

Original Research Article

Prospective study using Apache II scoring to predict the outcomes of patients undergoing emergency gastrointestinal procedure

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ABSTRACT

Background: Many scoring systems have been used to assess the morbidity and mortality of patients presenting with acute abdomen, of which Apache II (acute physiology and chronic health evaluation) score has been accepted widely. This study predicted the effectiveness of Apache II scoring system as a potential clinical and research tool which could be included as routine part of patient assessment to predict the morbidity and mortality in patients undergoing emergency gastrointestinal procedures.

Methods: This study was conducted in the surgical intensive care unit of our tertiary care hospital. It was a prospective observational study done over a period of one year where we assessed the efficacy of Apache II score in eighty two patients.

Results: The Apache II scores were divided into three categories, 0-15 low risk group, 16-30 moderate risk group and 31-45 high risk group. There were 25 patients in the low risk group with all being satisfactorily discharged. With 44 patients in the moderate risk group 13 expired (29.54% mortality) and out of 13 patients in the high risk group 11 patients died (84.61% mortality).

Conclusions: In the present study the APACHE II scores have correlated well with the outcomes and ICU stay of the patient groups.

Keywords: Apache II score, Acute abdomen, ICU, Perforation peritonitis

INTRODUCTION

Acute abdomen is defined as sudden onset abdominal pain regardless of the cause. Not all acute abdomens require surgery but most surgical abdomens are most likely acute abdomens. If a patient presents with sudden onset of abdominal pain and on clinical examination peritoneal signs like rebound/guarding are present, surgical exploration is required without further workup.

Usually four types of etiologies are encountered in an emergency department. They are perforation, ischaemia, bleeding and small bowel obstruction (SBO). Perforation

and SBO are the commonest diagnoses. For patients with perforation an X-ray shows air under the diaphragm (not suggestive of pathology) and in SBO an AXR (abdominal X-ray) shows multiple air fluid levels and history of previous surgery. While if there is suspicion of ischaemia, an X-ray shows thumb printing and pneumatosis.

Peritonitis is the inflammation of the parietal and the serosal layer of the peritoneum. It can be either primary, secondary or tertiary. Secondary peritonitis is due to any bowel or visceral pathology like perforation,

appendicitis,. In some cases it was found that induced abortion lead to peritonitis.

Primary peritonitis is an infection usually due to monomicrobial pathology from an extra-peritoneal source which usually does not have any visceral perforation. Whereas secondary peritonitis typically arises from perforation of hollow viscera (infections like typhoid or non-infectious causes like duodenal ulcer perforation, blunt trauma of abdomen). It follows an intra-peritoneal source and is the most common type seen. In cases wherein there is a delay in initiating treatment or the treatment turns out to be unsuccessful it may progress to tertiary peritonitis. This stage is potentially fatal despite all the advances available today in diagnosing a patient to the various types of modern surgical techniques.¹

These conditions are potentially fatal and are surgical emergencies. They have high risk of mortality and morbidity. Apache II scoring helps the attending physician to chalk out a proper treatment plan in view of the specific needs of such patients. The risk assessment plays a pivotal role to understand the condition and prognosis.

Various scoring systems are used to assess the severity of critically ill patients to help clinicians take economically feasible and distinctive treatment measures best suited for individual patient profiles.⁷ Amongst many severity assessing scoring systems, Apache II is one the most widely used scoring scale for both surgical and non-surgical cases. It helps to predict the outcome in patients undergoing emergency gastrointestinal procedures in the form of delayed recovery from anaesthesia, requirement of ventilator support, abdominal septicemia, haemorrhagic or septic shock and thus acts as an important clinical tool.

The use of Apache II severity grading has immensely helped in making better patient suited and outcome oriented assessments which has positively affected the final results.² The ability to objectively estimate patients risk for mortality or other significant outcomes, accounts to an important part of managing severely ill patients.³ The risk assessment by important clinical parameters used in Apache II scale have been useful in weighing new treatment modalities, proper allocation of resources with optimum utilization which resulted in the overall improvement of the quality of care provided.^{4,5} This study aimed at assessing the usefulness of Apache II scoring system as a potential clinical and research tool which could be included as a routine part of patient assessment in an institution like ours.

METHODS

The prospective and observational study titled prospective study using Apache II scoring to predict the outcomes of patients undergoing emergency gastrointestinal procedures was conducted at Indira

Gandhi government medical college and Mayo hospital from January 2019 to December 2019. Eighty two patients underwent emergency gastrointestinal procedures whose outcomes were assessed by daily Apache II scoring system. The acute physiological parameters of Apache II score were assessed and recorded pre and postoperatively till discharge. Morbidity and mortality was assessed using Apache II score.

Inclusion criteria

All patients of age group 10 years to 75 years undergoing emergency gastrointestinal procedures were included in the study.

