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Original article

Prevalence and prognostic value of microalbuminuria in critically ill patients: A hospital based study from north east India

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ABSTRACT

Background: There is lack of simple inexpensive tests to accurately predict clinical outcomes in critically ill patients.
Objective: To assess prognostic value of microalbuminuria in critically ill patients and its comparison with APACHE II, SOFA scores in predicting in-hospital mortality.
Method and material: Prospective observational study in 50 critically ill patients admitted to ICU. Severity of illness was assessed by APACHE-II, SOFA scores. Microalbuminuria was measured at 0, 8, 24, 48, 72, 96, 120 hours and trend compared with APACHE-II, SOFA scores. Statistical analyses were done using SPSS and STATA software. $p < 0.05$ was considered statistically significant.
Results: Mean age was 48.18 ± 17.34 years with male:female ratio of 2.6:1. Cerebrovascular accidents (22%), chronic liver disease (16%), sepsis (16%) were common aetiologies. Majority (70%) of patients had microalbuminuria. In-hospital mortality was higher in patients having microalbuminuria at admission than those without (48.6% vs. 40.0%). Microalbuminuria levels showed rising trend in non-survivors. Linear regression and correlation between microalbuminuria and APACHE-II, SOFA scores showed significant statistical co-relation ($p = 0.0011$, $p = 0.002$ respectively).
Conclusion: The degree as well as increasing trend in microalbuminuria has significant co-relation with scoring systems (APACHE II and SOFA) in predicting mortality and may serve as an important prognostic tool in critically ill patients.

1. Introduction

One of the major challenges in the management of critically ill patients is the ability to predict clinical outcomes. To overcome this challenge in clinical practice several tools like the Acute Physiology and Chronic Health Evaluation (APACHE) and Sequential Organ Failure Assessment (SOFA) scoring systems have been developed and validated in the past to predict outcomes in the critically ill [1]. However, there is a lack of simple inexpensive bedside tests that can be used as a predictor of disease severity and mortality [2].

Microalbuminuria has been widely used as a predictor of renal dysfunction in diabetes mellitus and is recognized as an independent predictor of adverse cardiovascular events in individuals with or without diabetes mellitus [2,3]. In critically ill patients it is postulated that microalbuminuria serves as a surrogate marker of systemic vascular permeability as well as prognostic marker for sepsis associated acute kidney injury and therefore can predict disease severity and mortality [2,4].

Microalbuminuria has been shown to be a simple, relatively inexpensive, and dynamic prognostic tool for critically ill patients and has been found to be comparable with the other tools like APACHE and SOFA in the western literature [5]. However, such data from India, and especially from this region is lacking [6].

With this background this study was carried out in critically ill patients with medical diseases, admitted to the Intensive Care Units (ICU) in a tertiary care hospital in north eastern India to assess the trend and prognostic importance of microalbuminuria in critically ill patients as well as its comparison with APACHE II and SOFA scores as a predictor for mortality.

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Table 1
Showing age distribution of the patients.

Age Group	Survivors	%	Non-survivors	%	Total (%)
18–30	5	45.46	6	54.54	11(22)
31–40	7	70	3	30	10(20)
41–50	4	66.67	2	33.33	6(12)
51–60	5	50	5	50	10(20)
>61	5	38.46	8	61.54	13(26)

2. Materials and methods

The present study was a hospital-based prospective observational study, carried out over a period of one year in 50 consecutive critically ill adult patients satisfying the selection criteria and admitted in the Intensive Care Unit of a large tertiary care hospital in Guwahati, the largest city of north east India.

Critically ill patients aged 18 years and above admitted to the Intensive Care Unit were included in the study. Post operative patients, patients with trauma, frank haematuria, urinary tract infections, co-morbidities like diabetes mellitus, chronic kidney disease, patients receiving nephrotoxic drugs and those suffering from chronic organ insufficiency were excluded from the study.

