

Prevalence and factors related to difficult peripheral venous puncture in adults and elderly patients undergoing chemotherapy*

Prevalência e fatores relacionados à punção venosa periférica difícil em adultos e idosos em quimioterapia

How to cite this article:

Santos JFA, Jardim LL, Oliveira ACS, Ramos AMPC, Barichello E, Toffano SEM, et al. Prevalence and factors related to difficult peripheral venous puncture in adults and elderly patients undergoing chemotherapy. Rev Rene. 2026;27:e96134. DOI: <https://doi.org/10.36517/2175-6783.20262796134>

 Jéssika Fernanda Alves dos Santos¹
 Lara Louise Jardim¹
 Ana Carolina de Souza Oliveira¹
 Aline Maria Pereira Cruz Ramos²
 Elizabeth Barichello¹
 Silmara Elaine Malaguti Toffano¹
 Adriana Cristina Nicolussi¹

*Extracted from the dissertation “Prevalência e fatores de risco para punção venosa periférica difícil em adultos e idosos submetidos a tratamento quimioterápico”, Universidade Federal do Triângulo Mineiro, 2023.

¹Universidade Federal do Triângulo Mineiro.
Uberaba, MG, Brazil.

²Universidade Federal do Pará. Belém, PA, Brazil.

Corresponding author:

Adriana Cristina Nicolussi
Universidade Federal do Triângulo Mineiro – Campus 1.
Curso de Graduação em Enfermagem.
Praça Manoel Terra, 330. CEP: 38015-050.
Uberaba, MG, Brazil.
E-mail: drinicolussi@yahoo.com.br

Conflict of interest: the authors have declared that there is no conflict of interest.

EDITOR IN CHIEF: Ana Fatima Carvalho Fernandes 

ASSOCIATE EDITOR: Ana Luisa Brandão de Carvalho Lira 

ABSTRACT

Objective: to estimate the prevalence and factors related to difficult peripheral venous puncture in adult and elderly patients undergoing intravenous chemotherapy. **Methods:** a cross-sectional study was conducted with 93 adult and elderly cancer patients undergoing intravenous chemotherapy at a chemotherapy center in a teaching hospital. Peripheral venous puncture was considered difficult when there was failure on the first attempt and was evaluated through non-participatory observation of the procedure. Bivariate analysis and binomial logistic regression were performed. **Results:** a prevalence of 26.9% was detected in difficult peripheral venous puncture. Patients with a history of difficult peripheral venous puncture were 4.35 times more likely to experience this occurrence. The following were listed as predictors: a history of difficult peripheral venous puncture ($p = 0.001$) and a non-palpable venous network ($p = 0.001$). **Conclusion:** the prevalence occurred in less than one-third of patients. A history of difficult peripheral venous punctures and a non-palpable venous network contributed to the difficulty of peripheral venous punctures in these patients. **Contributions to practice:** identifying the prevalence and factors related to difficulty in peripheral venous puncture is relevant for nursing to incorporate new technologies that enhance success on the first attempt and provide safer care to patients. **Descriptors:** Catheterization, Peripheral; Vascular Access Devices; Antineoplastic Agents; Oncology Nursing; Patient Safety.

RESUMO

Objetivo: estimar a prevalência e os fatores relacionados à punção venosa periférica difícil em pacientes adultos e idosos durante a quimioterapia endovenosa. **Métodos:** estudo transversal, desenvolvido com 93 pacientes adultos e idosos com câncer submetidos ao tratamento quimioterápico endovenoso, em uma central de quimioterapia de um hospital de ensino. A punção venosa periférica foi considerada difícil quando houve falha na primeira tentativa e foi avaliada por meio de observação não participativa do procedimento. Realizada análise bivariada e regressão logística binomial. **Resultados:** detectou-se prevalência de 26,9% na punção venosa periférica difícil. Pacientes com histórico de dificuldade na punção venosa periférica tiveram 4,35 vezes mais chances desta ocorrência. Foram relacionados como preditores: histórico de punção venosa periférica difícil ($p=0,001$) e rede venosa não palpável ($p=0,001$). **Conclusão:** a prevalência ocorreu em menos de um terço dos pacientes. O histórico de punção venosa periférica difícil e possuir rede venosa não palpável influenciaram na dificuldade para a punção venosa periférica nestes pacientes. **Contribuições para a prática:** identificar a prevalência e os fatores relacionados à dificuldade na punção venosa periférica é relevante para que a enfermagem incorpore novas tecnologias para o sucesso na primeira tentativa e na prestação de uma assistência mais segura aos pacientes.

