection	4	8,16
Heart disease	3	6,12
Neoplasia	3	6,12
Stroke	2	4,08
Others	20	40,81
Water Intake		
1 liter	25	51,08
2 liters	20	40,81
3 liters	2	4,08
Didn´t know to inform	2	4,08
Feeding		
Oral	44	89,79
Nasogastric catheter	4	8,16
Gastrostomy	1	2,04
Eliminations		
Continent	39	79,59
Diaper	7	14,28
Indwelling bladder catheter	4	8,16
Number of punctures (n=63)		
1	38	77,55
2	9	18,36
3	1	2,04
4	1	2,04
Catheter replacement number (n=49)		
0	37	75,51
1	6	12,24
2	4	8,16
3	2	4,08
Puncture site (n=64)		
Right upper limb	33	51,56
Left upper limb	29	45,31
Right external jugular	1	1,56
Right lower limb	1	1,56
Catheter number (n=62)		
18	3	4,83
20	43	69,35
22	13	20,96
No identification	6	9,67
Length of stay in days (n=63)		
1	29	46,03
2	14	22,22
3	8	12,69
4	4	6,34
5	3	4,76
6	3	4,76
7	1	1,58

Reason for changing		
Loss	12	19,04
Phlebitis	14	28,56
Time	2	3,17

When analyzing the incidence of signs and symptoms of phlebitis, 6.12% (n=3) presented hyperemia, 22.44% (n=11) presence of flushing, 8.16% (n=4) erythema, 12.24% (n=6) edema, 12.24% (n=6) had pain, in 4.08% (n=2) there was the formation of a palpable venous cord and 71.42% (n=35) had no signs and phlebitis symptoms. The incidence of phlebitis was 28.56% and the description according to the degrees is presented in table 2.

Table 2: Incidence of phlebitis found in study patients divided by grade, according to the Infusion Nursing Society classification. 2022.

Phlebitis Scale	**n**	**%**
Grade 1	7	14,28
Grade 2	5	10,20
Grade 3	2	4,08
Grade 4	0	0,00
Absence of signs and symptoms	35	71,42

Assessment using the Chi-square test did not demonstrate an association between phlebitis and the variables gender (p=0.473), race (p=0.066), smoking (p=0.294), alcohol consumption (p=0.075), type of diet (p =0.174), water intake (p=0.218). Furthermore, no relationships were found between phlebitis and catheter number (p=0.423) and puncture site (p=0.215). Table 3 describes the assessment of phlebitis in relation to age, BMI, puncture length and use of IV medications.

Table 3: Description of the relationship between phlebitis and age, puncture time, BMI and use of intravenous medication.

	Phlebitis				
	Yes		**No**		**p valor**
	mean	**sd**	**mean**	**sd**	
Age	69,82	16,422	53,83	21,439	0,004*
Body Mass Index	29,92	3,613	26,77	7,521	0,215*
Length of stay	2,64	1,866	1,93	1,322	0,084*
Systolic blood pressure	118,51	14,037	119,54	24,807	0,858*
Diastolic blood pressure	73,60	9,434	94,33	113,90	0,396*
Respiratory rate	17,86	4,144	15,44	7,050	0,090*
Temperature	36,21	0,481	35,43	5,613	0,520*
Heart rate	7,985	8,313	80,70	20,428	0,852*
Oxygen saturation	94,90	2,333	92,63	14,821	0,479*
Medicament	**n**	**%**	**n**	**%**	**p valor**
Glucose	14	45,2	17	54,8	0,078**
Antiemetic	14	31,8	30	68,2	0,523**
Antibiotic	2	28,6	5	71,4	0,732**
Anti-inflammatory	0	0	11	100	0,008**
Anticoagulant	7	63,6	4	36,4	0,025**

*t for student
**chi square

It can be seen in Table 3 that age was a variable that was related to the incidence of phlebitis, with older ages having higher rates of phlebitis. The same happened with the use of intravenous anticoagulants, which was linked to phlebitis. The use of

intravenous anti-inflammatory drugs has been shown to be associated with lower rates of phlebitis.

DISCUSSION

The incidence of phlebitis during the use of PVA was 28.56% (n=14). A study carried out [10] in a philanthropic hospital in Bahia revealed an incidence of 91.34% with a rate of 11.4% per month.

