ORIGINAL RESEARCH

APACHE IV versus SAPS II in diagnosis of severe sepsis

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ABSTRACT

Background: The main causes of mortality in non-coronary intensive care units (ICUs) include severe sepsis and septic shock, which are significant reasons for ICU admissions.The present study compared APACHE IV and SAPS II scoring in severe sepsis. **Materials & Methods:** 65 patients admitted to the ICU with severe sepsis and septic shock of both genders were recruited. Scoring system such as APACHE IV and SAPS II was used. **Results:** Out of 65 patients, males were 35 and females were 30. Diagnosis was congestive cardiac failure in 4, rheumatic heart diseasein 2, tetanus in 5, meningitis in 3, CNS sepsis in 2, cirrhosis of liver in 6, malignancy in 4, pneumonia in 18, tuberculosis in 6, COPD in 8, restrictive lung disease in 4 and ARDS in 3 patients. The difference was significant ($P< 0.05$). **Conclusion:** When comparing the mortality rates of individuals with severe sepsis, both methods APACHE IV and SAPS IIwere comparable.

Key words: APACHE IV, Sepsis, SAPS II

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INTRODUCTION

The top causes of mortality in non-coronary intensive care units (ICUs) include severe sepsis and septic shock, which are significant reasons for ICU admissions.[1] It is an infection-related systemic harmful host reaction. Severe sepsis and septic shock can develop quickly after sepsis, and septic shock is characterized by severe hypotension that is unaffected by fluid resuscitation.[2] There isn't a standardized scoring system for sepsis patients' sickness severity. Sepsis outcome studies are challenging to interpret without such a system. Systems for predicting mortality have been developed as tools for evaluating the effectiveness of intensive care units. Applications for prognostic scoring systems are numerous.[3]

By lowering uncertainty, they facilitate better decision-making and aid in the prediction of specific patient outcomes. By allowing comparison of an individual ICU's overall performance to a significant representative database, prognostic scoring systems can facilitate quality assessment of an individual ICU.[4]The mortality and morbidity of patients can be predicted using a variety of scoring systems. Among the often utilized scores are Simplified Acute Physiology Score (SAPS) II and Acute Physiology and Chronic Health Evaluation (APACHE) IV.4 There haven't been many research comparing grading methods in Indian ICUs. Being a country with limited resources, it is crucial for us to understand how to employ those resources to produce positive results.[5,6] The present study comparedAPACHE IV and SAPS IIscoring in severe sepsis.

MATERIALS & METHODS

The present study comprised of65patients admitted to the ICU with severe sepsis and septic shockof both genders. The study was approved from ethical review committee.

Data such as name, age, gender etc. was recorded. Parameters such as temperature,pulse rate, blood pressure, respiratory rate, haematocrit, total leucocyte count, serum blood urea nitrogen (BUN), serum creatinine, serum sodium etc. was estimated. Scoring system used was APACHE IV and SAPS II. Both worst and best value in the first 24 h of admission to ICU was recorded for temperature, pulse rate, blood pressure, respiratory rate, haematocrit, total leucocyte count, serum blood urea nitrogen (BUN), serum creatinine and serum sodium.Single worst value in first 24 hours was collected for FiO2, PaO2, PCO2, pH, urine output, serum albumin, serum bilirubin and glasgowcoma scale, ICU admission, pre-ICU length of stay, emergency surgery in ICU, re admission to ICU, requirement of ventilatory support, thrombolytic

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therapy and primary admission diagnosis.Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 65		
Gender	**Males**	**Females**
Number	35	30

Table I shows that out of 65 patients, males were 35 and females were 30.

Table II Assessment of diagnosis

Diagnosis	Number	P value
Congestive cardiac failure	4	0.05
Rheumatic heart disease	2	
Tetanus	5	
Meningitis	3	
CNS sepsis	2	
Cirrhosis of liver	6	
Malignancy	4	
Pneumonia	18	
Tuberculosis	6	
COPD	8	
Restrictive lung disease	4	
ARDS	3	

Table II, graph I shows that diagnosiswas congestive cardiac failure in 4, rheumatic heart disease in 2, tetanus in 5, meningitis in 3, CNS sepsis in 2, cirrhosis of liver in 6, malignancy in 4, pneumonia in 18, tuberculosis in 6, COPD in 8, restrictive lung disease in 4 and ARDS in 3 patients. The difference was significant (P< 0.05).