Descritores: Cateterismo Periférico; Dispositivos de Acesso Vascular; Antineoplásicos; Enfermagem Oncológica; Segurança do Paciente.

Introduction

Chemotherapy has been used to treat solid tumors and can be administered in various ways. Still, depending on the specific protocol for the cancer in question, intravenous administration has been the most commonly used method⁽¹⁾. Chemotherapy drugs are classified according to their potential for tissue damage, categorized as irritants and vesicants, which can cause discomfort, erythema, edema, and local necrosis⁽²⁾. Nurses are responsible for knowing how to handle and administer chemotherapy drugs to ensure patient safety during infusion therapy⁽¹⁾.

To promote the infusion of intravenous chemotherapy drugs, peripheral venous puncture is necessary, as it is considered capable of facilitating the injection of large volumes and enabling the direct administration of other drugs with a rapid response into the patient's bloodstream. Constant inspection of venous access is recommended, as well as adherence to institutional safety protocols and removal of the catheter after the end of the chemotherapy infusion or within 24 hours⁽¹⁻²⁾.

It is worth noting that proper maintenance of peripheral venous puncture in chemotherapy treatment is as essential as the treatment itself. The use of bundles with specific measures for vascular catheter maintenance is recommended, such as flushing, which involves the administration of 0.9% saline solution before and after drug infusions⁽³⁻⁴⁾. These and other precautions, such as correct stabilization and continuous evaluation of the insertion site, are essential to prevent complications, including infection, obstruction, infiltration, and extravasation⁽⁴⁾, which can be severe enough to compromise the entire treatment.

The need for intermittent puncture in outpatient treatment due to long cycles of antineoplastic infusion can cause the loss of vasorelaxant effects, suppressed anti-inflammatory and vascular restorative functions, as well as endothelial dysfunction⁽⁵⁾, which can cause fragility and instability of the venous network for patients undergoing chemotherapy, due to this periodicity of drug infusion⁽⁶⁾.

When peripheral venous catheters are used without scientific evidence, they account for up to 42% of failures⁽⁴⁾, one of which is the occurrence of multiple puncture attempts. Difficulty in peripheral venous puncture has a prevalence of 10-24% in adult patients⁽⁷⁾. There is no consensus, but difficult peripheral venous puncture (DPVP) can be considered when there is more than one puncture attempt⁽⁷⁻⁹⁾. Therefore, the nursing team must exercise care when inserting the device to avoid such failures and ensure the patient's comfort and safety.

Variables such as gender, body mass index, renal failure, diabetes, previous chemotherapy, related to vascular access such as diameter, visibility, and palpability of the vessels, in addition to a history of DPVP, are factors that hinder the success of puncture, as found in a systematic review of seven studies conducted in the United States and European countries⁽⁷⁾ and in a Brazilian study⁽⁹⁾. However, no study has evaluated this issue in chemotherapy services, leaving a knowledge gap.

Patient safety is a fundamental pillar of quality care, and ensuring its effectiveness is challenging because, in addition to providing adequate peripheral venous access, the nursing team is responsible for planning, executing, and maintaining the drug administration route, as incidents related to the preparation and administration of chemotherapy drugs have an incidence of 2% to 5% per year⁽¹⁰⁾.

Factors related to the difficulty of peripheral venous puncture in cancer patients were analyzed in thirteen articles, one of which was published in Brazil with patients admitted to a surgical unit, and only one article dealt with patients undergoing chemotherapy, which was developed in Italy⁽¹¹⁾. A study conducted in the Amazon region in the context of chemotherapy was identified in the literature⁽⁵⁾. Thus, there is a lack of research, especially in Brazil, on DPVP in patients undergoing chemotherapy. Given this, we ask: what is the prevalence of DPVP in patients undergoing chemotherapy, and which factors are related to it?

Considering the limited studies associating DPVP in patients undergoing chemotherapy, it is es-

essential to determine the prevalence and factors related to this difficulty in puncturing these patients. This information can then be used to suggest to the nursing team the incorporation of technologies to achieve success on the first attempt, aiming to provide safe care to these patients. Therefore, this study was conducted to estimate the prevalence and factors associated with difficult peripheral venous puncture in adult and elderly patients undergoing intravenous chemotherapy.

