OBJN
ONLINE BRAZILIAN JOURNAL OF NURSING
ISSN: 1676-4285

ORIGINAL

Analysis of nursing diagnoses, interventions, and activities in patients undergoing hemodialysis secondary to COVID-19: a descriptive study

Análise de diagnósticos, intervenções e atividades de enfermagem em pacientes submetidos à hemodiálise secundária à COVID-19: estudo descritivo

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Submission: 05/04/2022
Approved: 02/04/2023

ABSTRACT

Objective: To analyze nursing diagnoses, interventions, and activities in patients undergoing hemodialysis secondary to COVID-19. **Method:** This is a descriptive, retrospective, and quantitative study. The study population was represented by the medical records of patients undergoing hemodialysis secondary to COVID-19, totaling about 64 records. Data from the data collection instrument, sociodemographic and clinical data, and indicators of nursing diagnoses were consulted. Descriptive and inferential statistics were used for analysis. **Results:** The main nursing diagnoses found were risk for infection, risk for imbalanced fluid volume, bathing/toileting self-care deficit, and impaired gas exchange. The registered interventions and activities corresponded to the outlined diagnoses. **Conclusion:** The study identified the main diagnoses, interventions, and nursing activities in patients affected by COVID-19 who developed acute kidney injury.
Descriptors: COVID-19; Acute Kidney Injury; Nursing Process.

RESUMO

Objetivo: Analisar os diagnósticos, as intervenções e atividades de enfermagem em pacientes submetidos à hemodiálise secundária à COVID-19. **Método:** Estudo descritivo, retrospectivo e de natureza quantitativa. A população do estudo foi representada pelos prontuários de pacientes submetidos à hemodiálise secundária à COVID-19, totalizando cerca de 64 registros. Consultaram-se os dados do instrumento de coleta de dados, bem como dados sociodemográficos, clínicos e indicadores dos diagnósticos de enfermagem. Para análise, utilizou-se da estatística descritiva e inferencial. **Resultados:** Os principais diagnósticos de enfermagem encontrados foram: risco de infecção, risco de volume de líquidos desequilibrado, déficit no autocuidado para banho/higiene íntima e troca de gases prejudicada. As intervenções e atividades assinaladas foram correspondentes aos diagnósticos traçados. **Conclusão:** O estudo possibilitou identificar os principais diagnósticos, as intervenções e atividades de enfermagem em pacientes acometidos pela COVID-19 que desenvolveram lesão renal aguda.
Descritores: COVID-19; Injúria Renal Aguda; Processo de Enfermagem.

INTRODUCTION

The coronavirus disease was evidenced for the first time in Wuhan, Chinese province, causing a new type of acute respiratory infection[1], whose clinical manifestations range from asymptomatic conditions to the presence of respiratory complications compatible with the severe acute respiratory syndrome (SARS)[2].

In addition to respiratory infection, some extrapulmonary complications are commonly observed throughout the disease, such as Acute Kidney Injury (AKI), identified as one of the primary lesions to target organs that predict unfavorable outcomes[3]. According to the KDIGO clinical practice guidelines for acute kidney injury, AKI is characterized as a sudden decrease in glomerular filtration rate (GFR), manifested by an increase in serum creatinine or oliguria within 48 hours to 7 days, with a determined AKI stage by the

How to cite: Lima LB, Pessoa NRC, Sousa RS, Amorim RGP, Palha LCA, Lima JCA, et al. Analysis of nursing diagnoses, interventions, and activities in patients undergoing hemodialysis secondary to COVID-19: a descriptive study. Online Braz J Nurs. 2023;22:e20236631. https://doi. org/10.17665/1676-4285.20236631

severity of the increase in serum creatinine or oliguria[4]. Due to the metabolic decompensation generated by the decrease in renal function, with consequent accumulation of nitrogenous waste and water imbalance, hemodialysis (HD) is presented as the main renal replacement therapy (RRT) capable of correcting abnormalities and reestablishing homeostasis in patients affected by the dysfunction[5].