Exclusion criteria

Pregnancy, patients of age less than 10 years and more than 75 years were excluded from the study.

During the period of study, all the patients presenting to the emergency department satisfying the above criteria were included. Exploratory data analysis was done to identify initial trend using graphical method and tabulations.

All the patients presenting to the emergency department were clinically assessed and following findings were seen: sudden onset of severe abdominal pain, nausea, vomiting, diffused tenderness, rebound tenderness, guarding, rigidity, dull flanks on percussion, distension with silent abdomen, tachycardia, tachypnea, eventually leading to Hippocrates facies, septicemia, shock and loss of consciousness.²

Hematological and radiological investigations done preoperatively were CBC, WBC, hematocrit, serum creatinine, serum sodium, serum potassium, ABG, plain X-ray abdomen (erect and supine view), USG abdomen, CT abdomen (if necessary).

They were classified preoperatively by ASA-PS criteria.

Patients were categorized in 3 categories according to their scores.

Post operatively patients were shifted to the surgical intensive care unit. A drain was in place which was removed after less than fifty ccs output was observed for three consecutive days. Initially the patients were started on broad spectrum antibiotics and their vitals were closely monitored. Those patients without a drain with high WBC counts were further worked up with endotracheal tube and catheter swabs for routine microscopy and culture sensitivity and antibiotics were changed accordingly. Further in the postoperative duration complications like anastomotic leak, pneumonia, pleural effusion, electrolyte imbalance, septic shock, multi organ failure were assessed and treated accordingly.⁶

RESULTS

All the Apache scoring parameters were recorded every day for each patient and statistical analysis was done accordingly.

To summarize the data, descriptive statistics was performed and it was statistically analyzed by inferential statistics using paired t test. Multiple variables were studied and the final conclusion was derived accordingly.

Demographics

All patients of the age group 10-75 years undergoing emergency gastrointestinal procedures were included in this study with the youngest patient of age 16 years and oldest of 75 years. Male preponderance was found with male to female ratio of 5.3:1. Sharma et al, Huttunen et al and Ahuja et al in their study also reported male preponderance in cases with perforation peritonitis.⁶⁻⁸

Apache II score evaluation

All the patients in the study were divided into three groups according to their Apache scores.

The maximum number of patients (44) were seen in the 16-30 Apache group with 70.45% survival rate in that group. The minimum number of patients (13) were seen in the high risk Apache group (31-45) with maximum mortality of 84.61%.

In our study air under diaphragm was noted in 86% of the study population. Correspondingly, in a study published by Jhobta er al and Attri et al showed 67% of such cases.¹² Similar results were observed by Shahida et al and Malik et al where the incidence was 70% and in a related study done by Ahuja et al 84% of such cases were found.^{6,13}

Table 1: Demographic analysis.

Age (in years)	Male		Female	
	Survivors	Non-survivors	Survivors	Non-survivors
15-35	16	2	0	0
36-55	20	10	5	1
56-75	12	9	5	2
Total	48	21	10	3

Table 2: Distribution of subjects according to Apache II score.

Apache II score	No. of patients	Percentage	No. of survivor	Survivor (%)	No. of non-survivor	Non-survivor (%)
0-15	25	30.49	25	30.49	0	0
16-30	44	53.66	31	37.8	13	15.85
31-45	13	15.85	2	2.44	11	13.41
Total	82	100	58	70.73	24	29.27

Table 3: Distribution of subjects according to duration of illness.

Duration in days	No. of patients	Percentage (%)
1-3	26	31.71
4-6	26	31.71
≥7	30	36.59

Table 4: ICU stay in relation to Apache II score.

Apache score	ICU days		Survivors total ICU days	ICU days		Non-survivors total ICU days
	Male survivor	Female survivor		Male non-survivor	Female non-survivor	
Total	128	15	143	0	0	0
16-30	161	20	181	100	0	100
31-45	5	8	13	29	23	52
Total	294	43	337	129	23	152

Table 5: Mean ICU stay in relation to Apache II score.

Apache score	Total patients	ICU days		Survivors mean ICU days	ICU days		Non-survivors mean ICU days
		Male survivors	Female survivors		Male non-survivors	Female non-survivors	
0-15	25	5.82	5	5.72	0	0	0
16-30	44	6.44	3.33	5.84	7.69	0	7.69
31-45	13	5	8	6.5	3.63	7.67	4.73
Total	82	17.26	16.33	5.81	11.32	7.67	6.33

