ORIGINAL ARTICLE

Outcome of Patients with Sepsis Admitted in Intensive Care Unit of a Tertiary Care Hospital in India

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ABSTRACT

Introduction: Sepsis has a death rate of ~25% globally and its clinical treatment presents an important clinical challenge. The rapid progression of sepsis requires correspondingly swift adjustments in therapy, and accurate identification of disease severity is therefore vitally important for predicting prognosis, treatment, preventing complications, reducing complication and mortality. With this background, the present research is aimed to study the relation of serum procalcitonin levels in cases with sepsis, to calculate APACHE II scores and to correlate the levels of serum PCT levels with APACHE II Score with the outcome.

Methodology: This was a prospective observational non interventional cohort study was conducted in the Clinic of Intensive Care unit of a tertiary care hospital and medical college in western India from May 2020 to December 2020.

Results: A total of 75 patients, admitted to the ICU with the diagnosis of sepsis, were included in this prospective observational study. Of them 47 (62.7%) were males and highest cases were aged between 60 to 69 years. Of the total 75 patients, 47 (62.7%) patients were survivors. Age, gender and involvement of system were not associated with mortality while lower APACHE II score and presence of co-morbidities were significantly associated with mortality.

Conclusion: From this study we conclude that the lower APCHE II score and presence of co-morbidity significantly increases the mortality in ICU patients admitted with sepsis.

Keywords: Sepsis, APACHE II, Intensive Care Unit, Co-morbidity

INTRODUCTION

Sepsis has a death rate of ~25% globally and its clinical treatment presents an important clinical challenge. The rapid progression of sepsis requires correspondingly swift adjustments in therapy, and accurate identification of disease severity is therefore vitally important for predicting prognosis, treatment, preventing complications, reducing complication and mortality.[1]

Mortality rate in ICUs' rely on severity of the disease and worsening of health condition of critically ill cases. The condition that has shown to raise the in-hospital mortality rates are increasing age of case, severity of disease, certain pre-existing clinical conditions such as (eg. Malignancy, Immune suppressive and renal replacement therapy). Assessment of outcome of clinical treatment was first considered as an issue by Florence nightingale in 1863.[2]

Initially the treatment outcome prediction of severely ill cases was based on judgments made by the physician's but today the rapid development of ICUs, demand quantitative measurement and review of the outcomes in order to enhance practices largely based on evidence. The original initial outcome prediction scores were developed more than 25 years before to get an indication or prediction of risk of mortality critically ill cases. Since then, many situation-based ICU scoring systems were developed though only a few of them are practically put in to practice. Therefore, assessment of prognosis is a vital part of management of any critically ill cases.[3]

Multiple scoring systems are available for assessment and study prognosis of the severity of morbidity in critical care units. The scoring systems classify the severity of critically ill cases on the basis of clinic-biochemical values and classify the case in a specific risk category. Hence scoring systems have been developed and it is critical to use them in ICUs to improve standards of care and outcome.[4]

Acute Physiology and Chronic Health Evaluation II (APACHE II) is a severity score and mortality estimation tool developed for ICU cases in the US by Knaus et al in 1985.[5] The critical care severity scores are calculated from the data obtained on the first day of ICU admission e.g., APACHE, SAPS (Simplified Acute Physiology Score), and Mortality Probability Model (MPM). The Scoring system contains of two divisions: a severity score which is a digit (generally higher the score more is the severity of the condition) and a calculated probability of mortality. [6,7] In addition to clinical observation and advance treatments in health care, practicing clinicians need to realize and utilize scoring systems in their day today practice.[8]

The Acute Physiology and Chronic Health Evaluation II (APACHE II) is the standard method for assessing sepsis,

but along with that other diagnostic and prognostic biomarkers are also investigated.[5]

Procalcitonin is a 116 amino acid precursor of calcitonin. Serum procalcitonin concentrations are below the detectable level in healthy persons (0.5 ng/ml), and however, it can increase to 1000 ng/ml in severe bacterial infection or sepsis.[9] Procalcitonin has a half-life of 15–20 h in the blood, and it's plasma concentration is correlated with severity of infection in cases in the intensive care unit (ICU).[10]

With this background, the present research is aimed to study the relation of serum procalcitonin levels in cases with sepsis, to calculate APACHE II scores and to correlate the levels of serum PCT levels with APACHE II Score with the outcome.

OBJECTIVE

The study was conducted to study the outcome of sepsis cases admitted in Intensive Care Unit and its correlation with clinical variables.

MATERIAL AND METHODS

This was a prospective observational non interventional cohort study was conducted in the Clinic of Intensive Care unit of a tertiary care hospital and medical college in western India from May 2020 to December 2020. The approval of the Ethics Committee of the institute was obtained prior to the initiation of the study. Written informed consent was taken from all participants or their relatives before including them into the study.

