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Original Research Article

Application of APACHE II scoring system in assessing prognosis of critically ill surgical and trauma patients

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ABSTRACT

Background: Surgical patients who become critically ill almost always fall in to one of the three categories: major trauma, major surgery or sepsis. In all three patient categories the patho-physiological processes that make patients ill and lead to cellular injury and organ dysfunction are essentially same, and therefore the way that patients need support of critical organ function are same. Surgical complications remain a frustrating and difficult aspect of operative treatment of patients, regardless of how technically gifted, skilled and capable surgeons. Various critical care and outcome scoring systems are used for outcome assessment of surgical patients. Using scores like APACHE II at the admission and SOFA on admission and also in their due course may help in predicting outcome.
Methods: This study included 50 patients studied for a patient for 1 year. The clinical profile of 50 patients with sepsis with MODS was studied. There were 28 males and 22 females in this cohort.
Results: In this study, 18 patients died, and 32 patients survived with mortality rate of 36%. In this study also, mean APACHE II score was high among non-survivors than survivors (27.67 v/s 16.00), which score was suggestive of statistical significance ($p<0.001$). The APACHE II score on day of admission, though reliable, was less effective in predicting the mortality rate in our set up.
Conclusions: The APACHE II score on day of admission, though reliable, was less effective than SOFA score in predicting the mortality rate

Keywords: APACHE II score, Critically ill, MODS, Sofa score, sepsis

INTRODUCTION

Surgical patients who become critically ill almost always fall in to one of the three categories: major trauma, major surgery or sepsis. Major trauma relates to significant injury of a single organ system or anatomical part, or multiple injuries, often of varying severity, of different body parts.[1] In all three patient categories the patho-physiological processes that make patients ill and lead to cellular injury and organ dysfunction are essentially same, and therefore the way that patients need support of critical organ function are same. Various clinical, biochemical and hematological parameters in these critically ill surgical patients serve as indicators of organ dysfunction and hence can be used to define the prognosis in a patient with sepsis. Patients admitted to the ICU need aggressive supportive management as well as detailed investigations to reverse the cause.[2] Early initiation of appropriate effective anti-microbial therapy is essential for a favorable outcome in the patient withsepsis.[4-6]

There is evidence that failure to initiate appropriate therapy correlates with increased morbidity and mortality. Cultures and serology are available only after 24 to 48 hours. In the crucial hours which determine the prognosis

of the patient the physician has to depend on clinical symptoms and demographic data to aid in diagnosis and management.[4]

One possible solution to this problem is the application of a good prognostic or predictive scoring system. Good prognosis can help predict outcome or progress in a patient. Scoring systems are composed of degrees of organ dysfunction, organ failure or multiple organ failures, and anatomical derangements which eventually contribute to morbidity and mortality. With the help of such evaluation system, we will be able to distribute the limited resources to more suitable patients. There are many scorings widely used in the field of critical care medicine. They allow a quantification of the severity of illness and a probability of in-hospital mortality. A well performing ICU prognostic model helps to make meaningful comparison of the hospital's current performance with the past. But the present study focuses on mainly Acute Physiology and Chronic Health Evaluation II (APACHE II) score. Present study mainly aims at assessing morbidity and mortality of patients with multi organ dysfunction syndrome in critically ill surgical and trauma patients and Prognosticating the patients by using defined scores like APACHE II score.

Aims and objectives of this study were to determine the validity of the Acute Physiology and Chronic Health Evaluation II (APACHE II) score in predicting mortality in critically ill surgical and trauma patients treated in ICU.

METHODS

This study was undertaken at MVJMC and RH, Bangalore after the approval from Ethics Committee. The study was carried out in the period of November 2016 to September 2017 and 50 patients were included in the study.

The patients who are critically ill including operated, non-operated and trauma cases admitted in ICU were included in the study. The detailed history, clinical examination and all the relevant laboratory investigations were done including blood culture. In the present study, the conditions were defined according to standard practice and based on relevant literature. All the surgical patients of who are critically ill admitted to ICU/ emergency ward are being prognosticated on the basis of APACHE II score

APACHE II is calculated on the day of admission. The predicted mortality rate was calculated on the basis of this score.

