Original Research Article

Association of Clinical Outcome and APACHE II Score in Secondary Peritonitis (A Study of 50 Cases)

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ABSTRACT

Secondary peritonitis remains a very critical life-threatening condition which is a common surgical emergency. Prognosis of patient is to very extent determined by health status of patient prior to hospitalization. Knowledge of prognosis of patient and outcome of disease is desirable as high-risk patient will need timely and aggressive treatment. Several scoring systems are there to predict the outcome of secondary peritonitis. APACHE-II score is an easy and reliable method to predict the outcome in cases of secondary peritonitis. It assesses acute physiological status as well as chronic health condition of patient. It uses 12 variables including age to assess acute physiology. We studied 50 patients of secondary peritonitis, calculated APACHE-II score at admission and then correlated it with outcome of disease. APACHE-II ranged from 0 to 29. Score was found to be remarkably significant in predicting mortality of patients and it also predicted morbidity well.

Key words: APACHE-II score, Secondary peritonitis, Perforation peritonitis.

INTRODUCTION

Peritonitis is inflammation of the peritoneum and is most commonly due to a localized or generalized infection. [1] Generalized peritonitis remains a severe condition. At present mortality is reported to be between 13-43%. The prognosis and outcome of peritonitis depend on the complex interaction of many factors: patient related, disease related and intervention related. The chronic health status has also been noted to influence the outcome. [2] Secondary peritonitis follows an intraperitoneal source usually from the perforation of a hollow viscus. [3]

Despite advances in diagnosis, surgical technique, antimicrobial therapy and intensive care support, secondary peritonitis remains a potentially fatal affliction. Prognosis in peritonitis is decisively influenced by the health status of the patients at beginning of treatment, accurate prediction of the outcome of the disease can initially be made on the basis of the prognostic scoring systems, currently several scoring systems are employed. [1]

In 1981, Knauss et al. developed the Acute Physiology and Chronic Health Evaluation Score (APACHE) based on 34 individual variables, a chronic health evaluation, and the two combined to produce the severity. Despite its good correlation with mortality APACHE score received criticism due to large no. of (34) variables.

APACHE II was later developed as a simplified clinically useful system which included a reduction in the number of variables to 12 by eliminating infrequently measured variables. Weighting of other

variables were altered; most notably, the weightings for Glasgow Coma Score and acute renal failure were increased. Each variable is weighted from 0 to 4, with higher scores denoting an increasing deviation from normal. If variable has not been measured, it is assigned zero points. The APACHE II is measured during the first 24 hour of admission.. The maximum score is 71. Patients having higher APACHE II scores had higher incidences of postoperative complication.

This study shows the ability of APACHE II score to predict the mortality and morbidity rate in secondary peritonitis patients.

AIM AND OBJECTIVES OF STUDY:

This study was carried out with AIM of comparing the outcome of secondary peritonitis using APACHE II score and to find association in them.

Objectives of study being-
1. To find out the clinical outcomes of secondary peritonitis.
2. To determine the association of APACHE II score and clinical outcome in secondary peritonitis.

MATERIALS AND METHODS

This study is hospital based validational type of observational study which included 50 diagnosed case of secondary peritonitis admitted in SMS medical college and attached group of hospitals during the period from May 2014 to November 2015. Cases of blunt/penetrating trauma abdomen with any other associated injuries which can affect the APACHE II score were excluded from study.

APACHE-II was calculated according to Knauss et al. and patients were followed till their discharge.

APACHE-II score comprised of three components:
- Age
- Acute Physiology Score
- Chronic Health Evaluation

Points for Age vary from 0 to 6.

Age (yrs.)	Points
<44	0
45-54	+2
55-64	+3
65-74	+5
>75	+6

The Acute Physiology Score consists of 12 variables assigned 0 to 4 points depending on degree of abnormality.

