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Original Research Article

A prospective study of prediction of outcomes in perforative peritonitis using apache II scoring system

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ABSTRACT

Background: To predict the risk of mortality and morbidity in patients with perforative peritonitis using APACHE II scoring system. To evaluate the usefulness of APACHE II scoring system as a potential clinical and research tool which could be included as routine part of patient assessment in institution like ours.
Methods: This was a prospective, observational study of prediction of outcomes in 80 patients of perforative peritonitis using APACHE II scoring system, conducted during the period of 2 years at our tertiary care institute.
Results: Predicted death rate of the study was 17.31% and observed death rate was 25%. However, when observed and predicted death rates were compared in group of patients with APACHE II score of <10, it was over estimating the mortality. In group of patients with APACHE II score 11-20 and >20 it was underestimating the mortality. About 71.2% patients came under APACHE II score <10 with mortality of 3.5%. 23.7% came under group of patients with APACHE II score of 11-20 with mortality of 73.6% and only 5% patients had score >20 with 100% mortality were seen amongst them.
Conclusions: In the present study, APACHE II scoring system was found to be accurate predictor of group outcome and can be effectively used in prediction of group outcome in similar population, but does not give sufficient confidence for outcome in an individual patient.

Keywords: APACHE scoring, Perforation, Peritonitis

INTRODUCTION

Perforation of gastro-intestinal tract causes the contents of gastrointestinal tract (GIT) to leak into abdominal cavity, causing peritonitis –collectively called as perforative peritonitis. About 80% of the cases of secondary peritonitis in large hospitals are due to perforative peritonitis.[1] These patients are among the most complex cases encountered in surgical practice.[2] This may be due to persistence of the various risk factors among the general population like *H. pylori* infection, abuse of non-steroidal anti-inflammatory drugs (NSAID), endemicity of enteric fever, worm infestation, and several other illnesses like appendicitis, tuberculosis, GIT malignancies, Crohn's disease, diverticulitis, ulcerative colitis, peptic ulcer disease, gallbladder (GB) disease etc. The usual presentation of patients with perforative peritonitis includes severe abdominal pain, chills, fever, nausea, vomiting, abdominal distension with abdominal tenderness and guarding etc. Most of the times, this condition needs an emergency surgical intervention. One of the reasons for high mortality is that peritonitis due to

perforation of GIT causes profound sepsis and affects the general condition and leads to systemic inflammatory response which may lead to multiple organ failure (MOF). Early prognostic evaluation of patients with peritonitis is desirable to select high-risk patients for intensive management and also to provide a reliable objective classification of severity and operative risk. Thus, any study of the factors affecting mortality in perforation requires not only measurement of individual clinical and laboratory data but also evaluation of disease severity from a systemic perspective.

Most studies have shown that among scoring systems based on physiological parameters, the most reliable system is APACHE II (Acute Physiological and Chronic Health Evaluation) score.[3,4] APACHE II is extremely flexible, with good prediction and without significant difference between elective and urgent surgery.

The anatomical origin of infection and degree of local infection do not affect prognosis, but severity of disease measured by APACHE II scoring system does.[5] Severity of the disease and organ failure, not recurrent peritoneal infection, is the main reason for negative outcome in patients with peritonitis.[6] APACHE II is made for assessment of severity of patients and assesses general consequences of disease, respecting the age and previous medical conditions. This study aims to predict the outcomes in perforative peritonitis using APACHE II scoring system in our institution.

METHODS

This was a prospective, observational study of predictions of outcomes in 80 patients of perforative peritonitis using APACHE II scoring system, conducted during the period of 2 years in a tertiary health care institute.

Inclusion criteria

- Patients of age 13 years or above of either gender
- Patients diagnosed to have non-traumatic perforative peritonitis.

Exclusion criteria

- Under 13 years of age
- Pregnancy
- Patients with blunt and penetrating abdominal injury
- Post-operative peritonitis due to anastomotic leak

In this present study of 80 patients of perforative peritonitis we stratified them into 3 groups based on Apache II score.

APACHE < 10

This group consist patients of perforative peritonitis with APACHE II Score less than 10. Total numbers of patient in this group were 57. Mean APACHE II Score was 5.56. For this group observed mortality rate was 3.50% and predicted death rate was 11.48. Observed mortality rate was lower than the predicted death rate. APACHE II scoring system was under estimating the mortality risk in this group of patients.

APACHE 10-20

This group consist patients of perforative peritonitis with APACHE II Score between 10 and 20. Total numbers of patient in this group were 19. Mean APACHE II Score was 15. For this group observed mortality rate was 73.6 and predicted death rate was 33%. Observed mortality rate was higher than the predicted death rate. APACHE II scoring system was over estimating the mortality risk in this group of patients.