Methods

Type of study and location

A cross-sectional study was conducted at a chemotherapy center, that is, a unit structured for outpatient care of cancer patients at a teaching hospital, which serves as a reference for 27 municipalities in the Southern Triangle of Minas Gerais, Brazil, and guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Population and sample

The sample size calculation considered a DPVP prevalence of 42.7%⁽¹²⁾, 5% precision, and a 95% confidence interval for a finite population of 460 patients, resulting in a minimum sample size of 207 participants. However, because patients returned monthly for subsequent cycles of chemotherapy, it was not possible to reach the estimated sample size. Therefore, a non-probabilistic convenience sample of 93 patients was used.

The following were included in the study: patients aged 18 years or older undergoing chemotherapy treatment with an indication for peripheral venous puncture. Exclusion criteria: subjects readmitted to the chemotherapy ward with a previous history of peripheral venous puncture.

Data collection instruments

A questionnaire containing sociodemographic and clinical variables, as well as an observation of the

venipuncture procedure, was used. It was adapted from a hospital setting⁽⁹⁾ to an outpatient chemotherapy setting and submitted for content validation by three expert judges in the field, all of whom hold doctoral degrees.

The first part addresses the variables used to characterize the sociodemographic and clinical profile of patients, containing the following items: date of birth and outpatient care, gender, skin color (self-declared), marital status, education (in years of study), diagnosis, comorbidity, anthropometric data (height, weight, and body mass index), use of oral anticoagulants, history of previous surgeries, history of prior hospitalizations, current chemotherapy data, including cycle, name, and classification of chemotherapeutic agents, history of intravenous chemotherapy, and difficulty with puncture.

The second part refers to non-participatory observation of the procedure, analyzing the following items: topography, presence of edema at the puncture site/limb, skin preparation, peripheral venous catheter used, catheter cannula material, gauge (G), venous network at the puncture site (after tourniquet application), the act of puncture, including the outcome, fixation/stabilization performed, and its identification. This study considered DPVP to be a failure on the first attempt at puncture⁽⁷⁻⁹⁾.

Period and data collection

Data collection took place between September 2022 and February 2023. To standardize observations, the assistant researchers received training in data collection and peripheral venipuncture observation from their supervisor. They visited the unit to present the project to the nursing professionals (nurses and nursing technicians) responsible for performing peripheral venous punctures to obtain informed consent form.

Next, they conducted a weekly survey of patients' chemotherapy schedules. They were approached on the days they attended treatment. After explaining the research and obtaining consent to participate in the study, the researchers collected signatu-

res on the informed consent form and then observed the patients. The procedure was observed in the ward where the patient was staying, and the researchers were instructed not to interact and to remain about one meter away during the procedure to reduce the Hawthorne effect. The medical records were consulted to collect data, including diagnosis, current cycle, and the name of the chemotherapy drug.

Data analysis

The instrument variables were coded and cataloged in a dictionary. The data were double-entered and validated in a Microsoft Office® Excel® spreadsheet and subsequently analyzed using IBM® SPSS version 20 software.

The analysis of categorical variables was performed using absolute and relative frequency distributions, while quantitative variables were analyzed using measures of central tendency (mean). In bivariate analysis, measures of association in contingency tables, such as the chi-square statistic, prevalence ratio, and odds ratio, were included.

To identify the relationship between the occurrence of DPVP and clinical variables, binomial logistic regression analysis was used for potentially predictive variables (gender, self-declared skin color, age group, history of DPVP, and body mass index (BMI)) according to scientific evidence. A significance level of 5% was considered, and the confidence interval of the estimated prevalence ratios was 95%.

Ethical aspects

All participants were informed about the study and gave their consent by signing the informed consent form. The project was approved by the Research Ethics Committee of the Clinical Hospital of the Federal University of Triângulo Mineiro, under Certificate of Ethical Review 57533822.5.0000.8667 and opinion No. 5,441,235/2022.

Results

Ninety-three patients undergoing chemotherapy participated, with a mean age of 61 years, ranging from 21 to 95 years. The majority were elderly, self-identified as white, married, and had up to seven years of schooling, as shown in Table 1.

