Scholars Journal of Applied Medical Sciences (SJAMS)
Abbreviated Key Title: Sch. J. App. Med. Sci.
ISSN 2320-6691 (Online)
ISSN 2347-954X (Print)

A Unit of Scholars Academic and Scientific Society, India
www.saspublisher.com

Surgery

Apache II Score and Perforation Peritonitis

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Original Research Article

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Article History
Received: 28.11.2018
Accepted: 07.12.2018
Published: 30.12.2018

DOI:
10.36347/sjams.2018.v06i12.010

Abstract: Peritonitis is a demanding surgical emergency. Prospective assessment of such patients into low risk and higher risk group, help in better patient management and better outcome. The current study evaluated the role of APACHE II score in perforation peritonitis as a tool for risk stratification. Study included 100 patients with peritonitis admitted to a teaching hospital over a period of 2 years. APACHE II score of each patient was calculated and their outcome studied Of 100 patients, male sex was the dominant gender (74%). Most patient belong to APACHE II score of 0-10(42%), followed by 34% in APACHE II score of 11-20. Local complications were more in lower APACHE II score (APACHE II score 0-10 and 11-20) whereas systemic complications were more common in higher APACHE II (11-20 and 21-30). APACHE II score of 0-10 has lowest mortality (2.4 %) whereas APACHE II score of >30 has 100% mortality. The mean duration of hospital stay was 14.8 days in APACHE II score of 0-10, 20 days in APACHE II score 11-20; and lowest 1.5 days with APACHE II score > 30 due to early mortality. It was noted that higher the APACHE II score, more frequent and more severe were the postoperative complications. Moreover, higher APACHE II score carries higher morbidity and mortality.
Keywords: APACHE II score, Perforation, Peritonitis, Risk stratification.

INTRODUCTION

Perforation peritonitis is reported commonly in emergency surgical clinics in Indian subcontinent and tropical countries, attributing due to high reported cases of enteric fever and tuberculosis in these regions.

Despite various advances in the field of surgical techniques, antimicrobial therapy, intensive care support, management of perforation peritonitis is still a challenge and demanding due to associated morbidity and mortality. The incidence of lower gastrointestinal tract perforation predominate in western literature whereas the incidence of upper gastrointestinal tract perforation predominant in India and subcontinent [1, 2]. Perforation peritonitis usually present as acute generalized peritonitis which is a potentially life threating condition. It is a common surgical emergency across the world. It is associated with significant morbidity and mortality [3, 4].

Early prognostic evaluation is desirable to be able to select high-risk patients for more aggressive treatment especially in severe peritonitis. Many scoring systems have been found useful in predicting the outcome in critically ill patients, thus allowing application of resources for effective use [5]. Amongst them acute physiology and chronic health evaluation score (APACHE II) is taken for the task in this study.

IN 1981, Knauss *et al*. developed the Acute Physiology and Chronic Health Evaluation Score (APACHE) based on 34 physiological parameters. APACHE ll was later developed as a simplified clinically useful system using 12 physiological variables [6]. APACHE II prognostic scoring system is one of the sought-after & well–accepted for both surgical and non–surgical case subjects.

The point score is calculated from a patient's age and 12 routine physiological measurements:

- Aado2 or pao2 (depending on fio2)
- Temperature (rectal)
- Mean arterial pressure
- Ph arterial
- Heart rate
- Respiratory rate

- Sodium (serum)
- Potassium (serum)
- Creatinine
- Hematocrit
- White blood cell count
- Glasgow Coma Scale

These were measured during the first 24 hours after admission, and utilized in addition to information about previous health status (recent surgery, history of severe organ insufficiency, immunocompromised state) and baseline demographics such as age. The score is not recalculated during the stay; it is by definition an admission score. If a patient is discharged from the ICU and readmitted, a new APACHE II score is calculated.

In the original research paper that described the APACHE II score, patient prognosis (specifically, predicted mortality) was computed based on the patient's APACHE II score in combination with the principal diagnosis at admission.

PARAMETERS IN APACHE II SCORE

APACHE II score = (acute physiology score) + (age points) + (chronic health points) Acute Physiology Score.

