



ORIGINAL RESEARCH PAPER

General Medicine

MODERATELY INCREASED ALBUMINURIA AS AN INDICATOR OF OUTCOME IN CRITICALLY ILL PATIENTS WITHOUT OTHER COMORBIDITIES AFFECTING ALBUMINURIA

KEY WORDS: Moderately increased albuminuria; critically ill patient; SIRS; mortality; Urine ACR.

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ABSTRACT

Background and objectives: Critical illness is defined as any life-threatening condition that requires pharmacological and/ or mechanical support of vital organ functions in absence of which death is the likely outcome. The major portion of critically ill patients have sepsis, which remains a major global healthcare concern, being the major cause of Systemic Inflammatory Response Syndrome (SIRS), owing to a high morbidity and mortality. An early event in SIRS is the loss of barrier integrity leading to systemic capillary leak which is manifested as moderately increased albuminuria. This study was done to assess the prevalence of moderately increased albuminuria in critically ill patients and compare it with their outcome. **Methodology:** The study was conducted on patients admitted to Medical ICU at Government Medical College Hospital, Kozhikode, Kerala with features suggestive of SIRS. Method of Collecting Data: 180 patients who met the inclusion criteria were included in the study. **Results:** The present study included 180 patients, among which 102 were males and 78 were females. The mean age was 47.87 years. Mortality was 44.4%. Mortality was more among female patients and in the elderly than in female patients and younger patients. Mean urine ACR was 56.29mg/g among survivors and 102.15 mg/g among non-survivors. It was statistically significant with a P value of < 0.001 for predicting mortality. ACR1 ≥ 54.6 (mg/gm creatinine) was the cut-off point for predicting mortality with a sensitivity of 76.3 % and specificity of 68 % with total accuracy of 71.6% and AUC 0.759 (CI 0.688-0.829). **Conclusion:** Significant moderately increased albuminuria is predictive of mortality. Urine ACR is an inexpensive and rapid diagnostic tool, especially moderately increased albuminuria which may help in the clinical assessment of critically ill patients at risk of worse prognosis.

INTRODUCTION

Critical illness is defined as any life-threatening condition that requires pharmacological and/ or mechanical support of vital organ functions in absence of which death is the likely outcome.[1] Systemic Inflammatory Response Syndrome (SIRS) remains the main pathology implicated in critical illness. Among critically ill patients in a medical setting, sepsis remains to be a major contributor of mortality around the world. Other causes seen are hemorrhagic shock, acute liver failure, chronic liver disease with complications, diabetic ketoacidosis, hematological malignancies, hypertensive emergencies, cardiovascular dysfunction etc.

As sepsis draws all the attention among these patients in terms of morbidity and mortality, early detection and prompt treatment of sepsis becomes detrimental. Sepsis is defined as SIRS (systemic inflammatory response syndrome) that has a proven or suspected microbial etiology.[2] It is a life-threatening organ dysfunction due to a dysregulated host response to infection. SIRS is marked by a severe host defense response that triggers potent inflammatory cascades that release many pro-inflammatory molecules into circulation.

The endothelium becomes dysfunctional due to the sustained action of the inflammatory molecules and the simultaneous oxidative stress. An early event in this process is the loss of integrity of natural barriers, leading to a systemic capillary leak which is proven to be one of the earliest features of Systemic Inflammatory Response Syndrome (SIRS). The glomerular manifestation of this enhanced capillary permeability can be seen as an increased excretion of albumin in the urine. In various studies conducted earlier, moderately increased albuminuria has been correlated with rapid changes in vascular integrity.

Various ICU scoring systems are used to predict mortality and some of these which in current practice are the APACHE II and SAPS II score. These scoring systems are hectic and are done at 24 hours of admission during which precious time is lost in administering optimal treatment. The optimal use of ICU resources and an accurate method of predicting outcome in

critically ill patients has been the cornerstone of many studies undertaken earlier. Early identification of patients most at risk of serious complications and adverse outcomes would mean that they can be targeted more accurately with potentially expensive clinical interventions.

Moderately increased albuminuria, previously known as microalbuminuria, defined as 30–300 mg/day of albumin excretion in the urine, occurs rapidly after an acute inflammatory insult which is seen in critically ill patients especially those with sepsis and persists in patients with complications. It is a common finding in critically ill patients especially in sepsis, where it has shown promise not only as a predictor of organ dysfunction and vasopressor requirement but of mortality also. This study is an attempt to understand the degree of moderately increased albuminuria and the possibility of its use in predicting the mortality of critically ill patients with SIRS.