Table 1 – Sociodemographic characteristics of patients undergoing chemotherapy (n=93). Uberaba, MG, Brazil, 2022–2023

Variables	n (%)
Gender	
Male	58 (62.4)
Female	35 (37.6)
Age group	
Elderly person	50 (53.8)
Adult	43 (46.2)
Self-declared race	
White	57 (61.3)
Brown	23 (24.7)
Black	13 (14.0)
Marital status	
Married/civil union	51 (54.8)
Single	16 (17.2)
Widowed	13 (14.0)
Divorced	10 (10.8)
Other	3 (3.2)
Education (years)	
No education or < 1	2 (2.1)
1 to 7	46 (49.5)
8 to 14	29 (31.2)
≥ 15	16 (17.2)

Regarding clinical variables, the most prevalent comorbidities were systemic arterial hypertension (SAH), reported in 35 (37.6%) patients, and diabetes mellitus (DM), reported in nine (9.7%) patients. However, 53 (57%) patients had no comorbidities. Fifty-one (54.8%) patients had a history of previous surgeries, 67 (68.8%) were hospitalized, and 27 (29.0%) had DPVP. Regarding BMI, 34 (36.6%) were underweight, 38 (40.9%) were eutrophic, and 21 (22.6%) were overweight.

As for the types of cancer, the most frequent were 21 (22.6%) patients with colorectal cancer, 9 (9.7%) with lung cancer, 7 (7.5%) with breast cancer, 6 (6.5%) with prostate cancer, and 50 (54%) with other types of cancer. Most patients were undergoing their first chemotherapy treatment 85 (91.4%) with 62 (66.7%) undergoing between the first and third cycles.

Twenty different chemotherapeutic agents were identified as being used by the study participants, with fluorouracil predominating 34 (36.6%), followed by platinum derivatives: oxaliplatin 27 (29%) and cisplatin 21 (22.6%). Antineoplastic drugs were classified according to their potential for tissue and vascular damage, with nine being irritants (45%), five being vesicants (25%), three being both irritants and vesicants (15%), and three being neither vesicants nor irritants (15%).

Regarding the catheters used, in the first attempt at peripheral venous puncture (n=93), in most cases, a peripheral venous catheter with a needle protection device (90-96.8%) was used, with a 22G gauge

(69-74.2%), and on the back of the hand (42-45.2%). In the second attempt (n=25), the peripheral venous catheter with a needle protection device also predominated (21-95.45%), but the 24G gauge (13-52.0%) and the forearm (9-40.90%) were the preferred sites. For fixation, adhesive tape (89-95%) was the most used device, followed by microporous tape (4-4.3%); among these, only 19 (20.4%) were identified.

To verify the success of the peripheral venous puncture procedure, the effectiveness of catheter insertion on the first attempt, the presence of blood return, and the start of infusion were observed. Failure on the first attempt was considered DPVP, occurring in 25 (26.9%) patients.

Table 2 shows the association between the occurrence of difficult peripheral venous puncture and the clinical variables gender, self-declared skin color, age group, history of difficulty, and BMI. It can be observed that patients with a positive history were 4.35 times more likely to experience DPVP (p<0.001).

Table 2 – Association of clinical variables and difficult peripheral venous puncture in patients undergoing outpatient chemotherapy (n=93). Uberaba, MG, Brazil, 2022–2023

Variables	Difficult peripheral venous puncture		PR* (CI [†])	AOR [‡] (CI)	p-value [§]
	Present n (%)	Absent n (%)			
Gender					
Female	10 (28.6)	25 (71.4)	1.10 (0.55-2.18)	1.14 (0.44-2.93)	0.775
Male	15 (25.9)	43 (74.1)			
Skin color					
Not white	11 (30.6)	25 (69.4)	1.24 (0.63-2.43)	1.35 (0.53-3.42)	0.525
White	14 (24.6)	43 (75.4)			
Elderly person					
Adult	14 (28.0)	36 (72.0)	1.09 (0.55-2.15)	1.13 (0.45-2.84)	0.793
Elderly person	11 (25.6)	32 (74.4)			
DPVP history					
Yes	16 (59.3)	11 (40.7)	4.35 (2.19-8.60)	9.21 (3.25-26.08)	0.000
No	9 (13.6)	57 (86.4)			
Body mass index					
Eutrophic	11 (23.9)	35 (76.1)	1.24 (0.63-2.45)	1.35 (0.53-3.39)	0.523
Altered	14 (29.8)	33 (70.2)			

*PR: Prevalence ratio or unadjusted odds ratio; [†]CI: Confidence interval; [‡]Adjusted prevalence odds ratio; [§]Chi-square test; ^{||}DPVP: Difficult peripheral venous puncture

The association between venous network (visible and palpable) and DPVP on the first puncture attempt is shown in Table 3. A non-palpable venous network was a predictor of DPVP ($p < 0.001$).