Another important fact concerns the length of stay longer than the recommended 96 hours, which represented 11.1% of total; on the other hand, the number of access changes due to time exceeding the recommended 96 hours represented only 3.17% of total changes; furthermore, 9.67% of the accesses were not identified and data. These data lead to reflection on the need for greater rigor in monitoring length of stay and identification of accesses.

It was observed that 14.28% of patients had grade I phlebitis; 10.20% had grade II phlebitis and 4.08% of patients had grade III phlebitis. Grade IV phlebitis was not evidenced during data collection, which may be related to the short period of hospitalization of patients in the trained sector and the impossibility of monitoring post-fusional phlebitis.

This research points out that the most frequent reasons for PVA removal are loss of the vein for various reasons, which represent 19.4% of the total number of changes, phlebitis (3.17% of the total number of changes), time longer than the recommended 96 hours (3.17% of total exchanges). Among the variables considered, it is noted that 28.57% of patients with an average age over 69.82 years needed to change their accesses, representing 50% of the total loss of accesses in the study.

Studies [10,11] corroborate the findings of this research by pointing to a higher incidence of phlebitis in the elderly. As Buzatto et al [12] point out, this data can be explained by the greater fragility of tissues and blood vessels, more frequent dehydration, diseases that directly influence the permeability of the vessels and their resistance to invasive procedures.

Significant evidence from this study is that it deals with the incidence of phlebitis and the use of certain medications, such as the use of anticoagulants (p=0.025), or which 63.6% of participants with phlebitis used during internationalization. A study that sought to investigate nurses' perception of the causes of phlebitis, points to the use of an anticoagulant as a potential factor in the development of phlebitis in the field of medicines. Osmolarity and pH influence the onset of phlebitis due to changes in sonic electrolytes and potassium in the blood [13]. Corroborating these findings, Rebecchi and Fernandes [14] state that although heparin is biologically found in animal mucosa, it may interfere with the balance of electrolytes and consequently with blood pH.

In relation to variables such as sex, number and location of peripheral venous access, studies [10,11] describe sex as a variable related to the development of phlebitis, with a higher incidence in women, unlike this article, in which this was not a variable of influence.

The 20G catheter was the most used in intravenous therapy in this study, representing 69.35% of total punctures; of these, 51.36% were inserted mainly in the right upper limb. In a study carried out with 1,319 participants, 79.7% used the catheter 22; there was a relationship between the catheter number and the development of phlebitis, as well as between the choice of limb for puncture and the risk of phlebitis [15]. The present study, however, did not find a relationship between the choice of limb, catheter number and the incidence of phlebitis.

Regarding comorbidities, 28.57% of the patients in this study have SAH, while 16.32% (n=8) have Diabetes Mellitus. In the study by Lulie et al [11] 76.8% of patients were hypertensive and 90.1% had DM; These data are relevant since any pathology that affects the permeability of vessels, their resistance or that increases the probability of phlebitis must be considered before starting the use of PVA, as well as it can influence the choice of the member to be punished.

Mota et al [10] and Mattox [16] state that the lower limbs should be avoided in hypertensive or heart disease patients, given the risk of developing thrombi, which may also explain the predominance of PVA in the upper limbs (94.67%).

Another important finding concerns the length of stay, and in studies carried out in hospital sectors, the long length of stay was a factor that contributed to the emergence of phlebitis [10,11,17].

As limitations of the present study, data were not obtained after discharge, which makes it impossible to observe cases of post-infusion phlebitis; Even so, no data were found regarding length of stay, which may be a variable related to the emergence of phlebitis.

CONCLUSION

The incidence of phlebitis in this studied was 28.56% and the factors associated with its development were age (p=0.004) and use of intravenous anticoagulants (p=0.025). Furthermore, participants who used intravenous anti-inflammatory drugs internally had minor incidences of phlebitis (p=0.008).

The fundamental role of nursing in monitoring signs of phlebitis stands out, especially in elderly patients or those using anticoagulants, in addition to other factors highlighted in other studies. To this end, training and standardization for the assessment and management of these complications is essential, both for professionals and teaching patients and family members about the signs of phlebitis.

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