PHYSIOLOGIC VARIABLE	HIGH ABNORMAL RANGE					LOW ABNORMAL RANGE			
	+4	+3	+2	+1	0	+1	+2	+3	+4
Temperature rectal (ºC)	>=41	39-40.9		38.5-38.9	36.0-38.4	34-35.9	32-33.9	30-31.9	<=29.9
Mean arterial pressure = (2 x diastolic+systolic)/3	>=160	130-159	110-129		70-109		50-69		<=49
Heart rate (ventricular response)	>=180	140-179	110-139		70-109		55-69	40-54	<=39
Respiratory rate (non-ventilated or ventilated)	>=50	35-49		25-34	12-24	10-11	6-9		<5
Oxygenation PaO2(mmHg)	>=500	350-499	200-349		<200				
PaO2					>70	61-70		55-60	<55
Arterial pH	>=7.7	7.6-7.69		7.5-7.59	7.33-7.49		7.25-7.32	7.15-7.24	<7.15
Serum Sodium	>=180	160-179	155-159	150-154	130-149		120-129	111-119	<=110
Serum Potassium	>=7	6-6.9		5.5-5.9	3.5-5.4	3-3.4	2.5-2.9		<2.5
Serum Creatinine (mg/dl) Double point for ARF	>=3.5	2-3.4	1.5-1.9		0.6-1.4		<0.6		
Hematocrit (%)	>=60		50-59.9	46-49.9	30-45.9		20-29.9		<20
TLC	>=40		20-39.9	15-19.9	3-14.9		1-2.9		<1
Glasgow coma scale (Score = 15 minus actual GCS)	15-GCS=								
Total Acute Physiology Score (APS)	Sum of the 12 individual variable points =								
Serum HCO3(venous-mMol/L) Not preferred, use if no ABGs	<52	41-51.9		32-40.9	22-31.9		18-21.9	15-17.9	<15

And if patient had chronic organ insufficiency we added 5 points if the patient had emergency surgery and 2 points if the surgery was elective.

The following defines "**chronic organ insufficiency**" and immunocompromised status:

Liver insufficiency:
- Biopsy proven cirrhosis.
- Documented portal hypertension.
- Episodes of past upper GI bleeding attributed to portal hypertension.
- Prior episodes of hepatic failure / encephalopathy / coma.

Cardiovascular:
- New York Heart Association Class IV Heart Failure.

Respiratory:
- Chronic restrictive, obstructive or vascular disease resulting in severe exercise restriction, i.e. unable to climb stairs or perform household duties.
- Documented chronic hypoxia, hypercapnia, secondary polycythemia, severe pulmonary hypertension (>40 mmHg), or respirator dependency.

Renal:
- Receiving chronic dialysis

Immunosuppression:
- The patient has received therapy that suppresses resistance to infection e.g. immunosuppression, chemotherapy, radiation, long term or recent high dose steroids, or has a disease that is sufficiently advanced to suppress resistance to infection, e.g. leukemia, lymphoma, AIDS.

Then outcome of patients was observed in terms of:
- Hospital stay.
- ICU stay.
- Morbidity,
- Mortality.

Morbidity was defined by:-
- Wound infection.
- Wound dehiscence.
- Leak (of anastomosis/suturing, if any).
- Chest infection. [Suggested by cough, added breath sounds (crepts), chest X-ray findings] in our study.

RESULTS

Majority of perforations occurred in 3rd and 4th decade (46%). Only 2 cases were of above 70 yrs. Mean Age of patients was 37.74.

In our study 41 out of 50 (82%) cases were male and only 18 % cases were female. Male to female ratio was 4.55:1.

1) **Etiology:-**

Table: 1

Diagnosis	Cases		Mortality	
	No.	%	No.	%
Peptic Perforation	22	44	2	9.09
Enteric Perforation	15	30	4	26.6
Appendicular Perforation	3	6	0	0
Traumatic Jejunal perforation	3	6	0	0
Traumatic Colonic perforation	1	2	0	0
Traumatic Duodenal perforation	1	2	0	0
Gut gangrene with Ileal Perforation	1	2	0	0
Strangulated Femoral Hernia with Ileal Perforations	1	2	0	0
Strangulated Inguinal Hernia with Sigmoid Colon Perforation	1	2	0	0
Cecal Perforation	1	2	0	0
Malignant Peptic Perforation	1	2	0	0
Total	50	100	6	12

Test applied: Fisher exact test,   p value=0.01 (S)

In our study most number (22, 44%) of cases were of Peptic Perforation for which Laparotomy and modified grahm`s patch repair was done in majority of patients. There was only 1 patient who could not be operated upon due to his poor general condition. He died within 24 hours. Total 2 patients (9.09%) of peptic perforation died.

Second largest number of cases [15, 30%] was of Enteric Perforation. For which laparotomy was done. There were 2 cases in which surgery could not be done due to their poor general condition. In them Abdominal Drain was placed under local anaesthesia but they could not survive. Total mortality was 4 cases (26.6%).

There were 5 cases of Traumatic Perforations. Out of which 3 were Jejunal, 1 each of Duodenal and Colonic. All were Blunt Trauma Abdomen.