Figure and tables index

		+4	+3	+2	+1	0	+1	+2	+3	+4
1	Temp (°C)	>41	39–40.9		38–38.9	36–38.4	34–35.9	32–33.9	30–31.9	<29.9
2	Mean arterial pressure (mmhg)	>160	130–159	110–129		70–109		50–69		<49
3	Heart rate (bpm)	>180	140–179	110–139		70–109		55–69	40–54	<39
4	Respiratory rate (bpm)	>50	35–49		25–34	12–24	10–11	6–9		<5
5	Oxygen delivery (ml/min)	>500	350–499	200–349		<200				
6	PO_2 (mmhg)					>70	61–70		55–60	<55
7	Arterial ph	>7.7	7.6–7.69		7.5–7.59	7.3–7.49		7.25–7.3	7.15–7.2	<7.15
8	Serum sodium (mmol/L)	>180	160–179	155–159	150–154	130–149		120–129	111–119	<110
9	Serum potassium (mmol/L)	>7	6–6.9		5.5–5.9	3.5–5.4	3–3.4	2.5–2.9		<2.5
10	Serum creatinine (mg/dl)	>3.5	2–3.4	1.5–1.9		0.6–1.4		<0.6		
11	Hematocrit (%)	>60		50–59.9	46–49.9	30–45.9		20–29.9		<20
12	White cell count (10^3/ml)	>40		20–39.9	15–19.9	3–14.9		1–2.9		<1

Age Points	
Age	Points
<44	0
45–54	2
55–64	3
65–74	5
>75	6

Chronic Health Points	
History of Severe Organ Insufficiency	Points
Nonoperative patients	5
Emergency postoperative patients	5
Elective postoperative patients	2

AIM AND OBJECTIVES

To evaluate the relation of APACHE II score with post-operative complications, duration of hospital stay and clinical outcome.

MATERIALS AND METHODS

The study was conducted in the Tertiary Care Centre of Kashmir for a period of 2 years, in which 100 patients were, studied who were diagnosed with intestinal perforation. All the patients clinically diagnosed as perforation peritonitis, including abdominal trauma and patients of both sexes were included. Patients on steroids and immunosuppressive drugs were excluded. All the patients were meticulously evaluated for their demographic profile, history and clinical examination. All patients were subjected to routine baseline investigations. Abdominal X rays and chest X-ray were also done. Ultrasonography abdomen and CT abdomen (if required) were performed accordingly. Once the provisional diagnosis of perforation peritonitis was confirmed, the patient's APACHE II score was assessed. Management of patient was done as per the standard institutional protocols. All the patients were adequately hydrated, electrolytes imbalance corrected and broad spectrum antibiotics started. Gastrointestinal decompression was done to Ryle's tube. Post-operative complications, duration of hospital stay and clinical outcome were recorded

RESULTS AND OBSERVATIONS

The study included 100 patients with secondary peritonitis; the study population included 74 male and 26 females with Male: female ratio was 2.9:1 (Table & Fig. 1). The mean age of the study patients was 34 years (range of 2 to 88 years old). Majority of patients were in the age group of 21-40 years, constituting 44% followed by age group 41-60, making 30%. Zero-20 age group with 18% patients; 61-80 age group with 5% patients and 3% patients above 80 years of age (Table 2).

Table-1: Gender Distribution

Sex	No. of patients	Percentage
Male	74	74%
Female	26	26%
Total	100	100%

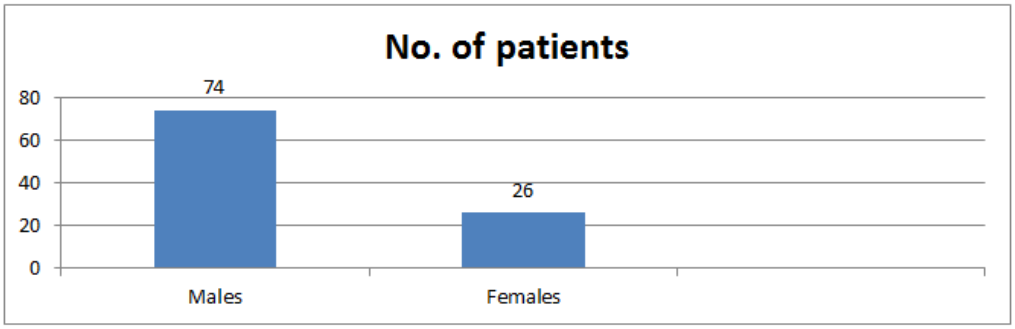

Fig-1: Gender distribution

Table-2: Age Distribution

Age(years)	No. of patients	Percentage
0-20	18	18%
21-40	44	44%
41-60	30	30%
61-80	5	5%
81+	3	3%