Health professionals who work with critically ill patients, such as those who underwent hemodialysis due to COVID-19, must be able to provide qualified and safe assistance to patients in the different clinical variations and understand the disease, its specificities, and repercussions on health. Therefore, the importance of the nurse is highlighted, both for her technical and scientific competence and for being the professional who uninterruptedly accompanies the patient, providing continuous care[2].

In order to provide safe and quality care, nurses must use clinical reasoning, critical thinking, and implement the Nursing Process (NP), a methodological work tool. The NP is divided into five interrelated stages: assessment, nursing diagnosis, planning, implementation, and evaluation, outlining an individualized care plan and guaranteeing effective and good quality nursing care to understand and respect the human being as a whole[6].

The Nursing Diagnosis (ND), the second stage of the NP, is based on data collected in the assessment stage through observations and subjective data provided by the patient. The ND needs to be clear in the title and definition, diagnostic indicators (defining characteristics, related factors, and/or risk factors), and essential elements to differentiate from other diagnoses[7].

Based on the ND guided by the defining characteristics, and related or risk factors, the following steps are guided: planning (expected results) and implementing independent or interdisciplinary interventions to achieve the planned results. These stages can be guided by classifications, such as the Nursing Outcomes Classification (NOC) and the Nursing Interventions Classification (NIC) for the prescribed activities. Finally, the evaluation is carried out, the last stage of the NP, which consists of comparing previous data with current ones to evaluate the outcomes achieved and (re) direct the nursing interventions[8,9].

Furthermore, implementing the NP is essential to standardize the work of the nursing team, allowing clear and objective communication and focusing on qualified and safe assistance. Thus, this study aimed to analyze nursing diagnoses, interventions, and activities in patients undergoing hemodialysis secondary to COVID-19, enabling the understanding of the nursing care provided. It is expected that the knowledge produced in this study will give rise to critical analysis to assess the need for changes or adaptations in the nurses' work method for this clientele.

METHOD

Study design

This is a descriptive, retrospective, and quantitative study carried out from the analysis of data found in medical records about the implementation of the NP in patients undergoing hemodialysis secondary to COVID-19, especially concerning diagnoses and interventions, and nursing activities.

Study location

The research took place at the Hospital das Clínicas (HC) of the Federal University of Pernambuco (UFPE), located in Recife - PE, Brazil, which is managed by the Brazilian Company of Hospital Services (EBSERH) that, currently, has different specialties. At the beginning of the COVID-19 pandemic, the dialysis center underwent structural adaptations and implemented protocols for admitting and managing symptomatic patients needing hemodialysis therapy. Currently, there are 14 dialyzers per service shift, two reserved in an exclusive room for patients undergoing specific precautionary measures.

Participants

The study population was represented by the medical records of patients hospitalized in the wards and intensive care unit intended for the care of COVID-19 at HC-UFPE and who underwent hemodialysis, totaling about 64 records recorded until May 2021. The sample size corresponded to the same amount as the study population.

The following inclusion criteria were adopted: medical records of patients over 18, undergoing hemodialysis secondary to COVID-19 at HC-UFPE. On the other hand, medical records that did not describe at least the diagnoses and nursing activities, and those in which the patients had some renal impairment prior to the COVID-19 infection, were excluded. Previous renal impair-

ment was evidenced through a medical diagnosis recorded in the medical record.

After applying the eligibility criteria, the following medical records were excluded from the sample: patients with previously diagnosed CKD (28 medical records), transplanted patients (2 medical records), patients with a negative COVID-19 test (1 medical record), patients without a confirmatory COVID-19 test -19 (1 medical record), AKI due to sepsis (6 medical record), and AKI due to vasculitis (1 medical record). After this screening, 25 records were eligible for analysis.

Data collection

Data collection took place from May to August 2021 by consulting the Medical and Statistics Archive Service (SAME), which made 10 records available a day for consultation. Sociodemographic data were consulted to characterize the population (gender, age, race, and marital status) and clinical data that described the nephrological profile (type of dialysis, number of dialysis procedures, access to dialysis, length of stay, and clinical outcome).

