SEPTIC PATIENTS WITH ACUTE KIDNEY INJURY: THE REALITY OF INTENSIVE CARE UNITS

PACIENTES SÉPTICOS CON LESIÓN RENAL AGUDA: REALIDADE DA UNIDADE DE TERAPIA INTENSIVA

LOS PACIENTES SÉPTICOS CON LESIÓN RENAL AGUDA: LA REALIDAD DE LA UNIDAD DE CUIDADOS INTENSIVOS

Thaís Martins Gomes1, Alessandra Freire Medina Valadares2, Tayse Tâmara Paixão Duarte3, Marcia Cristina Silva Magro4

ABSTRACT

Objective: to identify the epidemiological profile of septic patients who developed acute kidney injury. Method: an observational, longitudinal study of a quantitative approach conducted in the general intensive care unit of a public hospital in the Federal District (DF). The data were collected through a questionnaire, with query to records in the patients' electronic medical records. For statistical analysis, the average and standard deviation or absolute and relative frequency of variables were calculated using the Fisher's exact test and Mann Whitney test for nonparametric variables - for significant result with p < 0.05. Results: there was a predominantly female distribution, with an average age of 55 years old and average APACHE index of 21.2. 38.9% of septic patients developed risk and the same percentage with kidney damage. Conclusion: most of septic patients were staged at risk for renal injury and kidney injury itself, according to RIFLE classification. Descriptors: Classification; Acute Kidney Injury; Sepsis.

RESUMO

Objetivo: identificar o perfil epidemiológico de pacientes sépticos que evoluíram com lesão renal aguda. Método: estudo observacional, longitudinal, com abordagem quantitativa, realizado na unidade de terapia intensiva geral de um hospital da rede pública do Distrito Federal (DF). A coleta de dados ocorreu por meio de um questionário, com consulta em prontuários eletrônicos dos pacientes. Para análise estatística, foram calculadas a média e o desvio padrão ou frequência absoluta e relativa das variáveis. Aplicou-se o teste Exato de Fisher e Mann Whitney para variáveis não paramétricas e considerou-se significativo o resultado com p < 0.05. Resultados: observou-se uma distribuição predominantemente feminina, idade média de 55 anos e índice APACHE médio de 21,2. 38,9% dos pacientes sépticos evoluíram com risco e o mesmo percentual com lesão renal. Conclusão: a maioria dos pacientes sépticos foram estadiados com risco para lesão renal e lesão renal propriamente dita, de acordo com a classificação RIFLE. Descritores: Classificação; Lesão Renal Aguda; Sepsis.

RESUMEN

Objetivo: identificar el perfil epidemiológico de los pacientes sépticos que desarrollaron la Insuficiencia Renal Aguda. Método: este es un estudio observacional, longitudinal con un enfoque cuantitativo, realizado en la unidad de cuidados intensivos general de un hospital público en el Distrito Federal (DF). Los datos fueron recolectados a través de un cuestionario con los registros de consulta en los registros médicos electrónicos de pacientes. Para el análisis estadístico se calculó la media y la desviación estándar o la frecuencia absoluta y relativa de las variables. Se utilizó la prueba exacta de Fisher y el test de Mann Whitney para datos no paramétricos y se consideró resultado significativo con p < 0.05. Resultados: hubo una distribución predominada por mujeres, con una edad media de 55 años y la media de APACHE índice de 21,2. 38,9% de los pacientes sépticos desarrolló el riesgo y el mismo porcentaje con daño renal. Conclusión: la mayoría de los pacientes sépticos se organizan en riesgo de lesión renal y daño renal en sí, según la clasificación RIFLE. Descriptores: Clasificación; Lesión Renal Aguda; Sepsis.

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INTRODUCTION

Acute kidney injury (AKI) affects approximately 20% of hospitalized patients and up to 74.7% of those in the intensive care unit (ICU), featuring one of the most frequent health problems.4,5 The level of renal function impairment is directly related to high mortality rates and, consequently, costs to health systems.1-5

The lack of warning systems and early intervention measures represent a gap not only for the management of this disease, but to control the progression of an acute condition to a chronic and permanent one.6-7

Scientific and technological progress is a reality. However, this fact generally is not enough to prevent the accumulation of grievances to the patients. The sedentary life, impaired nutrition and advanced age are among many factors that make the individual susceptible to health problems. Sepsis is one of them. New evidence has signaled that the death rate related to this condition to a chronic and permanent one.8-7

AKI is a serious condition that complicates in every seven hospital admissions, and usually is diagnosed by rapid deterioration of serum creatinine tests or decreased urine volume.14 Thus, and besides arguing about recognition strategies and early protection of the LRA,17 this study objective is to identify and characterize patients admitted to the intensive care, setting who developed acute kidney injury induced by sepsis and perform the staging of renal impairment by RIFLE classification, so that decision-making is individualized, aiming patient safety and can be added in the health management process.