APACHE >20

This group consist patients of perforative peritonitis with APACHE II Score more than 20. Total numbers of patient in this group were 04. Mean APACHE II Score was 23. For this group observed mortality rate was 100% and predicted death rate was 73%. Observed mortality rate was higher than the predicted death rate. APACHE II scoring system was over estimating the mortality risk in this group of patients.

RESULTS

The results show that males were more commonly affected than females.

Table 1: Age and sex wise distribution of patients in study design.

Age (years)		Sex		Total
		Female	Male	
Upto 20 years	Count	5	5	10
	Percent	50.0%	50.0%	100.0%
21 to 30 years	Count	7	12	19
	Percent	36.8%	63.2%	100.0%
31 to 40 years	Count	10	11	21
	Percent	47.6%	52.4%	100.0%
41 to 50 years	Count	1	12	13
	Percent	7.7%	92.3%	100.0%
51 to 60 years	Count	1	7	8
	Percent	12.5%	87.5%	100.0%
Above 60 years	Count	5	4	9
	Percent	55.6%	44.4%	100.0%
Total	Count	29	51	80
	Percent	36.3%	63.8%	100.0%

Duodenal perforation was the most common etiology for perforative peritonitis followed by ileal, jejunal and gastric. Acid peptic disease remained the most common underlying pathology for perforative peritonitis. Postoperative complications were higher in patients with

higher APACHE II score. APACHE II score >12 was a cutoff score for the study. Risk of mortality was higher in patients with score >12 and mortality risk was lower in patients with score <12.

Table 2: Observed and predicted death and mortality in study design.

APACHE II Score	Total number of patients	Mean APACHE II Score	Observed death (mortality %)	Predicted death (mortality %)
<10	57 (71.2%)	5.56	02 (3.50%)	11.48%
11-20	19 (23.7%)	15.10	14 (73.6%)	33%
>20	04 (5%)	23.00	4 (100%)	73%
0-26 (overall)	80	8.712	20 (25%)	17.31%

Table 3: comparison of study outcomes with study variables.

Variabes	Discharged	Death	Total
Mean apache 2 score	6.1	16.5	8.71
Mean age	35.5 years	47.7 years	38.6 years
Male:female ratio	4:1	3:7	1.75:1
Mean hospital stay	8.9 days	6.9 days	8.4 days
Mean duration of presentation	2.6 days	3.8 days	2.9 days

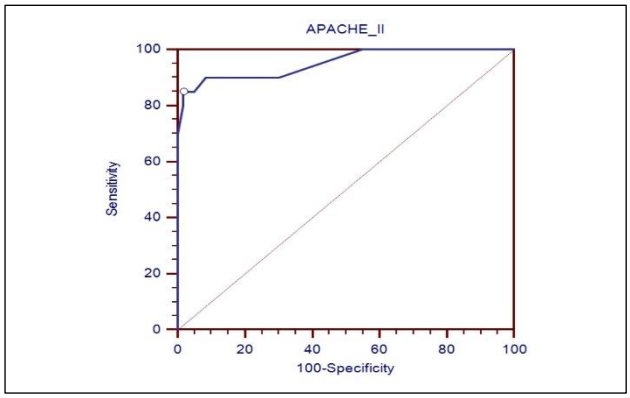
Both observed and predicted death rate increases with increase in APACHE II score but predicted death rate did not match with observed death rate for a given APACHE II score. There was overestimation of mortality in group of patients with APACHE II <10, and underestimation of mortality in a group of patients with APACHE II score 11-20 and >20.

Table 4: Association of APACHE II score and mortality in study design.

APACHE II score		Outcome		Total
		Death	Discharged	
Up to 5	Count	0	27	27
	Percent	0.0%	45.0%	33.8%
6 to 10	Count	2	28	30
	Percent	10.0%	46.7%	37.5%
11 to 15	Count	6	5	11
	Percent	30.0%	8.3%	13.8%
16 to 20	Count	8	0	8
	Percent	40.0%	0.0%	10.0%
Above 20	Count	4	0	4
	Percent	20.0%	0.0%	5.0%
Total	Count	20	60	80
	Percent	100.0%	100.0%	100.0%

On the basis of APACHE II scoring system, study population can be divided into various risk groups. This division can be beneficial in predicting the outcome in terms of morbidity and mortality and can help to plan the treatment accordingly.

Figure 1: Receiver operating characteristic curve.



Area under the ROC curve (AUC): 0.953
Standard error[a]: 0.0299
95% confidence interval[b]: 0.880 to 0.987,
z statistic: 15.143
Significance level P (area=0.5): <0.0001

DISCUSSION

Various scoring systems had been used to assess the prognosis and outcome of patients of peritonitis like the Acute Physiological and Chronic Health Evaluation score (APACHE II), the Mannheim Peritonitis Index (MPI), the Peritonitis Index Altona (PIA), the Sepsis Score, and the Physiological and Operative Severity Score for Enumeration of Mortality and Morbidity (POSSUM) etc.