Table 3 – Association between venous network and difficult peripheral venous puncture in patients undergoing outpatient chemotherapy (n=93). Uberaba, MG, Brazil, 2022–2023

Variables	Difficult peripheral venous puncture		PR* (CI) [†]	AOR [‡] (IC)	p-value [§]
	Present n (%)	Absent n (%)			
Visible venous network					
No	6 (42.9)	8 (57.1)	1.78	2.36	0.144
Yes	19 (24.1)	60 (75.9)	(0.86-3.66)	(0.73-7.68)	
Palpable venous network					
No	13 (68.4)	6 (31.6)	4.21	11.19	0.000
Yes	12 (16.2)	62 (83.8)	(2.31-7.69)	(3.55-35.28)	

*PR: Prevalence ratio or unadjusted odds ratio; [†]CI: Confidence interval; [‡]Adjusted prevalence odds ratio; [§]Chi-square test

The variables analyzed were dichotomized for the analysis of associated factors. In the binomial logistic regression analysis of the occurrence of DPVP and clinical variables, the following were identified as predictors: a history of DPVP and a non-palpable venous network, as shown in Table 4.

Table 4 – Logistic regression analysis between the occurrence of difficult peripheral venous puncture and sociodemographic and clinical variables. Uberaba, MG, Brazil, 2022–2023

Variables	AOR* (CI) [†]	p [‡]
Skin color	1.06 (0.32 – 3.46)	0.913
Body mass index	0.96 (0.29 – 3.16)	0.949
History of difficult peripheral venous puncture	7.15 (2.15 – 23.75)	0.001
Number of chemotherapeutic agents per patient	1.73 (0.66 – 4.55)	0.262
Non-palpable venous network	8.01 (2.29 – 28.03)	0.001

*Adjusted odds ratio; [†]CI: Confidence interval; [‡]Significance level

Discussion

Aging is one of the factors that influences the development of cancer⁽¹³⁾, which is sometimes detected and treated in patients with an average age of 61 years⁽¹⁴⁾. Contrary to the results found, patients undergoing chemotherapy in the Amazon region had an average age of 54.5 years, with the majority being female and self-declared brown-skinned, but converged in relation to the type of cancer, which predominantly affected the digestive system⁽⁵⁾.

Furthermore, regarding diagnosis, patients with cancer in palliative care presented colorectal, lung, head and neck, and breast cancer as the most frequent⁽¹⁵⁾, proportional to this analysis.

Regarding comorbidities, hypertension, and diabetes mellitus are predominant^(5,16) in this population, which, because it is undergoing chemotherapy, maintains regular contact with health services. To ensure patient safety, investigating certain aspects, such as a patient's previous health history, is crucial for the quality of care^(2,6-7). Regarding BMI, there was a divergence in results compared to this study, in which most patients were eutrophic⁽¹⁶⁾.

The drugs fluorouracil, oxaliplatin, and cisplatin are among the most used chemotherapeutic agents for cancer treatment, and despite their irritating and/or vesicant characteristics, the intravenous route is the safest for drug absorption and maintenance and is the leading choice for administering these chemotherapeutic agents^(1,17-18). The peripheral venous puncture technique is routinely used by nursing staff. Nursing practices in the process are relatively simple, but complications can cause harm to the patient^(2,4,7).

There were 25 cases of failure during the puncture procedure, ranging from one to four, performed by different professionals at each attempt. In a study conducted in the Amazon region with cancer patients, 82 had DPVP, finding that 47.6% of participants were punctured twice, 32.9% three times, and 19.4% more than four times until they were successful in peripheral puncture for chemotherapy infusion⁽⁵⁾.

Implementing strategies and utilizing equipment, such as ultrasound, increases the likelihood of success on the first attempt at venipuncture, resulting in better quality care and improved patient satisfaction. This approach avoids the need for multiple punctures, which can result in traumatic maneuvers and cause tissue damage, as well as possible adverse effects and discomfort for the patient⁽¹⁹⁾.

Chemotherapy treatment, a history of difficulty with peripheral venous puncture, the presence of lesions and hematomas, the number of previous punctures, and the non-palpability and non-visibility of the vein are factors that influence DPVP^(11,14,20). Although they have been linked to difficulty in peripheral venous puncture, the variables of gender, advanced age, BMI below and above normal, and non-visible venous network were not statistically significant.

