Original Article

Prevalence of vascular events associated with COVID-19 patients in a public hospital*

Prevalência de eventos vasculares associados a pacientes com COVID-19 em um hospital público

Prevalencia de eventos vasculares asociados a pacientes con COVID-19 en un hospital público

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Abstract

Objective: to verify the prevalence of the main vascular events associated with patients with COVID-19 admitted to a public hospital in Recife. **Method:** this is a descriptive cross-sectional study, carried out through epidemiological databases and electronic patient records, from March 2020 to August 2021. **Results:** 1122 patients (58.8%) with a positive diagnosis for COVID-19 were analyzed. The main vascular events evidenced were: Deep Venous Thromboembolism (4.55%); Pulmonary Thromboembolism (2.5%); Acute Arterial Occlusion (0.98%) and Critical Lower Limb Ischemia, the most prevalent, being 17.64% of the cases. **Conclusion:** it was possible to point out the prevalence of vascular events associated with patients with COVID-19, admitted to a public hospital in Recife, as well as to classify the main vascular events, their repercussion and evolution. Thus, knowledge about the profile of these patients in the context of the pandemic can contribute to the development of new research in the health area.
Descriptors: Coronavirus infections; COVID-19; Vascular Diseases; Thrombosis; Disseminated Intravascular Coagulation

Resumo

Objetivo: verificar a prevalência dos principais eventos vasculares associados a pacientes com COVID-19 admitidos em um hospital público do Recife. **Método:** trata-se de um estudo transversal descritivo, realizado por meio das bases de dados epidemiológicos e prontuários eletrônicos de pacientes, no período de março de 2020 a agosto de 2021. **Resultados:** analisaram-se 1122 pacientes, (58,8%) com diagnóstico positivo para COVID-19. Os principais eventos vasculares evidenciados foram: Tromboembolismo Venoso Profundo (4,55%); Tromboembolismo Pulmonar (2,5%); Oclusão Arterial Aguda (0,98%) e Isquemia Crítica de Membro Inferior a mais prevalente, sendo 17,64% dos casos. **Conclusão:** foi possível apontar a prevalência de eventos vasculares associados a pacientes com COVID-19, admitidos em um hospital público do Recife, tal como classificar os principais eventos vasculares, sua repercussão e evolução. Assim, o conhecimento acerca do perfil desses pacientes no contexto da pandemia pode contribuir para o desenvolvimento de novas pesquisas na área de saúde.
Descritores: Infecções por Coronavirus; COVID-19; Doenças Vasculares; Trombose; Coagulação Intravascular Disseminada

Resumen

Objetivo: verificar la prevalencia de los principales eventos vasculares asociados a pacientes con COVID-19 ingresados en un hospital público de Recife. **Método:** se trata de un estudio descriptivo transversal, realizado a través de bases de datos epidemiológicas y registros electrónicos de pacientes, de marzo de 2020 a agosto de 2021. **Resultados:** se analizaron 1122 pacientes (58,8%) con diagnóstico positivo para COVID-19. Los principales eventos vasculares evidenciados fueron: Tromboembolismo Venoso Profundo (4,55%); Tromboembolismo Pulmonar (2,5%); Oclusión Arterial Aguda (0,98%) e Isquemia Crítica de Miembros Inferiores el más prevalente, con el 17,64% de los casos. **Conclusión:** fue posible señalar la prevalencia de eventos vasculares asociados a pacientes con COVID-19, ingresados en un hospital público de Recife, así como clasificar los principales eventos vasculares, sus repercusiones y evolución. Así, el conocimiento del perfil de estos pacientes en el contexto de la pandemia puede contribuir para el desarrollo de nuevas investigaciones en el área de salud.
Descriptores: Infecciones por Coronavirus; COVID-19; Enfermedades Vasculares; Trombosis; Coagulación Intravascular Diseminada

Introduction

Coronavirus Disease-2019 (COVID-19), which means Coronavirus Disease-2019, presents itself as an infectious pathology caused by the Severe Acute Respiratory Coronavirus-2 (SARS-CoV-2), associated with Severe Acute Respiratory Syndrome (SARS). The disease spread rapidly in the city of Wuhan, Hubei province, in the People's Republic of China, and soon spread worldwide, triggering a pandemic with health, social, and economic consequences. In Brazil, the first cases were identified in February 2020, and the COVID-19 infection was declared a public health emergency of national importance.[1-2]