Table 3 & Fig. 3 shows distribution of patients according to APACHE II score. Major group of patients were in APACHE II score of 0-10 with 42% of patient followed by 34% of patients in APACHE II score of 11-20 , 18% in APACHE II score of 21-30 and 6% of patients having APACHE II score of above 30.

Table-3: Distribution of patient as per APACHE II Score

APACHE II Score	No. of patients	Percentage
0-10	42	42%
11-20	34	34%
21-30	18	18%
31+	6	6%
Total	100	100%

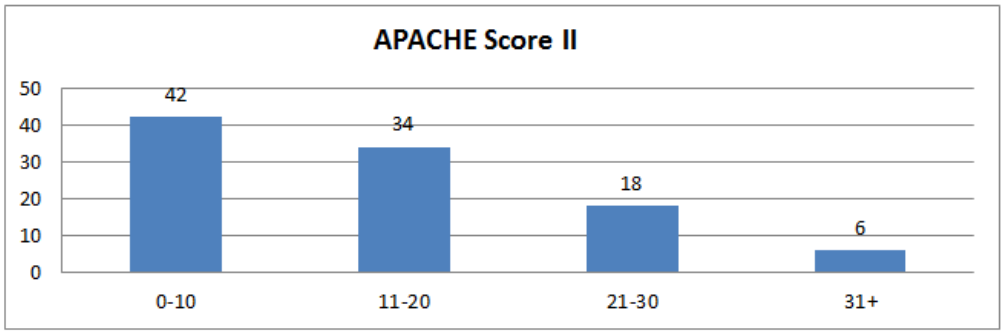

Fig-3: Distribution of patient as per APACHE II Score

Different operative procedures that are primary closure resection and anastomosis appendectomy with peritoneal lavage and moping stoma formation or only peritoneal drainage were performed according to the cause and severity of illness, as per the institutional protocols.

On analysis of postoperative complications encountered in the study in relation to APACHE II score it was observed that higher the APACHE II score more frequent and more severe are the postoperative complications. Incidence of systemic complications were more in patients with higher APACHE II score among 42 patient with APACHE II score of 0-10, 17 patient developed local complications and 6 developed systemic complications. Among 34 patients with APACHE II score of 11- 20, 20 patients developed local complications and 14 patients developed systemic complications. Among 18 patients with APACHE II score of 21 to 30, 15 patients developed local complications and 12 patients developed systemic complications. 6 out of 6 patients with APACHE II score of above 30, developed systemic complication Table 4.

Table-4: Distribution of patients according to complications as per APACHE II Score

APACHE II Score	No. Of patients	Local complications	Systemic complications
0-10	42	17	6
11-20	34	20	14
21-30	18	15	12
31+	6	-	6

Patients were divided into four groups according to APACHE II score and it was observed that APACHE II score of more than 30 was having 100% mortality. The mortality was lowest 2.4 % with low APACHE II score of 0 to 10. APACHE II score of 11-20 showed 17.6 % of mortality and APACHE II score of 21 to 30 showed 61% of mortality. Table 5 & Fig. 5.

Table-5: Outcome in relation to APACHE II Score

APACHE II Score	No. Of patients	No. Of Survivors	No. Of Non survivors	Observed mortality
0-10	42	41	1	2.4%
11-20	34	28	6	17.6%
21-30	18	7	11	61%
31+	6	0	6	100%