Women have greater vascular reduction and stiffening compared to men due to hormonal changes, with female sex being indicated as a strong risk factor for difficulty in peripheral venous puncture⁽²¹⁾, corroborating the findings, as the higher prevalence of DPVP was in women, although there was no statistical significance. Senescence causes changes in body composition, such as loss of lean mass and subcutaneous tissue, resulting in reduced vein support and stability, which can also contribute to difficulty in puncturing⁽²²⁾.

In the BMI assessment, it was observed that most individuals were underweight or obese, with an increased risk of 1.24 for individuals with changes in this index. Obesity is considered a risk factor for difficulty in peripheral venous puncture⁽⁷⁾.

The variables, history of difficult peripheral venous puncture and non-palpable venous network, were statistically significant for difficulty in the current puncture. This difficulty was also observed in 83.7% of patients who reported their history, suggesting it as a predictor ($p < 0.001$) and indicating a risk of 8.45⁽⁷⁾, which is also considered an independent factor for the success of the first attempt. In patients undergoing intravenous treatment for oncological and hematological conditions, 76% of participants with a history of DPVP presented some compromise in the procedure⁽¹⁴⁾.

Regarding blood vessel characteristics, the variable non-palpable venous network was a relevant factor for the success of peripheral venous puncture. Non-palpable venous networks after tourniquet application are an independent risk factor for DPVP^(7,16).

In addition, chemotherapy patients, in addition to a history of DPVP and a non-palpable venous network, also had a non-visible venous network as a predictor, with a chance of presenting puncture difficulty of 1.6, 1.3, and 1.5, respectively⁽⁵⁾.

Professional experience is a factor that increases the probability of success in peripheral venous puncture attempts, as early detection of DPVP assists in planning the execution of the technique^(4,7,23). The use of a tool that aids in decision-making, especially in more complex situations, is suggested, as it enables professionals to recognize a possible DPVP and take necessary action to avoid failure during the puncture⁽²³⁻²⁴⁾. In addition, nursing professionals who work in positive environments with collaborative relationships among the team improve the safety climate and, consequently, the quality of care provided to cancer patients⁽²⁵⁾.

Continuing education aimed at establishing a team specialized in vascular venous access with knowledge of adjuvant technologies, such as the use of ultrasound⁽²³⁾, and advanced skills in catheter insertion and maintenance can contribute to effective puncture, even under challenging procedures, resulting in fewer painful punctures for patients, fewer delays in treatment, and consequently greater satisfaction and safety in care^(4,23).

After identifying five predictors for DPVP in hospitalized adults: vein palpability and visibility, history of difficult puncture and intravenous drug abuse, and obesity, a meta-analysis created the SAFE mnemonic guideline, which stands for See, Ask, Feel, and Evaluate BMI, so that professionals can incorporate this SAFE rule as available evidence for DPVP and thus, upon identifying the presence of such predictors before the first attempt at catheter insertion, can make use of advanced techniques for venous visualization, such as ultrasound, to avoid puncture failures⁽²³⁾.

Thus, the identification of risk factors for DPVP

plays a crucial role in building nursing knowledge, enriching it with a scientific basis, and providing the necessary resources for more accurate clinical decision-making⁽¹⁶⁾.

Study limitations

As a limitation of the study, it was not possible to reach the estimated sample size because chemotherapy occurs in monthly cycles. Researchers often encountered the same patients who could not be observed again, necessitating a wait for new patients to be scheduled. However, it is believed that the results presented in this study can contribute to patient care and future research, ensuring the safety of patients with DPVP undergoing chemotherapy.

Contributions to practice

The results of this study may serve as a warning to nursing professionals to assess patients for possible risk factors for difficult peripheral venous puncture and highlight the need to implement new venous puncture practices in health services, such as the incorporation of new technologies and tools, to ensure success on the first attempt, providing safer care to patients during chemotherapy.

Conclusion

Difficult peripheral venous puncture in adult and elderly patients undergoing intravenous chemotherapy was prevalent in less than one-third of patients. The history of difficult peripheral venous punctures and a non-palpable venous network was associated with difficulty in peripheral venous punctures in these patients.