Adopted to ensure a better prognosis for patients.

Kidney is one of the organs affected in sepsis percussion, and the spectrum of this disease predisposes to the commitment of this organ, culminating in the installation of acute kidney injury and, consequently, increased risk of mortality.11-12

The pathophysiology of AKI in the presence of sepsis is complex and multifactorial. Septic patients develop intra-renal hemodynamic changes that generate low renal perfusion reduced glomerular filtration rate and finally the AKI itself.13

Small increases in serum creatinine predispose the occurrence of adverse events identifying and minimizing its complexity and multifactorial, representing a challenge to the implementation of measures in reducing the renal injury.14

Recent ratings have adopted the serum creatinine and urine volume as predictive measures of the AKI. In this study, it will be adopted RIFLE classification acronym R -risk, I -injury, F -failure, L -loss of kidney function, end-stage -renal injury in the final stage as an identification tool and staging of acute kidney injury (Figure 1).15

![Figure 1. Classification RIFLE.](image)

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<table>
<thead>
<tr>
<th>RIFLE classification</th>
<th>Criteria: creatinine serum</th>
<th>Criteria: urine output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk (Risk)</td>
<td>Increased SCr x1.5 or decreased SCr</td>
<td>Urine output &lt;0.5 ml/kg/h 6h</td>
</tr>
<tr>
<td>Injury (Injury)</td>
<td>Increased SCr x2 or decreased SCr</td>
<td>Urine output &lt;0.5 ml/kg/h 12h</td>
</tr>
<tr>
<td>Failure (Failure)</td>
<td>Increased SCr x3 or decreased SCr</td>
<td>Urine output &lt;0.5 ml/kg/h 24h or anuria for 24h</td>
</tr>
<tr>
<td>Loss of Kidney Function (Loss)</td>
<td>GFR &gt; 75% or SCr &gt; 4 mg/dL</td>
<td>Complete loss of renal function for &gt; 4 weeks</td>
</tr>
<tr>
<td>End-stage kidney disease (End-stage kidney disease)</td>
<td>Dialysis need for &gt; 3 months</td>
<td></td>
</tr>
</tbody>
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METHOD

This is an observational and prospective study, with a quantitative approach developed from March to September 2014, in the Intensive Care Unit of a public hospital in the Federal District (Brazil). The study sample consisted of 36 patients with a diagnosis of sepsis.

To obtain the estimated sample size (n) was used a formula to estimate a proportion.18 The “p-value” used in the formula was 66.7%, obtained from a pilot test with 15 septic patients who developed AKI. For the other parameters of the formula, absolute precision for the ratio (d)
assuming \( d = 16\)%. The sample size calculation resulted in 34 patients. The adopted sample value was 36 patients.

There were included patients aged over 18 years old, without renal dysfunction by the RIFLE classification. Patients with relapsed sepsis in the same hospital and with chronic renal failure were excluded (glomerular filtration rate <60mL/min/1.73m\(^2\)).

Data were collected after obtaining the approval of the study by the Ethics Committee of the Foundation for Teaching and Research in Health Sciences Health Department - FEPECS/SES, CAAE 24536913.0.0000.5553. All patients signed the Term of Consent.

Data collection was carried out by consulting records in the electronic medical records of patients with a diagnosis of sepsis. The information obtained was recorded in a structured questionnaire consisting of demographic data (gender, age, body mass index) and clinical (intubation time on mechanical ventilation, positive end-expiratory pressure (PEEP), vasoactive drugs use antibiotic). Patients were followed up until discharge from the ICU, and the APACHE II and the outcome (death, discharge) of patients were verified.

Statistical analysis calculated the average and standard deviation or absolute and relative frequency of quantitative variables using Fisher's exact test and Mann Whitney test for nonparametric variables - for significant result with \( p < 0.05 \).

### RESULTS

<table>
<thead>
<tr>
<th>Stages</th>
<th>Criteria: creatinine</th>
<th>Criteria: urine output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk</td>
<td>11 (30.6%)</td>
<td>14 (38.9%)</td>
</tr>
<tr>
<td>Kidney Injury</td>
<td>1 (2.8%)</td>
<td>15 (41.7%)</td>
</tr>
<tr>
<td>Kidney Failure</td>
<td>4 (11.1%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>

Figure 2. Distribution of patients in kidney dysfunction stages, according to the RIFLE classification. Federal District, 2014.

