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Hemodialysis indications and associated factors among patients with acute kidney injury

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ABSTRACT

Objective: Investigate the indications for hemodialysis and associated factors among patients with acute kidney injury. **Method:** This is a cross-sectional study using medical records analysis of patients with acute kidney injury undergoing hemodialysis at a large university hospital in southern Brazil from January 2017 to January 2018. **Results:** The nephrology service treated 335 patients with acute kidney injury, among whom 160 underwent hemodialysis treatment. The patients were predominantly male (58.8%), aged 60 years or older (60.8%), and in critical condition (73.1%). Most acute kidney injuries were categorized as renal (80%). Uremia was the main indication for hemodialysis (44.4%), followed by hyperkalemia (20.0%), oliguria (13.8%), and volemic control (13.1%). **Conclusion:** The main results were predominantly male, elderly, in critical condition, and with acute kidney injury of renal origin. Most patients died.

Descriptors: Acute kidney injury; Renal dialysis; Epidemiology.

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INTRODUCTION

Acute kidney injury (AKI) is characterized mainly by the sudden reduction in renal function, in hours or days, associated mainly with decreased urinary volume evidenced by disturbances in the control of hydroelectrolytic and acid-base balance[1]. According to AKIN (Acute Kidney Injury Network) criteria, AKI can be classified by serum creatinine dosage and urinary volume into stage 1, 2, or 3[1]. The others can also be classified as pre-renal, renal, or post-renal, depending on the lesion location[1].

AKI presents a high incidence and mortality among hospitalized patients, mainly in Intensive Care Units (ICU). In a systematic review, the mortality rate associated with AKI was higher than 60% in most developing countries, and an incidence of 40% was identified[2]. In the ICU, the incidence of AKI, in the national scenario, and in the international scenario, was 40 to 60%[3-4].

It is known that the incidence progressively increases with age, highlighting individuals who present some comorbidities and risk factors, such as diabetes mellitus (DM), systemic arterial hypertension (SAH), cardiovascular disease, continuous use of nephrotoxic medications, being male, and family history of kidney disease[5-6]. It is known that the survival of individuals on hemodialysis is directly influenced by factors such as age, sex, and serum levels of nitrogenous compounds[7-8].

AKI treatment will depend on the stage of diagnosis. Thus, when it is early, lifestyle changes and the adoption of healthy methods will prevent the disease progression[9-10]; however, when the diagnosis is late or in specific cases, more invasive methods are chosen, such as hemodialysis (HD)[5].

The availability of modern and advanced renal replacement therapy (RRT) techniques provides the prolongation of patients' lives with AKI and the replacement of renal function until the possible complete recovery of this mechanism[11]. However, no decrease in mortality has been identified within this profile of patients[12-13].

Hyperpotassium, hypervolemia, uremia, severe metabolic acidosis[5], pulmonary edema, uremic encephalopathy, and hyperkalemia[14] are the most common reasons for dialysis. Identifying the main

indications for HD and the knowledge of the peculiar characteristics of these patients may enable the formulation of more assertive care strategies to prevent complications and death.

Considering that AKI has high morbidity and mortality rates among hospitalized patients, especially those in critical condition, the importance of hemodialysis treatment for the reversibility of AKI, the prevention of renal integrity, and the importance of studies on the indication of hemodialysis therapy to diagnose the local reality, it is essential to survey the profile of patients with AKI undergoing HD to develop an effective therapeutic planning to reduce complications and preserve lives.

In light of this, this study set out to investigate the indications for HD among patients with AKI.

METHOD

This is a cross-sectional study analyzing medical records of patients with AKI undergoing HD In a large university hospital in southern Brazil.

Four undergraduate medical students performed data collection by analyzing medical records of patients diagnosed with AKI and seen by the nephrology service of the aforementioned institution. All adult patients seen by the nephrology clinic from January 2017 to January 2018 (13 months) were included.

The collection was preceded by a pilot test with 50 hemodialysis records. We designed our instrument to collect data from medical records, which was previously tested for its improvement during the pilot test. The following variables were selected for this study: age, sex, date of hospital discharge or death, AKI etiology and associated factors, use of nephrotoxic drugs, serum creatinine levels, whether or not dialysis sessions were performed, patient's clinical condition, and ICU admissions. For producing the variable "clinical condition," the patients who demonstrated inconstancy or risk of inconstancy of the vital signs and, consequently, with the possibility of death were considered critical patients[15].

The data were tabulated in Excel® software before being analyzed in SPSS®

version 19.0 software to determine the absolute and relative frequency of the variables.

This study is part of a larger project called "Acute Renal Failure: From the Profile of Patients in a University Hospital to the Multidisciplinary Outpatient Follow-up of Survivors." This project has already obtained the institution's consent where the data was collected and has been approved by the ethics committee under opinion number 1.784.201, CAAE: 60162116.0.0000.5231.