3) APACHE-II Score and Morbidity:

2) Frequency distribution of APACHE-II score:

Table-2:

APACHE-II Score	Cases		Male		Female	
	No.	%	No.	%	No.	%
0-4	21	42	20	40	1	2
5-9	15	30	9	18	6	12
10-14	8	16	7	14	1	2
15-19	4	8	3	6	1	2
>19	2	4	2	4	0	0
Total	50	100	41	82	9	18

Table 3:

APACHE-II score	Cases		Wound Infection		Wound Dehiscence		Leak		Chest Infection	
	No.	%	No.	%	No.	%	No.	%	No.	%
0-4	21	42	5	23.8	1	4.76	0	0	1	4.76
5-9	15	30	7	46.6	2	13.3	0	0	4	26.6
10-14	8	16	5	62.5	2	25	1	12.5	6	75
15-19	4	8	2	50	1	25	1	25	2	50
>19	2	4	1	50	1	50	0	0	2	100
Total	50	100	20	40	7	14	2	4	15	30
P value			0.30		0.31		0.01 (S)		0.001 (S)	

Test applied: Fisher exact test,   S=Significant

APACHE-II score was specifically significant in predicting Leak and Chest Infections. There were 15 (30%) cases in which chest infection occurred. Mean APACHE-II score in those cases was 12.46.

4) APACHE-II Score and Hospital Stay:

Table 4:

APACHE-II score	Cases	Mean Hospital Stay (days)
0-4	21	7.71
5-9	15	9.73
10-14	8	10.75
15-19	4	5.75
>19	2	6.50
P value		0.06

Relation between Mean Hospital Stay and APACHE-II score was not that significant because as APACHE-II Score increased, mortality also increased.

5) APACHE-II Score and ICU Stay:

Table 5:

APACHE-II score	Cases	Mean ICU Stay (days)
0-4	21	.10
5-9	15	1.25
10-14	8	2
15-19	4	0
>19	2	4
P value		0.002(S)

Relation between APACHE-II score and ICU Stay was significant. As Score increased ICU Stay increased.

6) APACHE-II Score And Mortality:

Table 6:

APACHE-II Score	Cases	Mortality	
		No.	%
0-4	21	0	0
5-9	15	0	0
10-14	8	2	25
15-19	4	2	50
>19	2	2	100
Total	50	6	12

Test applied: Fisher exact test, p value=0.001 (S)

APACHE-II Score was found to be significantly related to mortality.

DISCUSSION

Generalized peritonitis is a common cause of surgical emergency in developing countries, associated with high morbidity and mortality. The severity assessment of a disease condition is useful for early priority treatment and it reduces morbidity and mortality. High severity scores are usually associated with high morbidity and mortality, there for these patients may require more intensive treatment than those with low scores.

I. Age And It`s Relation With Outcome:-

In our study mean age of patients was 37.74 years.

For survivors it was 34.77 years and for Non-survivors it was 59.5 years which was quite higher than that of survivors.

Maximum cases were of 4th decade (26%) followed by 3rd decade (20%). Maximum mortality was observed in 8th (50%) decade followed by 7th decade (40%).

John Bohnen M.A studied effect of age as risk factor for mortality (in cases of abdominal sepsis) and got results that the patients of <50 years of age had 17% mortality whereas those over 50 years had a 45% death rate. [4]

In our study patients less than 50 years old had a mortality of 5.12% and patients more than 50 years had a mortality of 36.36%.

Ponting G.A. studied effects of sepsis and got the result that the mean age for non-survivors (68 years) was higher than those of survivors (57 years). [5]

Frank B. Cerra et al studied and got the result that the mean age of non-survivors (60.3 years) was higher than survivors (49.2 years). [6]

Our studies also gave similar results with mean age being 37.74 years and higher mean age (59.5 years) of non-survivors than of survivors (34.77 years).

II. Primary Source Of Contamination And It`s Relation With Outcome:-

In our study majority of patient were of peptic perforation (22 cases) followed by enteric perforation (15 cases).

Mortality in peptic perforation was 9% whereas in enteric it was 26.6%.

Bohnen M.A studied on abdominal sepsis and found out mortality of gastro-duodenal perforations was 45.6% and for appendix he got mortality of 0%. [4]
Our study showed mortality of gastro-duodenal perforation of 8.3% whereas 0% in appendicular cases.