Inclusion criteria: All patients above the age of 18 years who had been admitted to medicine ICU with sepsis were included in the study.

Exclusion Criteria: Patients with Major trauma, Burns, Surgery, and with massive blood transfusions were excluded. Chronic infections necessitating chronic antibiotic usage or patient on Immunosuppression were excluded.

After obtaining written informed consent, subjects aged 18 and older were included in the study. A detailed history was elicited from the patients, and general physical examination and systemic examination of the patients was done.

Routine complete blood counts, routine urine analysis and microscopy, renal function tests, random blood sugar, liver function tests, serum electrolytes, C-reactive protein, chest X-ray, ECG, sputum Gram's stain/AFB, cultures-blood/sputum/urine etc will be done wherever indicated and serum Procalcitonin will be done for all patients.

The APACHE II (Acute Physiology and Chronic Health Evaluation) severity score was calculated on the day of admission.

Data Analysis: Data were analysed using SPSS software version 18. P value <0.05 was considered as statistically significant. Descriptive statistics of variables such as age, sex, groups of sepsis etc, were analysed and presented as percentage. Chi square test was used to compare the categorical variables.

RESULTS

A total of 75 patients, admitted to the ICU with the diagnosis of sepsis, were included in this prospective observational study. Of them 47 (62.7%) were males and highest cases were aged between 60 to 69 years (Table 1).

Table 1: Demographic profile and frequency distribution of age in study population

Demographic characteristics	Cases (n=75) (%)
Age Group (in years)	
25-39	18 (24.0)
40-49	10 (13.3)
50-59	12 (16.0)
60-69	24 (32.0)
70-79	11 (14.7)
Gender	
Male	47 (62.7)
Female	28 (37.3)

Table 2: Distribution of different comorbidities in the study population according to gender

Clinical Variables	Cases (n=75) (%)
Comorbidities	
DM	20 (26.7)
COPD	8 (10.7)
Hypertension	9 (12)
Chronic liver disease	5 (6.6)
CKD	6 (8)
No comorbidities	27 (36)
System involved	
Respiratory system	37 (49.3)
Renal parenchyma and urinary tract	20 (26.7)
Gastrointestinal system	15 (20)
Diabetic Foot	2 (2.7)
Meningitis	1 (1.3)
Outcome	
Survived	47 (62.7)
Died	28 (37.9)
Apache II Score	
15-19	1 (1.3)
20-24	12 (16)
25-29	11 (14.7)
30-34	14 (18.7)
35-100	37 (49.3)

Table 3: Distribution of outcome in study population and its correlation with gender

Variables	Outcome		P value
	Survivors (n=44) (%)	Non survivors (n=28) (%)	
Age (in years)*	55.17±16.61	50.67±14.27	0.892
Gender			
Male (n=46)	31 (65.9)	16 (34.1	0.445
Female (n=26)	16 (53.8)	12 (46.2	
Co-morbidity			
Present	24 (50.0)	24 (50.)	<0.001
Absent	20 (85.2)	4 (14.8)	
System Involved			
Respiratory system	27 (72.9)	10 (27.1)	0.153
Renal system	11 (55)	9 (45)	
Gastrointestinal system	7 (47)	8 (53)	
Cellulitis	2 (100)	0 (0)	
CNS	0 (0)	1 (100)	
APACHE II Score*	28.95±4.07	41.25±12.75	<0.001

*Values are in Mean ± SD

Total 48 (64%) patients had comorbidities and 27 (36%) patients didn't have comorbidities. Of the total 48 (64%) patients having comorbidities, 30 (62.5%) were males and 18 (37.5%) were females. Diabetes Mellitus was the commonest co-morbidity. In the study population, the respiratory system was found to be the source of sepsis in 34 (48.6%) cases. It was followed by renal system which was involved in 18 patients (25.7%). Thus it could be inferred from this study that respiratory system was found to be involved more commonly among the patients admitted with sepsis (Table 2).

Total 75 patients diagnosed with sepsis were included in this prospective observational study. Of the total 75 patients, 47 (62.7%) patients were survivors and 28 (37.9%) patients were non survivors. The mean age in the group of survivors was 55.17±16.61 and the mean age in the group of non survivors is 50.67±14.27. The difference between the two means is statistically not significant ('p' value=0.89).

