



ORIGINAL ARTICLE

Comparison of clinical characteristics of acute kidney injury versus acute-on-chronic renal failure: Our experience in a developing country



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KEYWORDS

acute kidney injury;
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sepsis;
volume depletion

Summary *Background:* From developing countries, there is paucity of information regarding epidemiological characteristics of acute-on-chronic renal failure (ACRF) that differs from acute kidney injury (AKI).

Methods: In this prospective study, we analyzed and compared clinical characteristics and outcome of ACRF with AKI from January 2007 to August 2012.

Results: A total of 1117 patients with community-acquired AKI were included in study (AKI = 835; ACRF = 282). Patients with ACRF were older than patients with AKI ($p < 0.001$). Sepsis was the main cause of acute decline in renal functions in patients with ACRF in comparison to AKI ($p < 0.001$). Volume depletion/renal hypoperfusion was the most common cause of AKI and the difference was statistically significant as compared to ACRF (33.9% vs. 17.7%; $p < 0.001$). Need for dialysis was significantly less in patients with ACRF as compared to AKI (68% vs. 77.4%; $p = 0.002$). Lower inhospital mortality was observed in ACRF in comparison to AKI (5% vs. 8.9%, $p = 0.04$), while no significant difference was noted in terms of duration of hospital stay between the two groups ($p = 0.67$). However, a significantly higher proportion of patients with ACRF did not recover and progressed to end-stage renal disease as compared to AKI (20% vs. 7.8%; $p < 0.001$).

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Conclusion: ACRF constituted an important cause (25%) of AKI. An episode of superimposed AKI is associated with significantly increased risk of progression to end-stage renal disease in patients with chronic kidney disease.

背景: 慢性腎病合併急性腎衰竭 (ACRF) 不同於急性腎損傷 (AKI), 然而在發展中國家, ACRF 的流行病學數據仍然相當有限。

方法: 在 2007 年 1 月至 2012 年 8 月期間, 我們進行了一項前瞻性研究, 分析並比較了 ACRF 與 AKI 的臨床特徵和治療後果。

結果: 研究對象為 1117 位社區性 AKI 患者 (AKI = 835; ACRF = 282), 其中 ACRF 患者較 AKI 患者年老 ($p < 0.001$)。相比於 AKI, ACRF 的急性腎功能下降較常歸因於敗血症 ($p < 0.001$); 相比於 ACRF, AKI 則較常歸因於容積匱乏/腎灌注不足 (33.9% vs. 17.7%; $p < 0.001$); ACRF 患者比 AKI 患者較少需要接受透析療法 (68% vs. 77.4%; $p = 0.002$); ACRF 患者的院內死亡率低於 AKI 患者 (5% vs. 8.9%; $p = 0.04$), 兩組間的住院期則無明顯差別 ($p = 0.67$); 然而, 相比於 AKI 患者, 明顯較多的 ACRF 患者無法康復並惡化成末期腎病 (ESRD) (20% vs. 7.8%; $p < 0.001$)。

結論: 慢性腎病合併急性腎衰竭是急性腎損傷的重要病因 (25%); 在慢性腎病患者間, AKI 的發生明顯增加惡化為 ESRD 的風險。

Introduction

Acute kidney injury (AKI) is defined as a rapid (over hours to weeks) and usually reversible decline in glomerular filtration rate (GFR) that can occur either in the setting of previously normal renal function ("classical" AKI) or in a patient with pre-existing chronic kidney disease (acute-on-chronic renal failure; ACRF).^{1–3} In developed countries AKI primarily occurs in hospitalized patients, while AKI is mainly community acquired in developing countries.^{3,4} ACRF forms an important group of AKI and is a significant cause of morbidity and mortality.⁵ However, there is a paucity of information on the entity ACRF and its clinical outcomes are not well studied.⁶ Available data suggest that epidemiological characteristics of ACRF differ from AKI. Patients with ACRF are of older age, have lower in-hospital mortality, higher need for dialysis, and a significant number of these patients progress to end-stage renal disease (ESRD).^{5,7} With this background, the aim of the present study was to compare the etiology, clinical features, and outcome of patients suffering from ACRF with AKI from a tertiary level hospital of eastern India.

Methods

In this prospective study, patients of both sexes with clinical diagnosis of community-acquired AKI or ACRF, attending the Department of Nephrology, Sir Sundar Lal Hospital, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India, from January 2007 to August 2012, were included for analysis. Patients with hospital-acquired AKI were excluded. Ethics committee approval was obtained prior to the study and written informed consent was taken from all patients. In patients with AKI and ACRF, detailed history, physical examination, and relevant laboratory investigations were undertaken with the purpose to identify etiology and precipitating factors responsible for the acute decline of renal functions. Patient and renal outcome were analyzed using the following parameters: need for renal replacement therapy, duration of hospital stay, recovery of renal functions, and in-hospital mortality. The following definitions were used in this study. (1) AKI

was defined as increase in serum creatinine (SCr) concentration $\geq 44 \mu\text{M}$ and baseline SCr $< 132 \mu\text{M}$,⁸ or SCr level at time of presentation was $\geq 177 \mu\text{M}$,^{9,10} when baseline levels were not known and during course of illness SCr returned to normal range (70.7–123.7 μM). (2) Chronic kidney disease (CKD) was defined as either kidney damage or GFR $< 60 \text{ mL/min/1.73 m}^2$ for ≥ 3 months. Kidney damage is defined as pathological abnormalities or markers of damage, including abnormalities in blood or urine tests or imaging studies.¹¹ However, we calculated estimated GFR (eGFR) using the Cockcroft–Gault formula in this study. (3) Patients were classified as ACRF if they made the criteria for CKD as defined above and had an acute rise in SCr ≥ 1.5 times over baseline value in a known case of CKD⁵ or when underlying CKD¹¹ was diagnosed during course of treatment in patients with AKI. (4) Renal recovery⁵: the renal function status of all surviving patients with AKI and ACRF was evaluated at ≥ 3 months after AKI episode and these patients were categorized into fully recovered, partially recovered, or nonrecovered, defined as (a) full recovery: SCr concentration down to normal range (or to the baseline in case of ACRF); (b) partial recovery: SCr remains above 123.7 μM (or remains above baseline in case of ACRF, or above 177 μM when baseline not known); (c) failure to recover (nonrecovery): dialysis dependence after 3 months of AKI. (5) Sepsis was defined according to ACCP/SCCM consensus conference committee guidelines.¹²

Statistical analysis

Categorical variables are reported in the form of number (%) while continuous data are expressed as mean \pm standard deviation. Chi-square test was used for dichotomous variables, while continuous data were analyzed using unpaired *t* test. A statistical value of $p < 0.05$ was considered significant. All the calculations were carried out using SPSS software version 16 (SPSS Inc., Chicago, IL, USA).

Results

From January 2007 to August 2012, a total of 1117 patients (679 males, 438 females) with community-acquired AKI

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