Urinary samples for microalbuminuria were collected at hospital admission and at 8, 24, 48, 72, 96 and 120 hours after hospital admission. To exclude the influence of urinary flow on the level of microalbuminuria, the microalbuminuria: creatinine ratio was calculated. The severity of illness was assessed by the APACHE (Acute physiology and chronic health evaluation) II. Similarly, the degree of organ dysfunction was assessed using SOFA (Sequential organ failure assessment) score, calculated from the time of admission until the fifth day or till day of discharge, whichever was shorter.

All selected patients were subjected to a thorough clinical history and examination and a structured performa was filled in for each case. Laboratory investigations including complete blood counts, urine analysis, blood urea, serum creatinine, blood glucose, liver function tests, chest x-ray and ultrasonography of abdomen were done in all cases. Other investigations were done as and when required.

Ethical clearance was taken from the Institutional Ethical Committee and written informed consent was taken from the patients or legally accepted representative.

Statistical Analyses were done using Statistical Package for Social Survey (SPSS) and STATA Data analysis and Statistical software for Windows version 17.0. The results were tabulated and graphically represented using Microsoft Office for Windows 2008.

3. Results

Out of the 50 patients, 36 (72%) of the patients were males and 14 (28%) were females with a male to female ratio of 2.6:1. The overall mean age was 48.18 ± 17.34 years (age range was 18–77 years). The age distribution of the study population is shown in Table 1. Overall, there was an in-hospital mortality of 46%.

The most common causes for critical illness, in order of disease frequency were cerebrovascular accidents (22%) followed by chronic liver disease and sepsis (16% each). The aetiological diagnosis and outcomes is shown in Table 2.

In the patients with a baseline APACHE II score of 11–15 the in-hospital mortality was 6.25% whereas those with a higher APACHE II score (21–30) had a significantly higher mortality of 92.30% ($p = 0.025$), (Table 3). Likewise, with a low baseline SOFA score (<5) the in-hospital mortality was 4.35% compared to 100% in those with a higher (11–15) SOFA score ($p = 0.0140$), (Table 4).

Majority (70%) of the critically ill patients had urinary microalbumin at the time of admission. The in-hospital mortality with those having microalbuminuria at admission was higher than those without (48.6% versus 40.0%), although it was not statistically significant (Table 5). The mean urine microalbumin levels showed a rising trend in the non-survivors while in those who survived there was a gradual decline in the levels of mean urine microalbumin over time (Fig. 1).

Linear regression and correlation between APACHE II score and microalbuminuria in survivors showed significant correlation between APACHE II and microalbuminuria among survivors ($p = 0.0011$), (Table 6 and Fig. 2). Likewise, linear regression and correlation between SOFA score and microalbuminuria in survivors also showed a significant correlation ($p = 0.002$), (Table 7 and Fig. 3). The mean microalbuminuria levels variation with time and associated outcome showed an increasing trend in non-survivors (Table 8)

4. Discussion

In our study, we found that the number of patients in the different age groups was similar and the mean age was 48.18 ± 17.34 years. Patient in the elderly age group of more than 61 had the highest mortality rate. A previous study had a median age group of 63.5 (55–72) years and showed similar increased mortality in elderly age groups [6]. In our study mortality rates were similar in both the male and female population. A previous

Table 2
Showing the outcome of the patients based on the disease aetiology.

Diagnosis	Survivors (n = 27)		Non- survivors (n = 23)		Total	p-value
	No. of cases	%	No of cases	%		
Cerebrovascular accident	4	36.36	7	63.64	11	0.74
Chronic liver disease	4	50	4	50	8	0.99
Complicated malaria	5	100	0		5	–
Lower respiratory tract infection	2	40	3	60	5	0.80
Encephalitis	5	100	0		5	–
Chronic obstructive pulmonary disease	0		1	100	1	–
Status epilepticus	3	100	0		3	–
Pancreatitis	1	50	1	50	2	0.99
Acute inflammatory demyelinating polyneuropathy	1	100	0		1	–
Tubercular meningitis	1	100	0		1	–
Sepsis	1	12.5	7	87.5	8	0.48

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