Inclusion criteria

- Informed written consent.
- Age between 15 to 70 years
- Patients with critical surgical problems that includes operative, non-operative, surgical sepsis and with severe trauma.

Exclusion Criteria

- Patients aged below 15 years and above 70 years
- Non-surgical patients, that is patients admitted in other departments
- Patients outside the ICU. Patients with stay less than 48 hours in ICU. Moribound and terminally ill patients with impending mortality within hours.

RESULTS

The study was carried out in the period of November 2016 to September 2017 and 50 patients were included in the study. In our study, subjects were in the age group of 15 to 70 years. In the present study, out of 50 cases of critically ill surgical patients, 28 were male and 22 were females. Co-morbidities observed were diabetes and hypertension.

Table 1: Age distribution of patients studied.

Age in years	No. of patients	%
15-20	2	4.0
21-30	8	16.0
31-40	8	16.0
41-50	9	18.0
51-60	10	20.0
61-70	13	26.0
Total	50	100.0

Mean±SD: 48.38±15.05

Highest numbers of cases were seen in the age group of 61 to 70 years (26% of patients) fallowed by age group of 51 to 60 years (20% of patients). Youngest patient in the study is 18 years old. Oldest patient is 70 years old. Around same percentage of patients were reported in age group of 21-30 and 31-40. 13 patients were noted in age group of 61-70 which amounted to 26 percent. The mean age was around 48 years.

Table 2: Gender distribution of patients studied.

Gender	Number of patients	%
Male	28	56.0
Female	22	44.0
Total	50	100.0

In the present study majority were males when compared to females.28 patients which is amounting to 56 percent were males and 44 percent contributed to females.

In the present study majority of patients were found to have hollow viscus perforation (18%), at the next being blunt trauma and diabetic foot with sepsis being 16%. There were same number of patients with obstructed umbilical hernia and acute pancreatitis which amounted

to 8 percent.6% of patients belonged to category of penetrating abdominal injury which amounted to 6 percent. 3 cases of superior mesenteric artery thrombosis were reported.

Table 3: Distribution of diagnosis of patients studied.

Diagnosis	No. of patients (n = 50)	%
Hollow viscous perforation	9	18.0
Appendicular abscess	3	6.0
Ileo caecal tuberculosis	5	10.0
Superior mesenteric artery thrombosis	3	6.0
Obstructed umbilical hernia	4	8.0
Acute pancreatitis	4	8.0
Ruptured liver abscess	3	6.0
Blunt trauma	8	16.0
Penetrating abdominal injury	3	6.0
Diabetic foot with sepsis	8	16.0

Twenty-seven patients in the study group amounting to 54 percent had no comorbidities. 46 percent had co morbidities. 16 patients had diabetes which amounted to 32 percent. 5 percent had hypertension which amount to 10%. 2 patients had both diabetes and hypertension. 60 percent of the patients amounting to 30 were operated and the rest were not operated.

Table 4: Distribution of unknown co-morbidities.

Comorbidities	Number of patients (n=50)	%
Nil	27	54.0
Present	23	46.0
Diabetes	16	32.0
Hypertension	05	10.0
Both Diabetes and Hypertension	2	4.0

Table 5: Distribution of operated and non-operated patients in study group.

Modality	No. of patients	Percentage
Operated	30	60.0
Non-operated	20	40.0

Out of 50 patients, 4 patients (8%) had hypothermia and 34 patients (68%) had hyperthermia. 41 patients (82%) had tachycardia and 49 patients (98%) had Mean arterial pressure less than 70 mm hg. Among patients studied, 47 patients (94%) had tachypnoea

Out of 50 patients studied, 24 patients (48%) had hemoglobin less than 10gm/dl and 20 patients (40%) had hematocrit less than 30. 45 patients (90%) had total leukocyte count of more than 11,000 and 21 patients (42%) had platelet count less than 1.5 lakh.