Graph IAssessment of diagnosis

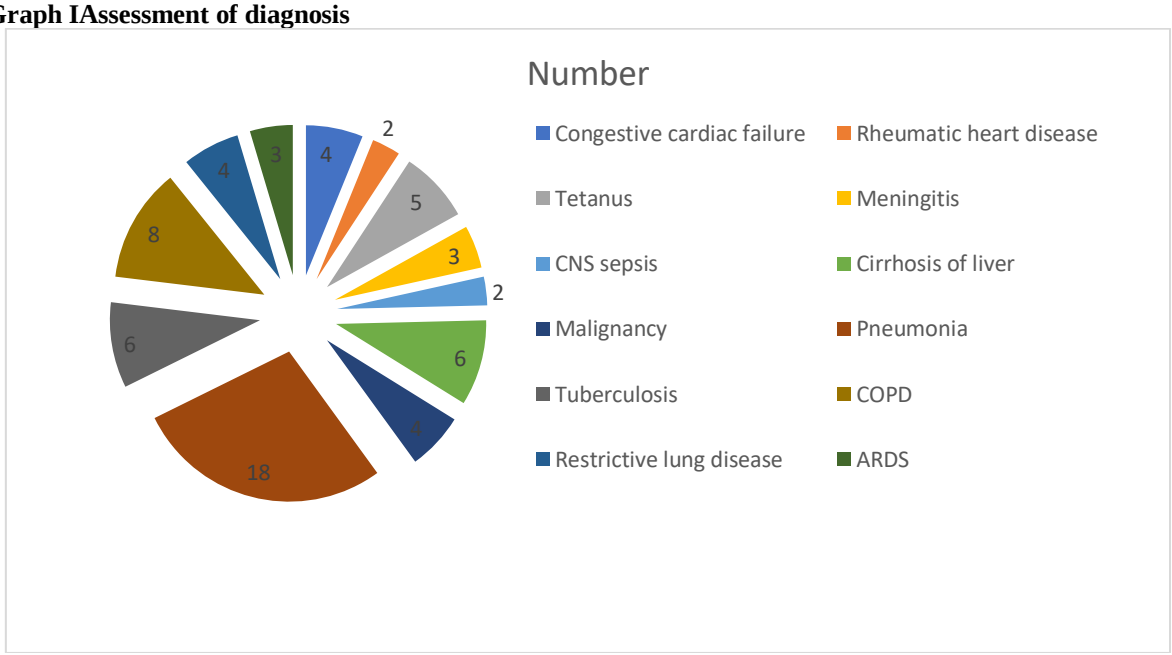

Table III Comparison ofmortality using APACHE IV & SAPS II

Variables	APCHE IV	SAPS II
Mean score	95.4	68.2
Predicted mortality rate %	38.2	75.6
Actual mortality rate %	62.5	61.5
Standardised mortality rate	1.44	0.76

Table III shows that mean APCHE IV score was 95.4 and SAPS II was 68.2, predicted mortality rate with APCHE IV was 38.2% and with SAPS II was 75.6, actual mortality rate was 62.5% with APACHE IV and 61.5% with SAPS II, standardised mortality rate was 1.44with APACHE IV and with SAPS II was 0.76.

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DISCUSSION

Sepsis is an infection-induced syndrome characterized by a number of symptoms and clinical signs including fever or hypothermia, leucocytosis or leucopenia, tachycardia and tachypnea. If organ-system failure is associated with the condition, sepsis is considered to be severe.[7]One of the main causes of death for patients admitted to the intensive care unit (ICU) is sepsis. One in four patients worldwide die from severe sepsis and septic shock, which are on the rise globally in terms of frequency.[8]An growth in the senior population, disease detection, the use of invasive procedures, immunosuppressive drugs, and chronic conditions including end-stage renal disease may all be contributing factors. It significantly affects the resources and cost of healthcare. Therefore, accurate categorization and assessment of the patient's risks, morbidity, and mortality become necessary.[9]The present study compared APACHE IV and SAPS II scoring in severe sepsis.

We found thatout of 65 patients, males were 35 and females were 30.Dhakshinamoorthy[10]compared the APACHE II and APACHE IV in predicting the mortality of patients in intensive care unit. There was no statistically significant difference in the estimated mortality rate of patients in ICU based on APACHE II and APACHE IV scoring system ($t= 1.674$) at $p<0.05$ level. There was a significant weak correlation between actual length of stay and estimated length of stay based on APACHE IV score ($r = 0.469$). Discrimination for APACHE II and APACHE IV models were good with area under the curve of 0.965 and 0.760 respectively. APACHE II was more accurate than APACEIV in this regard.