The difference between the mortality rates between two gender groups is statistically not significant (DF=1; X^2=0.5827; 'p' value=0.44524)

A total 75 patients, admitted to the ICU with the diagnosis of sepsis, were enrolled in this prospective observational study. There was presence of comorbidity in 48 (64%) patients whereas 27(36%) patients didn't have any history of comorbidities. Total 48 (66.7%) had history of comorbidity, of which 24 (50%) survived and 24 (50%) died. Total 24 (33.3%) patients were had no history of comorbidity, of which 20 (85.2%) patients survived and 4 (14.8%) patients died. It is observed that mortality was 14.8% amongst the group of patients with no comorbidities and mortality of 50% was observed in group of patients with history of comorbidities. Thus, mortality was more in group of patients with comorbidities (X^2=9.143; DF=1; 'p' value=0.000249).

Total 75 patients, admitted to the ICU with the diagnosis of sepsis, were enrolled in the prospective observational study. Total 37 (49.3%) patients had respiratory system as the focus of sepsis, of which 27 (72.9%) patients survived and 10 (27.1%) died. The mortality rate in patients with respiratory system as the focus of sepsis was 13.3%. Total 20 (26.7%) patients had renal system as the focus of sepsis of which 11 (55%) patients survived and 9(45%) patients died. The mortality rate in this group of patients was (12%). Total 15 (20.8%0 patients had gastrointestinal system as the focus of sepsis, of which 7 (47%) patients survived and 8 (53%) patients died. The mortality rate in this group of patients was 10.7%. Total 2 (2.8%) patients had cellulitis as the focus of sepsis, of which 2 (100%) survived and 0(0%) died. The mortality rate in this group of patients was 0%. Total 1 patient had CNS as the focus of sepsis of which 0(0%) survived and 1 (100%) died. The mortality rate in the patients with CNS as the focus of sepsis was 100%. The difference between the mortality rate of different foci of sepsis are statistically insignificant (DF=1; +X^2=2.042; 'p' value=0.1529).

In the study population of 75(100%) patients, majority of the patients 37 (49.3%) had APACHE II score in the range of 35-100 followed by 14 (18.7%) patients had APACHE II score in the range of 30-34. Total 75 patients admitted to the ICU with the diagnosis of sepsis, were enrolled in this prospective observational study. Total 47 patients survived and 28 patients were non-survivors. In the group of survivors, the mean APACHE II score was 28.95±4.07 with the median APACHE II score of 28 (26 - 32.5). Total 28 patients belonged to the group of non-survivors and the mean APACHE II Score in this group was 41.25±12.75. The median APACHE II score in the group of non survivors was 44(29-52.25). Thus, the mean APACHE II Score in the group of non-survivors is higher than that of survivors. The difference between the APACHE II score of the 2 groups is statistically significant('p'value=0.0000).

Total 75 patients, admitted to ICU with the diagnosis of sepsis, were enrolled to this prospective observational study. Total 53 (70.7%) patients had APACHE II score >30 and 22 (29.3%) patients had APACHE II Score <30. Total 22 (29.3%) patients had APACHE II score <30, of which 20 (90.9%) survived and 2 (9.1%) patients died. Total 53 (70.7%) patients had APACHE II score >30, of which 27 (50.9%) patients survived and 26 (49.1%) patients died. The mortality rate of patients with APACHE II score <30 was 2.7% as compared to 34.6% in the group of patients APACHE II score >30. The sensitivity of cut off APACHE II score >30 for predicting mortality was 92.9% and specificity was 42.6%. The PPV was 49.1% and NPV was 90.9%. The mortality rate in group of patients with APACHE II score >30 is significantly higher than those with APACHE II Score<30 (Df-1; X^2=10.61399; 'p' value=0.00112).

DISCUSSION

Demographic profile and frequency distribution of age in study population

The majority of the people were in the age group of 60-69 years (33.3%) followed by 25-39 years (20.9%). The distribution according to the gender showed that majority of patients were males 51 (68%) and females were 24 (32%). This finding was similar to study conducted by **Artero et al** [11], where the mean age was 63.5±15.8 years. The mean age of the present study population was slightly higher than that of **Jain et al**[12] (50.7±18.7). However, in contrast to the findings of this study population, **Nargis et al**[13] reported the mean age of the study population to be 28±9.3 years. The mean age reported by **Watanbe et al**[14] in Japan is 73.8±15.6 years which is considerably higher than that observed in the present study. The difference in the demographic profile and age groups in the various studies could be attributed to difference in geographical conditions and socio-economic profile of patients which have an impact on their susceptibility towards the disease.

Total 75 patients were enrolled in this prospective observational study of which 47 (62.7%) were males and 28 (37.3) were females. Thus there was male preponderance in the this study population. The male dominance in the study population was similar to the reported by **Nargis et al**[13] which is 63%. The percentage of male subjects in the study population were higher than those reported by **Khan A.A et al** [15].