Table 6: Distribution of vital parameters.

Vital parameters	No. of patients (n = 50)	%
Temperature (ºC)		
< 36	4	8.0
36 -38	8	16.0
38-39	13	26.0
39-40	21	42.0
> 40	4	8.0
Pulse rate (bpm)		
<60	-	-
60-80	-	-
80-100	9	18.0
>100	41	82.0
Mean Arterial Pressure (mmHg)		
<70	49	98.0
>70	1	2.0
Respiratory rate (cpm)		
<20	3	6.0
20-40	47	94.0
>40	-	-

Table 7: Distribution of haematological parameters.

Haematological parameters	No. of patients (n=50)	%
Hemoglobin %		
< 10	24	48.0
10-12	9	18.0
>12	17	34.0
Haematocrit		
< 25	5	10.0
25-30	15	30.0
30-45	30	60.0
> 45	0	00.0
TLC (/mm^3)		
< 4000	0	00.0
4000-11000	5	10.0
>11000	45	90.0
Platelet count (L)		
<1.0	2	4.0
1.0-1.5	19	38.0
>1.5	29	58.0

Out of 50 patients studied, 45 patients (90%) had hyponatrimia. 43 patients (86%) of patients had hypokalemia and 4 patients (8%) had hypokalemia.

Out of 50 patients studied, 36 patients (72%) had pH acedaemia (blood pH less than 7.35). Out of 50 patients studied, 44 patients (88%) had deranged renal function on admission. Glosgow coma scale score was initially similar in both survivor and non-survivor group, but as day progressed, the GCS score among non-survivors declined significantly. High APACHE II score among

patients studied on admission to ICU, is significantly associated with high mortality rate (p<0.001**).

DISCUSSION

The clinical profile of 50 patients with critical surgical problems was studied. There were 28 males and 22 females in this cohort. The age of patients varied from 15 years to 70 years. The mean age was 48.38 years. Similar studies in India have shown male preponderance with most patients in the fourth to fifth decade. Even in the present study, most patients were in fourth to fifth decade Among patients studied highest number of cases seen were trauma patients (including blunt and penetrating injuries) fallowed by hollow viscous perforation and diabetic foot with sepsis. Out of 50 patients studied, 30 patients required surgical intervention. Co morbidities were present in 23 patients. Among the several organ disorders encountered, acute kidney injury (AKI) is one of the most important because it is a life-threatening condition, increases the complexity and cost of care, and is an independent risk factor for mortality.[7,8]

The mean APACHE II score on the day of admission was 20.20 suggesting there was significant organ dysfunction in all patients. The mortality recorded in this study is 36%. In large clinical trials, the mortality associated with severe sepsis and septic shock ranges between 13% and 50%. Studies have shown that the Glasgow coma scale at admission is an independent predictor of mortality.[9,10] In the present study, the mean GCS among survivors and non-survivors was statistically similar on day 1 (day 1, 14.06 versus 14.59, p = 0.710). However, GCS among non-survivors was significantly declined as day progressed.[11] In the present study, mean serum creatinine was significantly high in non-survivor group as compared to survivor group (day 1, 3.97 versus 2.57, p <0.001). Even mean serum bilirubin was significantly higher in non-survivor group as compared to survivor group (day 1, 3.49 versus 2.07 p <0.001), showing their significant association with mortality rate.

Many studies have shown that high APACHE II score at the time of admission was associated with high mortality.[8] Even in this study, mean APACHE II score was high among non-survivors than survivors (27.67 versus 16.00), suggestive of statistical significance (p <0.001). With a sample size of 50 patients this model requires external validation. The time of admission to ICU for each patient is different. Lead time bias is possible. Nosocomial complications and socio-economic constraints are difficult to model in studies. History of prior antibiotic usage could not be ascertained by history.

CONCLUSION

The APACHE II score on day of admission, though reliable, was less effective than SOFA score in predicting the mortality rate.

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