METHODOLOGY

The present study was conducted on patients admitted to Medical ICU at Government Medical College Hospital, Kozhikode with features suggestive of SIRS during the 1 year duration of 2021 -2022. Spot urine samples were collected at 6 hours of admission to the medical ICU. Samples were tested for urine albumin by immunoturbidimetric method and for urine creatinine by Jaffe method and urine albumin: creatinine ratio were calculated. The significance of serial rise in urine ACR was also taken into account so as to compare it with patient outcome. Patients were selected according to specific inclusion and exclusion criteria. The purpose of the study was explained to the patient and informed consent obtained. Patients were followed up during the course of the ICU stay and the outcome of the patient (i.e. Death /recovery) were recorded. Exclusion criteria were: age < 18 years, patients receiving nephrotoxic drugs, patients with pre-existing chronic renal insufficiency; on renal replacement therapy or GFR <60 ml/min, patients with pre-existing urinary tract infection, patients with less than 24 hrs of ICU stay, pregnancy, Diabetes mellitus, duration > 5 years and hypertension, duration > 5 years.

RESULTS

In this study out of 180 patients with sepsis, 80 patients (44.4%) did not survive and 100 patients (55.6%) survived. Majority of the patients were in the age group of < 44 years (40.6%). Patients were distributed from age 18 to 90 years with a mean age of 47.87 years. 78 patients were females (43.33%) as compared to 102 males (56.67%). In the first 6 hours after ICU admission, 174 patients (96.7%) had moderately increased albuminuria in their urine ACR values while 6 patients (3.3%) did not have moderately increased albuminuria. 118 patients (65.6%) had ACR values between 30 - 79 mg/g, 29 patients (16.1%) had ACR of 80-129 mg/g, 14 patients (7.8%) had ACR of 130-179 mg/g, 9 patients (5%) had ACR of 180 - 229 mg/g, 6 (3.3%) of ACR <30 mg/g, 3(1.7%) with ACR of 230 - 280 mg/g and 1(0.6%) having ACR value >280 mg/g.

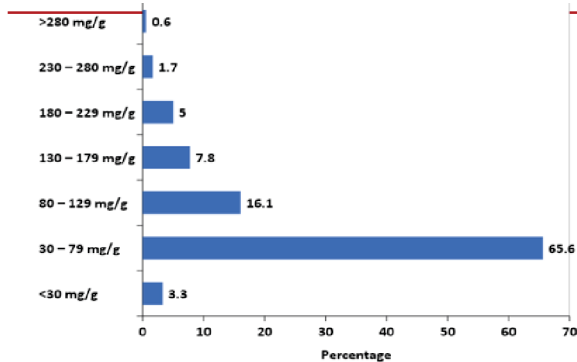


Figure 1: Distribution of patients according to their urine ACR values

Urine ACR ranged from 20.4 mg /g to 284.3 mg/g with a mean value of 76.67 mg/g. (SD 52.95). Urine ACR differed significantly among survivors and non- survivors. P value of ACR for survivors and non- survivors were statistically significant with P value of < 0.001. Patients who survived had a mean ACR of 56.29 mg/g and patients who died had ACR of 102.15 mg/g.

Table 1: Association of urine ACR with the outcome

Urine ACR	Outcome				P value
	Expired (N=80)		Survived (N=100)		
	No.	%	No.	%	
<30 mg/g	0	0	6	100	<0.001
30 - 79 mg/g	38	32.2	80	67.8	
80 - 129 mg/g	18	62.1	11	37.9	
130 - 179 mg/g	12	85.7	2	14.3	
180 - 229 mg/g	9	100	0	0	
230 - 280 mg/g	2	66.7	1	33.3	
>280 mg/g	1	100	0	0	

This study showed that in the first 6 hours after ICU admission, a significant majority of patients had moderately increased albuminuria both in the survivor and non- survivor group.

This may be due to the fact that there is significant systemic capillary leak happening in critically ill patients which can be attributed to the excess in cytokine and other proinflammatory molecules along with the hormonal surge that happens in this exaggerated SIRS which drives the course of illness in these patients.

This shows that there is a high prevalence of moderately increased albuminuria in critically ill patients even without renal dysfunction at the time of admission to the ICU.

Mean urine ACR value obtained was 76.67mg/g. Urine ACR differed significantly among survivors and non- survivors. Patients who expired had significantly higher ACR values compared to those who survived and the association was significant. ACR ≥ 54.6 mg/g can be taken as the cut off value

above which it could predict mortality in a significant proportion of critically ill patients with a reasonably high sensitivity and specificity.

CONCLUSIONS

Mortality percentage in this study was 44.4 %. Mortality was seen more in females when compared to males and it was more in elderly patients. Sepsis remained as the dominant cause for critical illness in this study. Urine albumin creatinine ratio differed significantly between survivors and non-survivors at 6 hours of admission. This study was undertaken in a group of patients with critical illness in a medical setting without any significant renal dysfunction and without other confounding factors like long-standing diabetes or systemic hypertension or urinary tract infections. Even after this, moderately increased albuminuria could be correlated with the outcome of critically ill patients. Early institution of intensive therapy for these patients can improve survival rates. Moderately increased albuminuria, even in patients without any significant renal dysfunction, is an inexpensive and rapid diagnostic tool. Further studies with serial measurements may prove a useful aid in the clinical assessment of critically ill patients at risk of worse prognosis, even in a resource-poor setting.

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