For evidence of the diagnoses, interventions, and nursing activities present in the analyzed medical records, we used the support of a form constructed by the Nursing Process Research Network (RePPE), which contains a terminological subset with nursing diagnoses, outcomes, and interventions relevant to the nurse's clinic in the scenario of critical care associated with Covid-19. The instrument comprises 20 ND distributed in the following domains: Nutrition, Elimination and exchange, Activity/rest, Role relationship, and Safety/protection. It is noteworthy that the list of outcomes, interventions, and nursing activities presented in the form are directed to nursing diagnoses and are based on the NANDA International, Nursing Outcomes Classification (NOC), and Nursing Interventions Classification (NIC) terminologies.

In order to search the nursing diagnoses, interventions and activities, all the nursing records were verified in the analyzed medical records. For the diagnoses and nursing activities, those recorded by the nurse were observed, and the diagnosis or equivalent activity was verified in the described data collection instrument. The authors defined nursing interventions based on the activities prescribed in nursing records since this type of intervention is not commonly included in the medical records.

Data analysis

The data analysis included descriptive statistics obtained using the Statistical Package for Social Sciences (SPSS) software, version 20.0 for Windows, after tabulating the data in Excel. Descriptive statistics included relative and absolute frequencies, means, medians, standard deviations, maximum, and minimum values. In addition, the Shapiro-Wilk normality test was used to verify the normality of continuous data (age, number of hemodialysis sessions, and length of hospitalization) using a p-value of 0.05.

Ethical aspects

The study was approved by the Research Ethics Committee of the Federal University of Pernambuco (UFPE), according to Opinion nº 43916121.0.0000.8807. A confidentiality term was signed by the authors to guarantee the secrecy of the collected information.

RESULTS

The research analyzed 25 medical records of patients diagnosed with COVID-19 who developed AKI secondary to the infection. As shown in Table 1, 56% of the sample was female, with a mean age of 56.92 (+/-10.36), a median age of 58 years, ranging from 40 to 81 years, and a p-value of 0.697 for the Shapiro-Wilk test. It is worth noting that 76% were of brown ethnicity, and 56% were married, coming from the Metropolitan Region of Recife (MRR) (84%).

As for the clinical characteristics (Table 2), the major morbidities found were: Systemic Arterial Hypertension (SAH), Diabetes Mellitus (DM), and obesity, with a relative frequency of 56%, whether associated or isolated. Cardiopulmonary diseases such as Heart Failure (HF) and Chronic Obstructive Pulmonary Disease (COPD) were found, as well as those with hematological involvement (Leukemia - 4%). Regarding the length of hospitalization, the average was 23.92 (+/-20.81), with a median of 17 days, a minimum of 2 days, a maximum of 78 days, and a p-value<0.001 of the Shapiro-Wilk test. Concerning the number of hemodialysis sessions, the average was 6.48 (+/- 5.76), with a median of 4 dialysis sessions, a minimum of 1, a maximum of 24 sessions, and a p-value of 0.06 of the Shapiro-Wilk test. The main accesses used to enable intermittent dialysis therapy, found in 96% of cases, were short-term catheters (Double/Triple Lumen Catheter). Concerning the clinical outcome, 36% of the

patients were discharged from the hospital, and 64% died.

Table 1 - Sociodemographic characteristics of patients (n=25) undergoing hemodialysis secondary to COVID-19. Recife, PE, Brazil, 2021

VARIABLES	ABSOLUTE FREQUENCY (n)	RELATIVE FREQUENCY (%)
Gender		
Female	14	56
Male	11	44
Ethnic group		
Brown	19	76
White	5	20
Black	1	4
Indigenous	0	0
Marital status		
Married	14	56
Single	7	28
Divorced	2	8
Widowed	1	4
In a stable union	1	4
Origin		
Recife-PE	10	40
Jaboatão dos Guararapes-PE	3	12
Paudalho-PE	3	12
Cabo de Santo Agostinho-PE	2	8
Paulista-PE	2	8
Camaragibe-PE	1	4
Escada-PE	1	4
Gravatá-PE	1	4
Petrolândia-PE	1	4
Manaus-AM	1	4

Source: Prepared by the authors, 2021.

Table 3 shows the nursing diagnoses indicated by the nurses during the elaboration of the care plans with the respective frequencies. Those present in the instrument and not listed were not identified in the analyzed medical records, namely: impaired spontaneous ventilation, ineffective airway clearance, risk for aspiration, risk for shock, risk for unstable blood pressure, risk for unstable blood glucose, risk for pressure injury, risk for corneal injury, dressing self-care deficit, and disrupted family processes.