Adesunkanmi ARK showed 50.7% mortality in cases of enteric perforation. [7]

Whereas our study showed 26.6% mortality in cases of enteric perforation.

III. APACHE-II Score And Outcome (Morbidity And Mortality):-

We observed maximum cases of 0-4 score. In which we observed 0% mortality.

Maximum mortality was observed in APACHE-II score >19 with 100% mortality.

Mean APACHE-II score was 7.4. For survivors it was 5.86 whereas for non-survivors it was 18.66.

Mean APACHE-II score in cases who developed chest infection was 12.46.Chest infection occurred in 30% cases.

Data was significant for mortality and chest infection (P value- 0.001) in relation to APACHE-II score.

Abdul Rashid et al studied cases of enteric perforation and found mean APACHE-II score for survivors was 7.6 and for non-survivors it was 9.4. There was no death in patients who scored 0-4, whereas mortality was 13% in those who scored 5-9, 41.2% in those who scored 10-14 and 50% in patients who scored 15-19. The APACHE-II score did predict mortality but not other complications. [7]

M. Schein et al also worked on APACHE-II score in peptic perforation and reported that mean APACHE-II score for survivors was 10.8 and for non-survivors it was 17.5. There was no death among those who scored 0-10. Whereas mortality rate was 5.4% in those who scored 11-15, 44% who scored 16-20 and 66.6% who scored >20. [8]

In our study mean APACHE-II score in non-survivors of enteric perforation was 19.25%. Whereas it also predicted chest infection as complication very well with mean APACHE-II score in cases of chest infection was 12.46 and in patients of enteric perforation with chest infection it was 18.57. there was no death reported among patients APACHE-II score 0-9, whereas 25%,50%,100% death was reported respectively in patients with APACHE-II score of 10-14,15-19,>19 .

Thomas Koperna et al worked on progress and treatment of peritonitis. The mortality rate in patient with APACHE-II score <15 was 4.8% while in patients with score equal to or > 15 was 46.7%. [9]

We reported mortality of 4.54% in patients with APACHE-II score <15 and 66.66% in patients with score equal or >15.

Adesunkanmi ARK et al worked on generalized peritonitis on children. For survivors mean score was 8 and for non-survivors it was 13. The range of APACHE-II was 0-18. Mortality was 6.4% in who scored 0-15 and 66.7% in who scored 16-18. The data for post-operative morbidity was not significant. [10]

We observed mean APACHE-II for survivors was 5.86 and for non-survivors it was 18.66. Our data for post-operative Leak and Chest infection was also significant. With mean APACHE-II score of patient with chest infection (15 cases) was 12.46 and patients with no chest infection (35 cases) it was 5.17 only.

IV. APACHE-II And ICU/ Hospital Stay:-

We observed mean ICU stay of 1.14 days. With 0.68 days for survivors and 4.5 days for non-survivors.

Mean ICU stay for APACHE-II score 0-4, 5-9,10-14,15-19,>19 was 0.10,1.25,2,0,4 days respectively.

Data was significant for ICU stay (P value- 0.002) in relation to APACHE-II score.

Bosscha K. et al worked on APACHE-II score in peritonitis and observed mean ICU stay of non-survivors was 17 days. [11]

The ICU stay in our study was much lower than this study. McAnena et al studied APACHE-II score and observed that score demonstrated a poor correlation with length of hospital stay. [12]

Our study also showed the relation between APACHE-II score and hospital stay is insignificant with mean hospital stay for APACHE-II score 0-4, 5-9, 10-14, 15-19,>19 were 7.71, 9.73, 10.75, 5.75, 6.5

Saad Ahmed Naved et al studied APACHE-II score and it`s correlation with mortality and length of ICU stay and found out mean ICU stay in the patients who expired was 6.65 (±4.76 ranging from 1 to 20) days while in those who survived and discharged was 7.34, [13] which is significantly higher than our study

Joseph M. Civetta after working on APACHE-II and duration of ICU stay observed that in patients who had ICU stay less than mean stay 13.1% died and in patients who stayed in ICU stay longer than the mean stay 59.6% died. [14]

In our study 5% of patients who had ICU stay less than mean died whereas 40% of patients who had ICU stay more than mean stay, died.

CONCLUSION

Our study showed that the APACHE-II score is an easy tool to assess severity and outcome of secondary peritonitis. According to our study patients with higher APACHE-II score has higher mortality rate and morbidity in terms of leak and chest infection. So as the APACHE-II score rises prognosis becomes poorer.

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