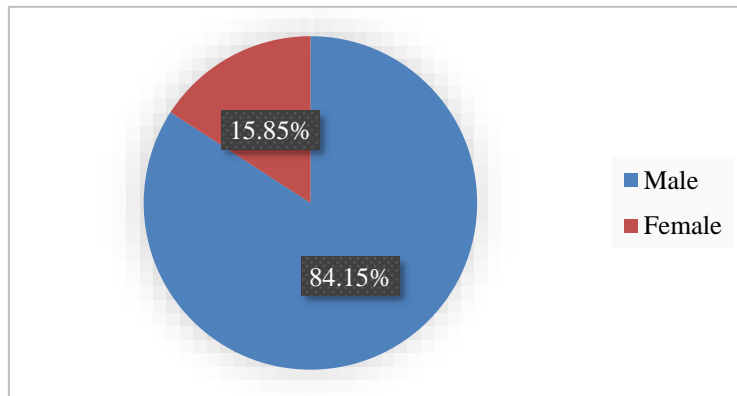


Figure 1: Gender distribution.

Correlation with ICU stay

The mean ICU stay for 0-15, 16-30 and 31-45 Apache score groups were 5.72 days, 6.39 days and 5 days respectively. When the mean ICU stay for survivors of the three Apache groups was calculated it came out to be 5.72, 5.84 and 6.5 days respectively.

In our study, all the patients in the low risk group of Apache scores 0-15 were satisfactorily discharged. Whereas in the high risk group of Apache scores 31-45, a 13.41% out of total of 29.27% mortality was observed. Similar results were reported in a study conducted by Bohnen et al, Adesunkanni et al and Agarwal et al where the mean Apache II score among survivors was 8 (low risk group) and among non-survivors was 22.4 (high risk group). Thus proving that mortality is directly associated with higher scores.^{10,11}

DISCUSSION

After a meticulous evaluation of 82 patients of perforation peritonitis undergoing emergency GIT procedures we have drawn the following conclusions.

Apache II score and outcome in relation to age

In our study there were 18 patients in the 15-35 years group, 36 patients in 36-55 years group and 28 patients in the older age group of 56-75 years. In the first group of 15-35 years, out of the total 18 patients 16 survived

whereas in both the remaining two groups 11 patients died of 36 and 28 total patients respectively. Correlation analysis between age and Apache II scores proved that as the age increased the probability of getting a higher Apache II score also increased. Whereas correlation between age and outcome proved that as the age increased the probability of survival decreased.

Apache II score and outcome in relation to ICU days

The mean ICU stay in days for the three APACHE score range groups (0-15, 16-30, 31-45) were 5.72 days, 5.84 days and 6.50 days for all the survivors of these groups respectively. Bohnen et al reported the mean duration of hospital stay in survivors (5.81 days) in comparison with non survivors (18 days) after receiving appropriate treatment.¹¹ Correlation analysis between ICU days and Apache II score was found to be weakly negative. Similarly, correlation between ICU days and outcome was also found to be weakly negative (-0.05).

Apache II score in relation to outcome

In current study low risk group (0-15 Apache II scores) of 30.49% patients, all were discharged satisfactorily. Whereas in the moderate risk group (16-30) of 53.66% patients there was a 15.85% mortality. In the high risk group (31-45) comprising of 15.85% patients there was an expected 13.41% mortality. Thus conclusive of the fact that mortality was directly linked with higher scores.^{6,10,11} In a study of colonic perforation done by

Kamatsu et al Apache II score of 19 or greater was considerably related to poor prognosis as seen in present study. In another study done by Agarwal et al similar findings were noted where high risk Apache II group (>11) was correlated to mortality.¹⁴ Correlation study between Apache II scores and outcome were strongly positive (0.77) proving that when Apache II score increased the probability of survival decreased.

Limitations

Any prognostic scoring systems did not reflect the dynamic changes that occurred during the patient's stay in ICU. Although Apache II score was based on objective data, derivation of risk of death was based on a subjective choice of a single specific diagnostic category or major organ system as the primary cause of ICU admission. The correct choice can be difficult to make, especially among patients with multiple organ system failure and high mortality rates, the group of patients in whom a correct prediction was very important. An incorrect choice can lead to wrong computation of risk of death and hence a wrong prediction. This study being done in a tertiary referral center and government medical college, the surgical, anaesthesia and intensive care team members kept on changing. Therefore, personal bias cannot be ruled out completely.

CONCLUSION

After detailed analysis of Apache II scores of 82 patients, this study confirms the resoluteness of Apache II score in predicting the morbidity and mortality of perforation peritonitis patients undergoing emergency GIT procedures. Perforation peritonitis is a critical and life threatening condition requiring a prompt diagnosis and suitable management to reduce complications and to attain a better outcome. The use of various medical investigations, surgical procedures and ICU resources should be carefully considered in the management of these patients. Apache II scoring of such patients provides an easier way to choose, plan and execute the suitable treatment procedures for a better outcome in these patients. Therefore Apache II scoring can be used as a vital tool by the clinicians to treat perforation peritonitis patients in an economically viable, feasible and outcome oriented manner.

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