Table 2 - Clinical characteristics of patients (n=25) undergoing hemodialysis secondary to COVID-19. Recife, PE, Brazil, 2021

VARIABLES	ABSOLUTE FREQUENCY (n)	RELATIVE FREQUENCY (%)
Type of dialysis		
Intermittent	25	100
Continuous	0	0
Dialysis access		
Double Lumen Catheter	16	64
Triple Lumen Catheter	8	32
Permcath	1	4
Arteriovenous fistula	0	0
Clinical outcome		
Death	16	64
Discharge	9	36
Transfer	0	8
Comorbidities		
Systemic Arterial Hypertension	14	56
Diabetes Mellitus	14	56
Obesity	14	56
No comorbidities	3	12
Cardiac insufficiency	1	4
Chronic obstructive pulmonary disease	2	8
Asthma	2	8
Leukemia	1	4

Source: Prepared by the authors, 2021.

The 24 nursing interventions listed in Table 4 were registered in the nursing prescriptions.
As for the nursing prescriptions described in the data collection instrument belonging to the NIC interventions, of the 44 found, the 23 listed in Table 5 were those indicated for the patients and developed by the team. These actions were

intended to bring about positive results, whether through direct assistance to the patient, such as airway maintenance and body hygiene, or indirect assistance, such as maintaining contact and aerosol isolation, that involves protecting the family and community.

DISCUSSION

According to the Brazilian Society of Nephrology (BSN), studies in China at the beginning of the COVID-19 pandemic showed a low incidence of AKI in patients infected with SARS-CoV-2. However, throughout 2020, there was an increase in these numbers. Research carried out in Hubei province, China, found an incidence of 18.1% of AKI among patients hospitalized with COVID-19. A rate of 52.4% of these patients was considered critical, while only 27.4% of those who did not develop AKI were classified in this way[10,11].

AKI, secondary to COVID-19, can be classified as early or late. The early state (up to 72 hours after admission) is described as a result of direct cellular changes caused by viruses and induced immunological mechanisms. The late state manifests itself combined with sepsis, organ failure, and the use of nephrotoxic drugs, which corrobo-

Table 3 - Nursing diagnoses present in patients (n=25) undergoing hemodialysis secondary to COVID-19. Recife, PE, Brazil, 2021

NURSING DIAGNOSES	ABSOLUTE FREQUENCY (n)	RELATIVE FREQUENCY (%)
Risk for infection	25	100
Risk for imbalanced fluid volume	25	100
Bathing self-care deficit	24	96
Toileting self-care deficit	24	96
Impaired gas exchange	20	80
Impaired tissue integrity	19	76
Ineffective peripheral tissue perfusion	17	68
Impaired skin integrity	11	44
Dysfunctional response to ventilatory weaning	4	16
Feeding self-care deficit	3	12

Source: Prepared by the authors, 2021.

Table 4 - Distribution of Nursing Interventions (NIC) of patients (n=25) undergoing hemodialysis secondary to COVID-19 according to the ND identified. Recife, PE, Brazil, 2021

NURSING DIAGNOSES	NURSING INTERVENTIONS (NIC)	ABSOLUTE FREQUENCY (n)	RELATIVE FREQUENCY (%)
Risk for infection	Protection against infection	25	100
Bathing/toileting self-care deficit	Self-care assistance	25	100
Impaired gas exchange	Airway control	22	88
	Positioning	17	68
Impaired tissue/skin integrity	Pressure injury prevention	11	44
	Wound care	7	28
	Skin supervision	6	24
Dysfunctional response to ventilatory weaning	Weaning from mechanical ventilation	3	12
Risk for unbalanced fluid volume	Hydro electrolytic control	25	100
	Hemodynamic regulation	2	8
	Hemodialysis therapy	25	100

Source: Prepared by the authors, 2021.