Considering this aggravation, the number of cases increased daily until August 2022. According to the World Health Organization, 586,000,000 episodes of COVID-19 and 6,042,000 reported deaths have been confirmed worldwide. In the national territory, according to the Ministry of Health (MH), 37,579,028 eventualities and 702,664 deaths were confirmed. In relation to Pernambuco (PE), according to the State Health Secretariat, 1,040,000 people have been confirmed to date, and 22,091 deaths have been reported.[3-5]

COVID-19, among its variable clinical presentation, presents as sequelae of the main complaints' manifestations: fatigue; continuous cough; respiratory problems; absence of smell and taste; persistence of strong to moderate headaches.[6-7]

The virus also presents a broad clinical spectrum; its power of propagation has attracted the attention of angiologists and vascular surgeons. The symptoms associated with inflammation of the vascular system and hypercoagulability culminate in manifestations such as vasculitis of smaller vessels and macro- and microvascular thrombosis of veins and/or arteries. Another relevant factor pointed out from the beginning was the association between altered D-dimer (DD) values and a poor prognosis of the pathology, proving a relationship between severe systemic inflammatory conditions and the consequent pro-thrombotic state.[8-9]

These disorders are commonly found in individuals with risk factors, such as advanced age, Systemic Arterial Hypertension (SAH), obesity, Diabetes Mellitus (DM), heart diseases, pneumopathies, thrombophilias, previous Venous Thromboembolism (VTE), as well as in children and younger patients, indicating a genetic component. In addition, dehydration, immobilization, and the need for mechanical ventilation.[10-11]

Therefore, various thromboembolic complications such as Pulmonary Thromboembolism (PTE) and Disseminated Intravascular Coagulation (DIC) are possible causes of clinical deterioration in individuals with COVID-19 with or without previous aggravations.[12]

Thus, when caring for these individuals, nurses can use the Nursing Process (NP), a daily professional practice tool that helps organize the work of the nursing team and reduce the signs of nursing complications during critical treatment, in addition to being

able to prioritize, identify needs and develop individualized, humanized, comprehensive and safe care.[13]

Due to the increasing number of COVID-19 cases, a high incidence rate of VTE has been observed worldwide in this patient profile, even when acquiring anticoagulation or comprehensive pharmaco-prophylaxis supposedly adequate for medically hospitalized patients. It is expected that there will be a gradual increase in studies related to the association between VTE and COVID-19 infection in the current medical literature, aiming to share the still scarce knowledge about this new infection.[10]

Given these issues, this study aims to verify the prevalence of the main vascular events associated with patients with COVID-19 admitted to a public hospital in Recife.

Method

This is a cross-sectional, descriptive, epidemiological study carried out in a public hospital located in the city of Recife, PE, a hospital unit that offers inpatient beds for patients with COVID-19 and other specialties.

The hospital is a public unit under the management of the Government of PE, and operates in high complexity care, having 369 inpatient beds and 100 emergency beds. Although this hospital unit was not a reference in COVID-19 care, it participated in receiving patients in the emergency service.

The study data were collected through epidemiological databases by the Notifiable Diseases Information System (SINAN, in Portuguese) and the Pernambuco Strategic Health Surveillance Information Center (CIEVS-PE, in Portuguese) and from the electronic medical records of patients treated at the hospital. Conducted between March 2020 and August 2021, with data collection period between October 2021 and December 2021.

The survey was carried out with all clients suspected of having COVID-19 (1,907 cases), however, only patients with a positive diagnosis of COVID-19 (1,122 cases), admitted to the hospital and meeting the inclusion criteria were included in the sample.

Patients of both genders and all ages, with clinical manifestations and confirmed diagnosis (clinical-laboratory) of the main vascular events found and with confirmed investigation for COVID-19 were included.

Patients with duplicate results, inconclusive results for COVID-19, or medical records with incomplete data that hindered data analysis were excluded.

Sociodemographic data were collected, namely: age and gender and clinical data, initial diagnosis, clinical history, and case outcome.

The risks related to the research were considered minimal for the participants involved, not generating, directly or indirectly, physical, psycho-emotional or labor problems, since the data collection procedure does not interfere with the administrative dynamics of the sector or hospital or the quality of life of the patients. The information obtained through this study may serve as a basis for research.

The data were analyzed descriptively using absolute and relative frequencies, and the categorical variables used were mean; standard deviation; and median of the age variable. These data were tabulated using Microsoft Excel® 2016.