RESULTS

In the study period, the nephrology service attended 335 patients with AKI, among whom 160 underwent hemodialysis treatment. The patients were predominantly male (58.8%), aged 60 years or older (60.8%), and in critical condition (73.1%) (Table 1).

Among the causes of AKI, sepsis (42%) stood out, followed by the use of nephrotoxic drugs (22.3%) and cardiorenal syndromes (9.5%). Most AKIs were categorized as renal (80%) (Table 2). Uremia was the main indication for HD (44.4%), followed by hyperkalemia (20.0%), oliguria (13.8%), and volemic control (13.1%) (Table 3).

Some cases had more than one indication for hemodialysis. For this reason, Table 3 shows the indications identified as the main ones and some associated with other factors.

Table 1 - Sociodemographic and clinical profile of patients with acute kidney injury related to clinical outcome in a university hospital in Southern Brazil (n=335). Paraná, Brazil, 2017-2018.

Variables	Total N (%)	High (%)	Death (%)
Sex			
Female	138 (41.2)	37.7	62.3
Male	197 (58.8)	38.1	61.9
Age (in years)			
≤18	4 (1.2)	75	25
19-59	130 (38.0)	49.2	50.8
≥60	201 (60.8)	30.2	69.8
Patient in Critical Condition			
Yes	245 (73.1)	23.3	76.7
No	90 (26.9)	77.8	22.2

Source: the author

Table 2 - Classification of patients with acute kidney injury related to the injury classification in a university hospital in southern Brazil (n=335). Paraná, Brazil 2017-2018.

AKI Classification	N	%
Pre-renal	54	16.1
Renal	268	80.0
Post-renal	13	3.9

Source: the author

Table 3 - Hemodialysis indications among patients with acute kidney injury in a university hospital in Southern Brazil (n=160). Paraná, Brazil, 2017-2018.

Hemodialysis indications	N	%
Severe metabolic acidosis and associated factors	2	1.2
Volemia control and associated factors	21	13.1
Edema	8	5.0
Hyperkalemia and associated factors	32	20.0
Hyponatremia	1	0.6
Poisoning and associated factors	3	1.8
Oliguria	22	13.7
Uremia	71	44.3

Source: the author

DISCUSSION

The findings revealed that uremia, hyperkalemia, and oliguria are among the main HD indications for AKI patients. Male patients older than 60 years in critical condition with renal AKI predominated.

The glomerular filtration rate is physiologically decreased wit h age[16], and research indicates that being male, having comorbidities, and having unhealthy lifestyle habits are also factors that contribute to the onset of renal pathologies[17]. Thus, the sociodemographic profile verified in this study is justified, which corroborates the national and international literature[18-19].

AKI has a high incidence among critically ill patients and a high non-favorable

outcome[20]. This investigation identified that approximately four out of five patients died, highlighting the relationship between patient severity and the negative clinical outcome. Similar findings were reported in a study in several countries, where AKI was found in more than half of the patients admitted to the ICU[4]. However, other studies have shown slightly lower death rates, with rates between 34% and 73%[21,3,14].

As to the AKI classification, the renal etiology prevailed. Other national studies obtained divergent data and had a predominance of prerenal AKI, which was mainly associated with impaired renal perfusion[19,22]. This data is presumably related to the high rates of sepsis among the studied population. Studies have shown that sepsis, characterized by a deregulated response of the individual to infection, with the kidneys being the most affected organs, is directly associated with the development of AKI in the hospital environment[23,24, 25].

National and international studies have shown that approximately 50% of ICU patients present AKI, and it is more prevalent in the elderly and with a predominance of an unfavorable outcome, as in this study[26,27]. In a national survey, sepsis and AKI were concomitant in 98% of cases[27].

Therefore, it was found that uremia and hyperkalemia (44.37% and 32.20%, respectively) were the main indications for hemodialysis. Moreover, oliguria, a symptom of renal AKI, was the third most frequent indication for HD (13.75%). Thus, it was verified that 75% of critically ill patients with AKI also presented a reduced urinary elimination pattern and serum changes in urea and potassium[3].

CONCLUSION

This study investigated the HD indications among patients with AKI. As a result, most of the participants were male, elderly, in critical condition, and suffering from renal AKI. Most patients died, and uremia, hyperkalemia, and oliguria were the main indications for hemodialysis. Most of the findings align with national and international literature, except for the high mortality rate, which is possibly associated with the high sepsis rates at the institution in this analysis.

This research was an epidemiological and documentary study, essential to support other studies and implement actions to improve the quality of care for AKI patients who require HD. A limitation is that it is cross-sectional and prevents a causal analysis.

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