In this study, within the 36 patients, there was followed a predominance of females (58.3%) was found. The average age of patients was 55 years old, APACHE II score and body mass index (BMI) average of 21.2 and 22.7 kg/m\(^2\), respectively. Of the total patients, 88.9% developed acute kidney injury according to RIFLE classification. The predominant comorbidities were pneumonia (22.2%), sepsis (13.9%) and respiratory failure (8.3%).

The vasoactive drugs administered more frequently (72%) was noradrenaline, unlike dobutamine was administered in 5.6% of patients and 2.8% received dopamine. Patients who received norepinephrine during the hospitalization period showed higher incidence of death (93.3%). The relationship between these variables was significant (\( p < 0.038 \)).

The average duration of intubation of patients was of 14 days. Most mechanically ventilated patients were accompanied with positive end-expiratory pressure (PEEP) average of 9.1 cmH\(_2\)O.

In this study, urine output test showed a greater discriminatory power to identify patients at risk for renal injury stage and on the other hand only creatinine criterion identified patients in renal failure stage (Figure 2).

The number of antibiotics administered showed a statistically significant association with the occurrence of renal dysfunction (\( p < 0.04 \)). Thus, patients who used more antibiotics evolved with this complication. Moreover, it was found that patients with longer intubation had longer use of antibiotics (Figure 3).
Associated with sepsis, the AKI preannounces a high burden of morbidity and mortality in children and adults. Sepsis and AKI impose significant clinical challenges. Until the conclusion of this study, no single effective therapy is designed to alter the natural history of sepsis and AKI. However, strategies to alleviate poor results are focused on clinical risk identification. Early detection of lesions can modify the clinical behavior to prevent damage. Furthermore, survivors of monitoring long-term sequelae resulting from kidneys damage can guide more individualized preventive measures to the actual needs.  

In a broad view, the treatment of sepsis employs vasoactive drugs such as norepinephrine and dopamine, for restoration of hemodynamic derangement of patients and consequent balance between supply and demand of oxygen, caused by shock evidenced by conditions such as hypotension and appropriate distribution blood flow with improved renal perfusion.  

The increase in positive pressure end-expiratory pressure (PEEP) was shown to be a factor related to the occurrence of AKI. This association was repeated in other scientific evidence, although studies highlight that the use of invasive mechanical ventilation has the purpose of protecting the airways, its extension is associated with increased mortality.  

Scientific evidences indicate that the higher body mass index (BMI), the greater risk of occurring AKI and death. In this study was found that patients with higher BMI were affected by injury or kidney failure. Another study reports that BMI is a consistent predictor of prognosis and risk related death inflammatory factors, oxidative stress, indicating this as a mediator between obesity and the development of AKI.  

The development of acute kidney injury is strongly associated with advancing age. Pre-existing diseases unleashing new diseases from the use of drugs with potential risk for nephrotoxicity, are common factors currently and are closely linked to renal insult. The literature also indicates that the relation between the increase in the number of elderly and the onset of acute kidney injury is growing and linear, showing that patients over 60 years old are 3.0 times more likely than younger patients to evolve with risk AKI. All these factors influence the decrease in glomerular filtration rate and dysfunction in other organs. Information proved in this study.  

Evidence demonstrates a significant relation between antibiotics, the occurrence of nephrotoxicity and other factors such as age, pre-existing kidney diseases among other clinical conditions. The nephrotoxicity is justified by mechanisms such as tubule-epithelial injury, interstitial nephritis, glomerulitis and crystal formation and reduction in renal blood flow.  

Pneumonia associated with mechanical ventilation is one of the most common infections in the ICU, so the relation between intubation and the use of antibiotics is common. The endotracheal intubation can lyse the barrier between the
environment and the mucosa and facilitate bacterial colonization in different ways, which was also associated with long periods of hospitalization. In the current study, it is evident the relation between a progressive increase of intubation time with the increase in antibiotic usage time.

Bacterial resistance has been commonly faced in hospitals is associated with a high mortality. Studies indicate relationship between time of intubation and the use of antimicrobials. The robust recovery of preventive measures in these environments proves to be effective and can be performed from the use of simple strategies such as hand washing and oral hygiene of patients on mechanical ventilation.

CONCLUSION

In this study, more than half of the monitored patients had impaired kidney function. Most patients with acute kidney injury induced by sepsis were female.

Most septic patients were staged at risk for renal injury and renal injury itself, according to RIFLE classification.

REFERENCES


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