The research was conducted in accordance with the ethical standards required by Resolutions 466/2012, 510/2016 and 580/2018, of the MH, and began after the approval of the project by the Research Ethics Committee of the Hematology and Hemotherapy Foundation of the State of Pernambuco on July 23, 2021, having as opinion number 4.864.065 and Certificate of Presentation of Ethical Appreciation: 47598621.3.0000.5195.

Results

A total of 1,907 patients were analyzed and of these, 1,122 were detectable for COVID-19, equivalent to 58.8% of the tests, followed by 35.5% non-detectable, 2.3% corresponded to inconclusive cases, and for 3.4%, there was no material collected for the test. The age of the patients surveyed ranged from 6 to 109 years, with a mean of 61.94 years, a standard deviation of 17.08 years and median of 64.00 years.

Regarding the results related to the characteristics of the sample, it can be observed that the majority (52.85%) were male patients; the least prevalent age group was 6 to 19 years with (0.71%) of the total, the most prevalent were 60 to 69 years

(27.18%), 70 to 79 years (23.8%) and 20 to 49 years (18.63%), and the others were 50 to 59 years (15.15%) or 80 years or more (15.24%).

Regarding the evaluation of the clinical data of the sample, Critical Lower Limb Ischemia (CLI) was prevalent, and recorded in 17.65% (n = 198) of patients, and DVT, PTE and Acute Arterial Occlusion (AAO) occurred, respectively, in 4.55% (n = 51), 2.5% (n = 28) and 0.98% (n = 11).

Regarding the evolution and outcome of the clients in the sample, the highest percentage was 53.74% (n = 603), and corresponded to patients who died, followed by 30.21% (n = 339) who were discharged, and the remaining 16.04% (n = 180) were transferred to another hospital unit.

The evolution of the patient according to gender and age group was verified, and for the referred variables it is highlighted that the percentage that died increased with the age group, being 0.35% in the range of 6 to 19 years, 7.58% in the range of 20 to 49 years, 7.39% in the range of 50 to 59 years, 13.99% in the range of 60 to 69 years, 14.26% in the range of 70 to 79 and 10.16 in the range of 80 years or more.

From the results contained in Table 1, after evaluating the evolution of the cases, it was recorded that the pathology CLI presented 11.05% of the cases of death, followed by DVT with 2.04%, TEP 1.60% and AAO with 0.53% of the deaths.

Table 1 - Evaluation of patient evolution, according to vascular events. Recife, PE, Brazil, 2022. (n = 1122)

Variable	Evolution			Total n (%)
	Death n (%)	Discharge n (%)	Transfer n (%)	
DVT*				
Yes	23 (2.04)	17 (1.51)	11 (0.98)	51 (100.0)
No	580 (51.70)	322 (28.69)	169 (15.06)	1071 (100.0)
PTE†				
Yes	18 (1.60)	5 (0.44)	5 (0.44)	28 (100.0)
No	585 (52.13)	334 (29.76)	175 (15.60)	1094 (100.0)
CLI‡				
Yes	124 (11.05)	53 (4.72)	20 (1.78)	197 (100.0)
No	479 (42.69)	286 (25.49)	160 (14.26)	925 (100.0)
AOO§				
Yes	6 (0.53)	4 (0.35)	1 (0.08)	11 (100.0)
No	597 (53.20)	335 (29.85)	179 (15.96)	1111 (100.0)
Total	603 (53.74)	339 (30.21)	180 (16.4)	1122 (100.0)

Note: *Venous Thromboembolism, †Pulmonary Thromboembolism, ‡Critical Lower Limb Ischemia, §Acute Arterial Occlusion.

Tables 2 to 5 show the results of the cross-checks with the variables sex and age group and with each of the events: DVT, PTE, CLI and AAO.

Table 2 presents data on DVT, and for this variable it was evidenced that 4.55% of patients with COVID-19 developed DVT, while 95.45% of cases did not develop the pathology.