Acknowledgements

To the Coordination for the Improvement of Higher Education Personnel (*Coordenação de Aperfei-*

çoamento de Pessoal de Nível Superior), for supporting author Jéssika Fernanda Alves dos Santos with a Social Demand scholarship at the master's level.

Authors' contributions

Conception and design or analysis and interpretation of data; Drafting of the manuscript or critical revision of intellectual content; Final approval of the version to be published; Agreement to be accountable for all aspects of the manuscript related to accuracy or integrity being investigated and resolved appropriately: **Santos JFA, Jardim LL, Oliveira ACS, Ramos AMPC, Barichello E, Toffano SEM, Nicolussi AC.**

Data availability

The authors declare that the data are fully available in the body of the article.

References

1. Meade K, Clarck E, Weber ML. Critical care anti-neoplastic infusions: safety and practice essentials. *AACN Adv Crit Care*. 2025;36(3):258-71. doi: <https://doi.org/10.4037/aacnacc2025932>
2. Karius DL, Colvin CM. Managing chemotherapy extravasation across transitions of care: a clinical nurse specialist initiative. *J Infusion Nurs*. 2021;44(1):14-20. doi: <https://doi.org/10.1097/NAN.0000000000000411>
3. Bezerra MM, Assis LRS, Filgueira VSA, Ferreira TFA, Reis KR, Santos MA, et al. Incidence of obstruction in peripheral intravenous catheters in adults and related factors. *Rev Enferm UERJ*. 2024;32:e74880. doi: <https://doi.org/10.12957/reuerj.2024.74880>
4. Doll MS, Aprile DCB, Gonçalves ALP, Silva BSM, Kusahara DM, Lopes KT. Development and content validity of a questionnaire on peripheral intravenous catheter maintenance and knowledge of nursing professionals regarding best practice. *J Infusion Nurs*. 2025;48(1):53-69. doi: <https://doi.org/10.1097/NAN.0000000000000571>