We observed that diagnosis was congestive cardiac failure in 4, rheumatic heart diseasein 2, tetanus in 5, meningitis in 3, CNS sepsis in 2, cirrhosis of liver in 6, malignancy in 4, pneumonia in 18, tuberculosis in 6, COPD in 8, restrictive lung disease in 4 and ARDS in 3 patients. In order to evaluate the reliability of mortality prediction methods for patients admitted to the ICU with severe sepsis and septic shock, Arabi et al[11] conducted a study in a tertiary care medical/surgical Intensive Care Unit in Saudi Arabia. The study took APACHE II and SAPS II scores into account. The standardized mortality ratio and predicted and actual mortality rates were computed. The study came to the conclusion that while overall ICU mortality system models were accurate at predicting mortality, they were poorly calibrated. However, SAPS II's modification led to better calibration. When assessing outcomes in sepsis patients, the customized model could be a useful tool.

We found that mean APCHE IV score was 95.4 and SAPS II was 68.2, predicted mortality rate with APCHE IV was 38.2% and with SAPS II was 75.6, actual mortality rate was 62.5% with APACHE IV and 61.5% with SAPS II, standardised mortality rate was 1.44 with APACHE IV and with SAPS II was 0.76.Singh et al[12]compared the predictability of outcome with APACHE III and SAPS II score in ICU patients of sepsis, severe sepsis, and septic shock and the 28-day mortality. The mean APACHE III score in the survivor group was 66.49 ± 18.56 as opposed to 80.67 ± 19.03 for non-survivors. The mean SAPS II score for the survivor group was 43.32 ± 13.02 as against the non-survivor group at 51.92 ± 12.34. The area under the ROC curve for APACHE III was 0.711 as against 0.686 for SAPS II. The best cutoff value obtained for mortality prediction using the ROC curve was 69 for APACHE III while that for SAPS II was 49.

CONCLUSION

Authors found that when comparing the mortality rates of individuals with severe sepsis, both methods APACHE IV and SAPS II were comparable.

REFERENCES

1. Lemeshow S, Le Gall Jr. Modelling the severity of illness of ICU patients. JAMA 1994;272:1049-55.
2. Angus DC, Linde-Zwirble WT, Lidicker J, Clermont G, Carcillo J, Pinsky MR. Epidemiology of severe sepsis in the United States: analysis of incidence, outcome and associated costs of care. Crit Care Med. 2001;29:1303-10.
3. Angus DC, Wax RS. Epidemiology of sepsis: an update. Crit Care Med. 2001;29 (Suppl 7):109-16.
4. Friedman G, Silva E, Vincent JL. Has the mortality of septic shock changed with time? Crit Care Med. 1998;26:2078-86.
5. Robert S Munford. Severe Sepsis and Septic Shock. In: Kasper DL, Eugene Braunwald, Fauci AS, Hauser SL, Longo DL, Jameson JL, editors. Harrison's Principles of Internal Medicine. 16th Ed. New York: McGraw-Hill; 2005. p.1606-12.
6. Goldhill DR, Sumner A. Outcome of intensive care patients in a group of British Intensive Care Units. Crit Care Med. 1998;26:1337-45.
7. Lemeshow S, Teres D, Klar J, Avrunin JS, Gehlbach SH, Rapoport J. Mortality Probability Models (MPM II) based on an international cohort of ICU patients. JAMA. 1993;270:2478-86.
8. Arabi Y, Haddad S, Goraj R, Al-Shimemeri A, Al-Malik S. Assessment of performance of four mortality prediction systems in a Saudi Arabian intensive care unit. Crit Care. 2002;6(2):166-74.
9. Moreno R, Morais P. Outcome prediction in intensive care: Results of a prospective, multicentre, Portuguese study. Intensive Care Med. 1997;23:177-86.
10. Dhakshinamoorthy S. Comparison of Apache IV Vs Apache II Scoring System in Predicting the Clinical Outcomes of patients in Intensive Care Unit. Asian Journal of Nursing Education and Research. 2022 May 4;12(2):170-2.
11. Arabi Y, Al-Shirawi N, Memish Z, Venkatesh S, Al-Shimemeri A. Assessment of six mortality prediction models in patients admitted with severe sepsis and septic shock to the intensive care unit: a prospective cohort study. Crit Care. 2003;7(5):116–22.
12. Singh P, Pathak S, Sharma RM. A comparison of acute physiology and chronic health evaluation III and simplified acute physiology score II in predicting sepsis outcome in Intensive Care Unit. Anesth Essays Res 2018;12:592-7.

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