Table 5 - Nursing activities of patients (n=25) undergoing hemodialysis secondary to COVID-19. Recife, PE, 2021

NURSING INTERVENTIONS (NIC)	NURSING ACTIVITIES	ABSOLUTE FREQUENCY (n)	RELATIVE FREQUENCY (%)
Protection against infection	Maintain specific precautionary measures for contact and aerosols;	17	68
	Change the fixation of vascular devices, according to the institutional protocol;	22	88
	Limit the number of visitors according to institutional protocol.	1	4
Airway control	Maintain decubitus elevated to 30°;	22	88
	Perform aspiration of the orotracheal tube with a closed system and record the amount and appearance of the secretions;	19	76
	Record ventilatory parameters (ventilation mode, tidal volume, inspiratory pressure, Pressure Support, PEEP, FiO2, ventilator and total respiratory rate (ventilator + patient);	1	4
	Observe, note and report: tachypnea, cyanosis and Oxygen saturation below 90%;	7	28
	Change the fixation of the orotracheal tube once a day or according to the institutional protocol;	14	56
	Perform oral hygiene according to institutional protocol 3 x a day	3	12
	Observe, record and report blood gas analysis results;	21	84
	Observe, record and communicate PaO2 < 60 mmHg, PaCO2 > 50 mmHg, use of accessory muscles for breathing, respiratory muscle fatigue.	3	12
Hydroelectrolytic control/ Hemodialysis therapy	Record vital signs according to clinical severity;	two	8
	Control urinary output and water balance according to clinical severity;	24	96
	Determine perfusion status (extremities temperature, skin color);	1	4
	Record drug infusion speed in 2/2 hour infusion pump;	17	68
	Administer liquids according to institutional protocol;	17	68
	Change body position if hemodynamic/oxygenation is stable.	21	84
Pressure injury prevention	Maintain decompression in bony prominences;	11	44
	Administer skin ulcer care if necessary;	8	32
	Perform body hygiene and hemodynamic and oxygenation stability.	25	100
Self-care assistance	Perform intimate hygiene, when necessary;	25	100
	Infuse diet through NG tube, according to institutional protocol.	4	16

Source: Prepared by the authors, 2021.

rates the increase in mortality rates associated with the pathology[11]. Another study in Wuhan, China, concluded that 29% of patients affected by COVID-19 developed AKI[12], and mortality rates were three times higher in patients who developed the lesion than in those unaffected by it[13]. In this study, the median length of stay was 17 days, with a minimum of two days and a maximum of 78 days. Patients with shorter lengths of hospitalization had greater severity, evidenced by non-responsiveness to the applied interventions, even if intensive. This aspect can also be reinforced by the high mortality rate of the participants (64%).

As for the vascular accesses, 96% of the patients used short-term catheters, the predominant devices in acute patients. An experience report carried out during the COVID-19 pandemic showed the preponderance of this type of access in patients, preferably located in the jugular and femoral veins. Some catheters did not have effective blood flow, which was considered a factor that hindered therapy[14].

As for the comorbidities, SAH, DM, and obesity were present in 56% of the population, associated or isolated. A study based on the Ministry of Health database regarding the prevalence of comorbidities in cases of SARS due to COVID-19 at the national, regional, and state level (Pernambuco) counted as the main linked diseases, heart diseases (51%) and DM (40%). The mean lethality rate in the three levels found for patients with the latter was 47.6%[15].

As for the ND, the following was mostly highlighted in the nursing records of the hospital: risk for infection (100%), risk for imbalanced fluid volume (100%), bathing/toileting self-care deficit (96%), impaired gas exchange (80%), and impaired tissue integrity (76%). The first listed was the most commonly found in the care plans of nurses in the hospital environment, especially due to the client's exposure to invasive procedures and the immunological status that makes them vulnerable to infection[16].

At least one type of infection was already established in the study population, SARS-CoV-2 infection, which does not allows characterizing a risk diagnosis. However, acquiring new infections can be possible due to invasive devices, justifying the need to carry out the activities attributed to this diagnosis[16].