Distribution of gender in the population and its association with the outcome

Total 75 patients, admitted to the ICU with the diagnosis of sepsis, were enrolled in the study. Total 47 (62.7%) patients were males of which, 31 (65.9%) survived and 16 (34.1%) died. Total 28 (37.3%) patients were females, of which 16 (57.1%) survived and 12 (42.9%) died. The mortality in males was 21.3% as compared to 16% within the females. The difference between the mortality rates between two groups is statistically not significant ('p' value=0.44524). The male preponderance in the study population was similar to previous studies. **Jain et al**[12] reported non-significant association between gender and outcome ('p' value >0.05). Not many studies have investigated the correlation between the outcome. **Rhee C et al**[16] too reported male predominance in their study population of patients diagnosed with sepsis. However similar to observations of the present study no significant association was observed between gender and outcome by the previous study.

Distribution of comorbidities in study population and its association with the gender

Total 48 (64%) of the 75 patients had pre-existing comorbidities. The prevalence of comorbidities in the study population is similar to that reported by **Yang Y et al**[17] (66%). Diabetes mellitus was found to be commoner comorbidity (41.7%) in the study population followed by hypertension (18.7%). The observation of this study was similar to that reported by **A. Artero et al**[11] in Spain which reported Diabetes mellitus to be a commoner comorbidity in their study population with prevalence of 32.7%. **Rhee C et al**[16] reported conducted a similar prospective observational cohort study in USA and reported solid cancer and other malignancies to be the most common underlying comorbidity. The above observation was in contrast the that of the present study. The difference in the prevalence can be attributed to more prevalence of Diabetes mellitus in Indian population as well lack of awareness and screening for malignancies. However, none of the studies observed any significant association between comorbidities and gender.

Distribution of comorbidities in study population and its association with the outcome

There was presence of comorbidity in 48 (64%) patients whereas 27 (36%) patients didn't have any history of comorbidities. Total 48 (66.7%) had history of comorbidity, of which 24 (50%) survived and 24 (50%) died. Total 24 (33.3%) patients were had no history of comorbidity, of which 20 (85.2%) patients survived and 4 (14.8%) patients died. It is observed that mortality was 5.3% amongst the group of patients with no comorbidities and mortality of 32% was observed in group of patients with history of comorbidities. The above observation was similar to that reported by **Suarez De La Rica et al**[18] which also reported increased mortality in subset of patients with comorbidities and diagnosed with sepsis.

Distribution of system involvement in study population and its association with the outcome

Total 37 (49.3%) patients were reported to have respiratory system as the source of sepsis, therefore it being the commoner source of infection followed genitourinary system in 20 (26.7%) patients. **A. Artero et al**[17] also reported respiratory system (24.1%) as the commonest source of sepsis in their study population. However, the 2nd most common source of sepsis reported by them was gastrointesinal system in contrast to observations in this study population. **Jain et al**[12] reported respiratory system as the source of sepsis in 71% cases, however the study setting was predominantly a respiratory ICU. **Clec'h.etal**[19] also reported respiratory system to be the contributor to the majority of the cases (19%). **Watanbe et al**[14] also reported respiratory system to be commonest source of sepsis in their study. **Rhee C et al**[16] also observed pneumonia to be the most common presentation in their prospective cohort study. However, none of the studies found any association between system involvement and outcome.

Distribution of APACHE II score in study population and its association with the outcome

In the group of survivors, the mean APACHE II score was 29.09091±4.175 which was lower than the group of non-survivors and the mean APACHE II Score in this group was 35.34±8.67. **Jain et al**[12] reported mean APACHE II score in survivors as 21.9±7.1 which was lower than 28.6±7.1. **Anand et al**[20] reported higher APACHE II scores among non survivors a s compared to survivors (21.5 vs 29.28). Similarly, **Mustafic et al**[21] reported higher median APACHE II score in non survivors as compared to survivors (19vs 11). In the present study median APACHE II Score in the group of non survivors was 37.5 (28.75-42.5) and in the group of survivors was 28(25.75-33). The difference between the APACHE II score of the 2 groups is statistically significant (P value=0.0002). Similar difference was reported by **Jain et al** [12], and **Artero et al** [11]**.** Similarly, **Dupleiss et al**[22] noted mean APACHE II score of17.5±5.9 among non survivors which was higher as compared to 10.1±5.9 among survivors. **Artero A et al**[11] in their study observed APACHE II score to be significantly different between the two groups of survivors and non survivors. Similarity between findings of this study present study and the previous reports implies the significance of APACHE II score as an independent marker for prognosis in sepsis.

CONCLUSION

From this study we conclude that the lower APCHE II score and presence of co-morbidity significantly increases the mortality in ICU patients admitted with sepsis.

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