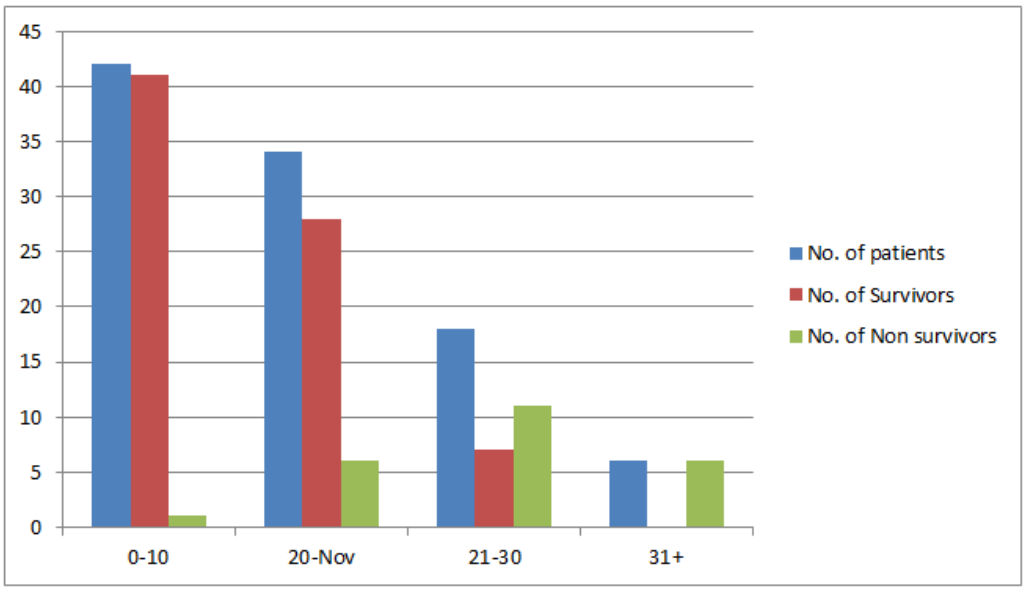

Fig-5: Outcome in relation to APACHE II Score

In patients with APACHE II score of 0 to 10, mean duration of hospital stay was 14.8 days, where as it was 20 days among the patients with APACHE II score of 11 to 20 and 12.5 days in patients with APACHE II score of 21 to 30. The mean duration of hospital stay of patients with APACHE II score above 31 was less (1.5) days due to early mortality (Table 6 & Fig. 6).

Table-6: APACHE II Score and mean duration of hospital stay

APACHE II Score	No. Of patients	Mean duration of hospital stay (days)
0-10	42	14.8
11-20	34	20
21-30	18	12.5
31+	6	1.5

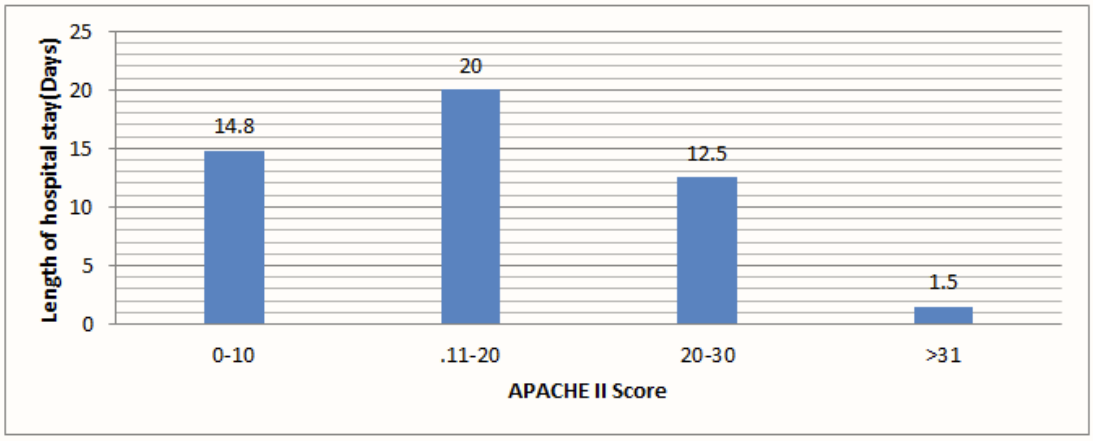

Fig-6: APACHE II Score and mean duration of hospital stay

DISCUSSION

The study was taken to risk-stratified the patients of secondary peritonitis so as to take appropriate steps and measures to deal with patients expected to have adverse outcome as predicted by APACHE II score evaluation. The study included 100 patients with 74 males and 26 females. We analysed that the most patients belong to 21-40 years of age group (44%) followed by 41-60 years of age group (30%). Overall mean age of study population was 34 years.