Table 2 - Evaluation of DVT, according to sample characteristics and patient evolution. Recife, PE, Brazil, 2022. (n = 1122)

Variable	Evolution			Total n (%)
	Death n (%)	Discharge n (%)	Transfer n (%)	
DVT*				
Yes	23 (2.04)	17 (1.51)	11 (0.98)	51 (100.0)
No	580 (51.70)	322 (28.69)	169 (15.06)	1071 (100.0)
PTE†				
Yes	18 (1.60)	5 (0.44)	5 (0.44)	28 (100.0)
No	585 (52.13)	334 (29.76)	175 (15.60)	1094 (100.0)
CLI‡				
Yes	124 (11.05)	53 (4.72)	20 (1.78)	197 (100.0)
No	479 (42.69)	286 (25.49)	160 (14.26)	925 (100.0)
AAO§				
Yes	6 (0.53)	4 (0.35)	1 (0.08)	11 (100.0)
No	597 (53.20)	335 (29.85)	179 (15.96)	1111 (100.0)
Total	603 (53.74)	339 (30.21)	180 (16.4)	1122 (100.0)

Note: *Venous Thromboembolism, †Pulmonary Thromboembolism, ‡Critical Lower Limb Ischemia, §Acute Arterial Occlusion.

Table 3 presents data on PTE, and for this variable it was evidenced that 2.5% of patients with COVID-19 developed PTE, while 97.5% did not develop the disease.

Table 3 - Evaluation of PTE, according to the data of the sample characteristic and the evolution of the patient. Recife, PE, Brazil, 2022. (n = 1122)

Variable	PTE*		Total n (%)
	Yes n (%)	No n (%)	
Gender			
Male	16 (2.69)	577 (97.30)	593 (100.0)
Female	12 (2.26)	517 (97.73)	529 (100.0)
Age Group			
6 to19 years	-	8 (100.0)	8 (100.0)
20 to 49	9 (4.30)	200 (95.69)	209 (100.0)
50 to 59	3 (1.76)	167 (98.23)	170 (100.0)

60 to 69	3 (0.98)	302 (99.02)	305 (100.0)
70 to 79	8 (3.08)	251 (96.91)	259 (100.0)
80 or over	5 (2.92)	166 (97.07)	171 (100.0)
Total group	**28 (2.50)**	**1094 (97.50)**	**1122 (100.0)**

Note: *Pulmonary Thromboembolism.

Table 4 shows that the gender variable was not associated with CLI; the age group variable ranged from 0 to 3.34% in the two younger age groups, with 10% in the 50-59 age group, 22.29% in the 60-69 age group, 27.02% in the 70-79 age group and 21.05% in the 80+ age group. It is emphasized that 17.64% of the sample developed the pathology, while 82.35% did not develop CLI.

Table 4 - CLI evaluation, according to sample characteristic data and patient evolution. Recife, PE, Brazil, 2022. (n = 1122)

Variable	CLI*		Total n (%)
	Yes n (%)	No n (%)	
Gender			
Male	104 (17.53)	489 (82.46)	593 (100.0)
Female	94 (17.76)	435 (82.23)	529 (100.0)
Age group			
6 to19 years	-	8 (100.0)	8 (100.0)
20 to 49	7 (3.34)	202 (96.65)	209 (100.0)
50 to 59	17 (10)	153 (90)	170 (100.0)
60 to 69	68 (22.29)	237 (77.70)	305 (100.0)
70 to 79	70 (27.02)	189 (72.97)	259 (100.0)
80 or over	36 (21.05)	135 (78.94)	171 (100.0)
Total group	**198 (17.64)**	**924 (82.35)**	**1122 (100.0)**

Note: *Critical lower limb ischemia.

Table 5 presents data related to AAO, and, for this variable, it was evidenced that 0.98% of the patients who presented COVID-19 developed the pathology, while 99.02% did not develop AAO.

Table 5 - Assessment of AAO according to sample characteristic data and patient evolution. Recife, PE, Brazil, 2022. (n = 1122)

Variable	AAO*		Total n (%)
	Yes n (%)	No n (%)	
Gender			
Male	8 (1.34)	585 (98.65)	593 (100.0)
Female	3 (0.56)	526 (99.43)	529 (100.0)
Age group			

6 to19 years	-	8 (100.0)	8 (100.0)
20 to 49	2 (0.96)	207 (99.04)	209 (100.0)
50 to 59	1 (0.59)	169 (99.41)	170 (100.0)
60 to 69	5 (1.64)	300 (98.36)	305 (100.0)
70 to 79	3 (1.16)	256 (98.84)	259 (100.0)
80 or over	-	171 (100.0)	171 (100.0)
Total group	11 (0.98)	1111 (99.02)	1122 (100.0)

Note: *Acute Arterial Occlusion.