Of the several scoring systems available for the estimation of severity of the disease and prognosis in ICU, especially in peritonitis patients, most studies had shown that amongst the scoring systems based on physiological parameters, the most reliable system was APACHE II score.[3,4] APACHE II is extremely flexible, with good prediction and without significant difference between elective and urgent surgery, in benign and malignant diseases, or in prediction of complications.[4] APACHE II reliably assesses mortality in the group of

surgical patients with systemic disarrangement, such as peritonitis.[7]

Perforative peritonitis is a frequently encountered surgical emergency in tropical countries like India, most commonly affecting young men in the prime of life as compared to the studies in the west.[8] Despite newer surgical techniques and intensive care treatment peritonitis remains the surgical emergency for all the surgeons. Various factors like age, sex, duration, site of perforation, extent of peritonitis and delay in surgical intervention are associated with morbidity and mortality. A successful outcome in patients of perforative peritonitis depends upon prompt diagnosis, early surgical intervention, source control and intraoperative peritoneal lavage.

In this study, 80 patients of perforative peritonitis were included ranging from 14 to 80 years of age with median age of presentation was 35 years. Male predominance was seen. Most patients (60%) had duodenal perforation as the underlying etiology of perforative peritonitis and acid peptic disease as the most common pathology. Complications were more in those patients with higher APACHE II score. 81% of patients who suffered with systemic complication had APACHE II score more than 11 and 64% of patients who suffered with local complication had their APACHE II score more than 9.

Majority of patients (78%) presented after 24 hours of the onset of symptoms and mortality (85%) was higher in them. Overall observed mortality of the present study was 25% with predicted mortality was 17.31%. In this study of 80 patients of perforative peritonitis 27 (33.8%) of patients had APACHE II Score below 5, 30 (37.5%) patients have score between 6 to 10, 11 (13.8%) patients with score between 11 to 15 and 12 (15%) patients had their APACHE II Score more than 16. Amongst all these 80 patients of perforative peritonitis no death was observed in patients whose APACHE II Score were less than 5 and 90% death were seen in patients whose APACHE II Score were more than 10. 100% mortality was observed in a group of patients with APACHE II Score 16 to 20 and above 20. Comparison were made between patients who were either discharged or dead with respect to study variable age, sex, hospital stay, duration of presentation and APACHE II Score in. Mean APACHE II Score was very higher in patients who died of perforative peritonitis as compared to those patients who survived.

Mortality rate of present study could not be compared with other studies mentioned above because other studies have higher mean APACHE II score as compared to our study. This observation may be attributed to inclusion of both medical and surgical patients in these studies as medical patients had higher APACHE II score when compared to surgical patients and our study included only surgical patients. In Samir et al study APACHE II score was found to be ranging from 0 to 38, with the average of 25 points.[7] No patients with a score higher than 28 survived. In other studies, different values of scores were reported for the dead patients. Chen et al, in their study cited that patients with a score higher than 40 did not survive and Edwards et al. cited the score value of 22, so that value can be used as an additional criterion for clinical decision not to operate.[9,10]

However, there were opposite opinions that this scoring system can be used in retrospective studies, but that it should not be used in a triage process or as a predictor of the outcome in individual patients. The triage decision should be based on clinical estimation.[11] Mannheim peritonitis index (MPI) is based on intraoperative data and it has been developed specifically for abdominal infection.[12] Although there were opinions that combination of APACHE II and MPI should be a standard classification system for grading severity of peritonitis and intra-abdominal sepsis.[13] Samir et al showed that MPI had no predictive power, while APACHE II does.[9] Organ failure is associated with prolonged stay and higher costs.[14] APACHE II system was accurate enough to predict the outcome which is accessed by ROC curve and its test of significance. Total area under this ROC curve was 0.93. Apache II score >12 had maximum sensitivity and specificity with positive and negative likelihood ratio of 51 and 0.15 respectively. Some other studies included both surgical and medical patient, area under ROC curve was 0.86 in Canadian studies, 0.83 in UK studies and 0.89 in Hong Kong studies.[15-17]

In the present study APACHE II score found to be a good predictor of a group outcome in patients of perforative peritonitis and can be effectively used in assessment of outcome in similar type population. However, it does not provide enough confidence to predict the outcome in individual patient of perforative peritonitis.

CONCLUSION

In the present study, APACHE II scoring system was found to be accurate predictor of group outcome and can be effectively used in prediction of group outcome in similar population, but does not give sufficient confidence for outcome in an individual patient. More studies need to be carried out with larger number of patients to evaluate APACHE II scoring system for the prediction of outcomes in patients of perforative peritonitis or critically ill patients.

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