Most patients were having low APACHE II score; 42% having Apache II score 0 to 10 and 34% having APACHE II score of 11 to 20. Different operating procedures, namely primary closure, resection anastomosis, appendectomy with peritoneal lavage and peritoneal moping, stoma formation or simple

peritoneal drainage, were performed according to the cause and severity of illness as per institutional protocols. Local complications were encountered more in patients with low APACHE II score whereas systemic complications were more common in patients with higher APACHE II score. APACHE II score correlated well with the outcome; with poor outcome (higher mortality rate) seen with higher score. The duration of hospital stay was more with lower APACHE II < 20 but less with higher APACHE II score >20 due to associated increased mortality during early Hospital stay.

Various studies also advocated the similar policy and mentioned the correlation of APACHE II score with the outcome. *Gupta et al.*[7] in their study on 100 patients of perforation peritonitis concluded that for the prediction of death and complications in peritonitis, the physiological reserves of the patient is of great importance. The APACHE II score as measured before treatment of abdominal sepsis correlated with the outcome. In their study they reported more than 65% mortality in patient with APACHE II score of more than 20 and 100% mortality rate in score more than 34. They reported abdominal pain as the most common presenting complaints 100% followed by vomiting 43% and constipation 31%. The most common cause of perforation was peptic ulcer disease and the most common site of aetiology was gastroduodenal site 50%. They also observed that more the APACHE II scoreless is the hospital stay as observed with our results.

Anand Agarwal *et al*. **[**8] in their study on 100 patients with perforation peritonitis also concluded that APACHE II score correlated well with the outcome as well as with the hospital and ICU stay. They reported that 100% patients in low risk group (APACHE II score 0 to 5) and 95.8% patients in median risk group (APACHE II score 6 to 10) were discharged in satisfactory manner and 100% patients expired in higher risk group (APACHE II score of 11 to 16). They reported mean age of study population as 37.57 years with 76 males and 24 females. Peptic perforations were found to be the major group 39%. The most common presenting symptoms reported were abdominal pain (100%), followed by vomiting (57%) and constipation (24%) similar as our observation. It was also noted that the patient having APACHE II score more than 10 had significant higher incidence of postoperative complications as compared to patients having APACHE II score less than 10. They reported 100% mortality with high APACHE II score (11 to 16).

In a similar study by S Sahu *et al*. [9]on 50 patients with secondary peritonitis it was concluded that APACHE II score as measured before the treatment of secondary peritonitis correlates significantly with outcome of the disease with respect to both morbidity and mortality. They reported a mean age of 38.12 years. The commonest presenting symptom being abdominal pain (100%) followed by distension 82%. The most common cause of secondary peritonitis was perforation of first part of duodenum 42%. They also reported wound infection (40%) as commonest morbidity in patient having low score whereas incidence of septicaemia was higher in patient with higher APACHE II score. They reported that patient who had a score of 0-9 had most favourable prognosis and whereas worst prognosis was seen with score above 20 the lowest mortality was seen in patient with score less than 20. The observations were similar as of our results.

Sarabjit Singh *et al.* [2] in their study on 60% of ileal perforation peritonitis also concluded that APACHE II score is useful score to predict the surgical outcome and complication rate.

CONCLUSION

- Conclusion on analysis of our study following conclusions overdrawn secondary peritonitis was common in males 74% it is more common in age group of 21 to 40 years 44% followed by 41 to 60 years age group 30%.
- Maximum number of patients were in low risk of group APACHE II score of zero to 10 (42%) followed by APACHE II score of 11 to 20 (34%). Higher the APACHE II score more frequent and more severe are the post-operative complication.
- APACHE II score correlated well with the outcome. Higher the APACHE II score higher is the mortality. Lowest (2.4 %) mortality seen in less APACHE II score (0-10) 100% mortality in APACHE II score more than 30.
- APACHE II score also correlated well with the mean Hospital Stay. However in patients with very high APACHE II >30, the mean duration of hospital stay is less due to associated increased mortality during early hospital stay.

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