Discussion

COVID-19, in addition to causing alveolar lung injury and acute respiratory failure, has a high prevalence in vascular diseases, VTE. Considering the above, it was possible to observe the predominance of vascular events associated with patients with COVID-19 admitted to a public hospital in Recife.

A sample was observed in which more than half of the individuals who presented COVID-19 were female (53.9%) and aged between 50 and 69 years (47.6%). Differently from this study, in which the most incident population was male (52.85%), and the most prevalent age group was 60 to 69 years (27.18%).[14]

When validating a survey carried out with individuals who developed COVID-19, age groups over 65 years old had higher mortality rates, the highest being in the "80 years or more" group, reaching 44.5% mortality. These results indicate that the outcome is strongly influenced by the patient's age, corroborating this study, in which the age groups above 60 years were the most affected: 60 to 69 years (27.18%); 70 to 79 years (23.8%); and 80 years or more (15.24%).[15]

Research has emphasized that patients who have COVID-19 may manifest a state of hypercoagulability, in which there is an increase in serum levels of factor VIII, von Willebrand factor and fibrinogen. Hypercoagulability may be linked to the development of DVT of the lower limbs and/or pulmonary embolism in these patients. Ratifying this analysis, findings of DVT and PTE were evidenced (4.55%) (2.50%), but in insignificant percentages.[16]

In addition, hospitalized COVID-19 positive patients are at high risk of VTE, for which early and prolonged pharmacological thromboprophylaxis associated with low molecular weight heparin is recommended.[17-18] This study identified CLI as the most prevalent vascular disease found, recorded in 17.64% of cases.

The importance of identifying thromboembolic complications such as DVT, which can occur even after many days of infection, was highlighted.[19] Attention should be paid to the signs and symptoms of VTE in patients, even after the COVID-19 isolation period, especially in severe cases, to reach a diagnosis quickly, effectively, avoiding complications, the most serious of the complications, death, in which it was evidenced in this study that 15.22% of the deaths in the sample were caused by vascular diseases, where CLI presented the highest percentage of cases (11.05%), followed by DVT (2.04%), PTE (1.60%) and AAO(0.53%).

In another research, it was pointed out that the means by which viral infection becomes a risk factor for acute PTE has not yet been clarified, however, the relationship of endothelial injury due to viral action is analyzed, since the immune angiogenic profile of patients with COVID-19 is evident, which presents diffuse alveolar damage with inflammatory cells, in the microvasculature, and the appearance of thrombi that can cause vessel obstruction, causing pulmonary damage, such as pulmonary infarction and marked hemorrhagic necrosis.[20-21]

Therefore, it is worth pointing out that the application of the NP and the development of nursing diagnoses (ND) in patients with COVID-19 are essential for the provision of holistic care that addresses all human needs. Likewise, it is necessary to update these diagnoses with each new assessment, since the health status of patients is unstable, favoring the emergence of changes in the needs of these people.[22]

A limitation of this research is the lack of specific clinical investigation to identify vascular events associated with COVID-19, restricting the discussion of the results. However, the recent nature of research on COVID-19 and its consequences should be considered.

This study contributes to a better understanding of the perspective phenomena of clinical analysis regarding the prevalence of vascular events in patients with COVID-19. This understanding is necessary so that a better consultation can be provided according to the patient's demands in a holistic way, where the peculiarities from diagnosis to health care intervention must be thoroughly observed.

Conclusion

This study contributed to analyze the presence of vascular events in patients with COVID-19 who may die; however, there is still a need for further research to raise this question so that it is possible to confirm this prevalence. As well as, to highlight the role of the health team, and of the nursing professional in the direct care of these patients, alerting them about any signs suggestive of vascular events associated with COVID-19.

Considering this, it was possible to point out the prevalence of vascular events associated with patients with COVID-19 admitted to a public hospital in Recife, as well as to classify the main vascular events, their repercussion and evolution, and thus acquire knowledge about the profile of these patients in the context of the pandemic and contribute to the development of new research for the health area.

Moreover, current findings indicate that there is an incidence of clinically relevant thrombotic events related to SARS-CoV-2 infection. The understanding of the pathophysiological processes that succeed in these thrombotic phenomena is incomplete so far. Similarly, the cause-and-effect relationship between thrombotic events and the severity of SARS-CoV-2 infection needs to be better understood. Thus, although there are not many studies addressing this fact, it is evident that COVID-19 is associated with the degree of involvement and worsening of these events.

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