The diagnosis Risk for imbalanced fluid volume is similar to that mentioned above since the population had a medical diagnosis of AKI, which directly affects fluid regulation, which does not characterize the situation as risky. The most appropriate ND for this case would be Excess fluid volume, considering that the imbalance state is already installed. However, this diagnosis was absent in the data collection instrument, which restricted the study. The ND Impaired gas exchange, present in 20 medical records analyzed, is a common diagnosis in cases of respiratory tract disorders, the main system affected by COVID-19, which results mainly in respiratory distress, which can evolve with the need for oxygen therapy or mechanical ventilation in cases of aggravation[17]. In those cases, in which impaired gas exchange requires an invasive method to maintain the respiratory parameters, it would be opportune to apply the diagnosis Impaired Spontaneous Ventilation, defined as the inability to initiate and/or maintain a breathing pattern that is capable of sustaining life[7].

The description of nursing interventions (Table 4) occurred according to the NIC classification. The domains found in 100% of the medical records were: Protection against infection, Hydroelectrolytic control, and Self-care assistance. Airway control was indicated in 22 medical records, equivalent to 88% of the sample. This high prevalence is mainly due to the high rates of use of invasive mechanical ventilation in intensive care settings where most of the patients in the study were hospitalized.

The activities developed for the nursing interventions were: maintaining contact and aerosol isolation, changing the fixation of vascular devices according to the institutional protocol and controlling the number of visitors. These measures are related to the intervention "Protection against infection" associated with the "Risk for infection" diagnosis. Unlike the controversially applied risk diagnosis, as previously discussed, the prescribed activities are appropriate given the need to control the pathogen spread within the hospital environment between professionals and patients and among family members visiting hospitalized relatives.

Maintaining decubitus with headboard at 30º, aspiration of tracheal secretion, and collection/analysis of arterial blood gases were the main activities developed for the Airway control intervention. As these are actions related to a vital system of the body (respiratory tract), they become a priority for systemic maintenance, with a strong relevance among the applied practices[18]. Urinary output control, water balance, recording

the speed of drug infusion and fluid administration according to the institutional protocol were the main activities carried out during care for patients diagnosed with Risk for imbalanced fluid volume, in which, as discussed, there is not a risk state anymore due to the installation of the AKI. However, the excess fluid volume is already established. When analyzing the nursing activities to be carried out as a response to the two diagnoses, many similarities are perceived, which does not characterize planning as inadequate.

The importance of using standardized taxonomies when assisting patients with COVID-9 is highlighted since it generates data that allow the analysis of the impact of nursing care in the pandemic, in addition to helping to create new knowledge to improve outcomes in patients with COVID-19[8].

In this study, the diagnoses, activities, and nursing interventions recorded in the medical records were evidenced with the aid of a validated instrument that comprehended a terminological subset with nursing diagnoses, outcomes, and interventions relevant to the clinical practice of nurses in the context of associated critical care to COVID-19 patients using the NANDA-I, NOC, and NIC taxonomies for formulating nursing outcomes and interventions.

In this study, the analysis of the nursing outcomes and the evaluation step were made impossible by the unavailability of the records in the institution's instrument, a fact that can compromise the application of the individualized Nursing Process according to the patient's real needs.

CONCLUSION

The main nursing diagnoses, interventions, and activities applied to patients affected by SARS-CoV-2 who developed AKI, assisted at the University Hospital of Pernambuco, were identified. As a limitation of the study for the complete analysis of the NP in this clientele, the expected outcomes and the evaluation step, important stages of the NP, were not recorded in the analyzed medical records. Despite being a topic that has been much discussed and experienced in the last two years, there are still not many studies that deal with the subject, nor robust ones, due to the novelty of the disease. The long-term sequelae are still unknown, and the effectiveness of interventions is uncertain. It is necessary to conduct research in the area to produce more scientific knowledge that supports the application of proposed therapies.

Therefore, the importance of professional aptitude to deal with this public health problem is emphasized. The role of the nurse is highlighted as a specialist capable of identifying the main documented changes, pointing out interventions applicable to each case during the elaboration of the care plan, such as contact precautions and aerosols, in order to contain the spread of the virus, direct assistance in personal hygiene, due to the momentary incapacity of the patient, maintenance of airway patency, the performance of fluid balance, the feasibility of hemodialysis therapy in necessary cases, and other appropriate actions to provide the best possible quality of care.

CONFLICT OF INTERESTS

The authors have declared that there is no conflict of interests.

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