5. Miranda ALC, Sagica TP, Barros KBC, Tavares LNF, Costa MSCR, Toffano SEM, et al. Factors associated with difficult peripheral venipuncture in adults undergoing antineoplastic chemotherapy. *Rev Enferm UERJ*. 2023;31:e77065. doi: <http://dx.doi.org/10.12957/reuerj.2023.77065>
6. Larsen EN, Marsh N, O'Brien C, Monteagle E, Friese C, Rickard CM. Inherent and modifiable risk factors for peripheral venous catheter failure during cancer treatment: a prospective cohort study. *Support Care Cancer*. 2021;29(3):1487-96. doi: <http://doi.org/10.1007/s00520-020-05643-2>
7. Rodriguez-Calero MA, Blanco-Mavillard I, Morales-Asencio JM, Fernández-Fernández I, Castro-Sánchez E, Pedro-Gómez JE. Defining risk factors associated with difficult peripheral venous cannulation: a systematic review and meta-analysis. *Heart Lung*. 2020;49(3):273-86. doi: <https://doi.org/10.1016/j.hrtlng.2020.01.009>
8. Abe-Doi M, Murayama R, Komiyama C, Tateishi R, Sanada H. Effectiveness of ultrasonography for peripheral catheter insertion and catheter failure prevention in visible and palpable veins. *J Vasc Access*. 2021;24(1):14-21. doi: <https://doi.org/10.1177/11297298211022078>
9. Monteiro DAT, Torre-Montero JC, Nicolussi AC, Reis RK, Toffano SEM. Prevalence of and factors associated with difficult peripheral venipuncture in adult surgical patients. *J Vasc Access*. 2020;22(3):404-10. doi: <https://dx.doi.org/10.1177/1129729820939335>
10. Oliveira PP, Santos VEP, Bezerril MS, Andrade FB, Paiva RM, Silveira EAA. Patient safety in the administration of antineoplastic chemotherapy and of immunotherapies for oncological treatment: scoping review. *Texto Contexto Enferm*. 2019;28:e20180312. doi: <https://doi.org/10.1590/1980-265X-TCE-2018-0312>
11. Carvalho DP, Queluci GC, Tonin T. Fatores relacionados à dificuldade de cateterismo periférico em pacientes oncológicos adultos: revisão integrativa de literatura. *Rev Enferm Atual In Derme*. 2021;97(3):e023118. doi: <https://dx.doi.org/10.31011/reaid-2023-v.97-n.3-art.1871>
12. Soares CR, Almeida AM, Gozzo TO. A avaliação da rede venosa pela enfermagem em mulheres com câncer ginecológico durante o tratamento quimioterápico. *Esc Anna Nery*. 2012;16(2):240-6. doi: <https://dx.doi.org/10.1590/S1414-81452012000200005>
13. Mangelinck A, Mann C. DNA methylation and histone variants in aging and cancer. *Int Rev Cell Mol Biol*. 2021;364:1-110. doi: <https://doi.org/10.1016/bs.ircmb.2021.06.002>
14. Larsen EN, Ray-Barruel G, Takashima M, Marsh N, Friese CR, Chopra V, et al. Peripheral intravenous catheters in the care of oncology and haematology patients. *Aust J Cancer Nurs*. 2022;23(1):16-22. doi: <https://doi.org/10.33235/ajcn.23.1.16-22>
15. Bolela F, Lima R, Souza AC, Moreira MR, Lago AJO, Simino GPR, et al. Cancer patients in Palliative Care: occurrences related to venipuncture and hypodermoclysis. *Rev Latino-Am Enfermagem*. 2022;30:e3624. doi: <https://dx.doi.org/10.1590/1518-8345.5825.3623>
16. Santos-Costa P, Paiva-Santos F, Sousa LB, Bernardes RA, Ventura F, Fearnley WD, et al. Nurses' practices in the peripheral intravenous catheterization of adult oncology patients: a mix-method study. *J Pers Med*. 2022;12(2):151. doi: <https://doi.org/10.3390/jpm12020151>
17. Krishna MM, Reddy S, Somayaji S, Maka V. 5-Fluorouracil induced extravasation injury. *Indian J Cancer*. 2020;57(4):467-9. doi: https://dx.doi.org/10.4103/ijc.IJC_281_19
18. Pereira NML, Lemos TMAM, Martins RR, Costa RF, Raffin FN. Management and prevention of adverse reactions to platinum antineoplastic chemotherapy in patients with esophageal and gastric cancer: systematic literature review. *Rev Bras Cancerol*. 2021;67(4):e-091347. doi: <https://doi.org/10.32635/2176-9745.RBC.2021v67n4.1347>
19. Nunes AAC, Herculina PM, Souza SI, Oliveira SP, Vieira TL, Parreira P, et al. Eficácia de uma intervenção educativa para prevenção de complicações no cateter venoso periférico. *Cogitare Enferm*. 2022;28(27):1-14. doi: <https://doi.org/10.5380/ce.v27i0.83329>
20. Corley A, Ullman AJ, Marsh N, Genzel J, Larsen EN, Young E, et al. A pilot randomized controlled trial of securement bundles to reduce peripheral intravenous catheter failure. *Heart Lung*. 2023;57:45-53. doi: <http://doi.org/10.1016/j.hrtlng.2022.07.015>

21. Moreau KL, Babcock MC, Hildreth KL. Sex differences in vascular aging in response to testosterone. *Biol Sex Differ*. 2020;11(1):18. doi: <https://doi.org/10.1186/s13293-020-00294-8>
22. Cambiriba AR, Oliveira AV, Valdés-Badilla P, Picinin M, Bertoloni SMMG, Magnani BH. Visceral adiposity index as a tool for cardiometabolic risk in obese older women. *Geriatr Gerontol Aging*. 2020;14(3):189-95. doi: <https://dx.doi.org/10.5327/Z2447-212320202000032>
23. Bahl A, Alsbrooks K, Zazyczny KA, Johnson S, Hoerauf K. An improved definition and SAFE rule for predicting difficult intravascular access (DIVA) in hospitalized adults. *J Infusion Nurs*. 2024;47(2):96-107. doi: <http://doi.org/10.1097/NAN.0000000000000535>
24. Ray-Barruel G, Cooke M, Chopra V, Mitchell M, Rickard CM. The I-DECIDED clinical decision-making tool for peripheral intravenous catheter assessment and safe removal: a clinimetric evaluation. *BMJ Open*. 2020;10(1):e035239. doi: <https://doi.org/10.1136/bmjopen-2019-035239>
25. Costa AFA, Fernandes AFC, Oliveira RM, Coelho MMF, Almeida PC. Nursing practice environment, safety climate and burnout in antineoplastic treatment units. *Rev Rene*. 2025;26:e94207. doi: <http://doi.org/10.15253/2175-6783.20252694207>



This is an Open Access article distributed under the terms of the Creative Commons