

## ORIGINAL RESEARCH

# Assessment of APACHE 2 (Acute Physiology and Chronic Health evaluation-II) Scoring in Critically ill Hospitalized Patients of Secondary Peritonitis

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## ABSTRACT

**Introduction:** Although perforation peritonitis is one of the leading causes of mortality in Surgical ICU, information regarding early predictive factors for mortality and morbidity is limited. The current study was thus carried out with the aim to determine the pattern of secondary peritonitis in the study area and identify the prognostic variables for critically ill patients.

**Materials and Methods:** All the patients who were admitted with the diagnosis of secondary peritonitis with hollow viscus perforation were enrolled. The parameters of APACHE II (Acute Physiology and Chronic Health evaluation II) score were assessed and recorded at the time of admission and the outcome of the patients recorded according to their APACHE Score.

**Results:** Group with APACHE Score (0-4) contained maximum number of patients - 37 patients. Group with APACHE Score (20-24) contains minimum number of patients - 3 patients. No patient had APACHE Score > 24. Rests of 60 patients were in APACHE Score 5-19. The age group with <44 years contains maximum number of patients, 55 patients and age group 65-74 years contains minimum number of patients 8 patients.

**Conclusion:** The initial stratification of risk factors and a predicative equation estimate patient's outcome. APACHE II Score has over two decades proven to be a reliable guide for grading peritonitis and prognosis.

**Keywords:** APACHE - 2, Peritonitis

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## INTRODUCTION

Peritonitis is defined as acute inflammation of peritoneum. Secondary bacterial peritonitis is infection of peritoneal cavity from a detectable intra-abdominal source, most commonly secondary to perforated viscus. The incidence is correlated to the incidence of underlying pathology e.g. colitis, appendicitis, diverticulitis or peptic ulcer disease and varies in different parts of the world. Perforation peritonitis carries a high mortality rate due sepsis, systemic inflammatory response syndrome, and hypovolumic shock due to third space fluid collection, vomiting and loss of oral intake and associated comorbid conditions.<sup>1</sup> Depending upon the condition of the patient definitive management is performed i.e. exploration and repair, resection of bowel and anastomosis or limited intervention such peritoneal lavage and exteriorization of the bowel i.e. ileostomy, colostomy is chosen. Therefore there is a need of universal scoring system for planning appropriate management, to compare the clinical efficacy of the different treatment strategies, and for the prognostic evaluation. Different scoring systems have been developed e.g. APACHE (Acute Physiology and Chronic Health Evaluation), MODS (Multiple organs dysfunctions score), SAPS (Simplified Acute Physiology Score), SOFA (Sequential Organ Failure Assessment), and LODS (Logistic organ dysfunction Score). APACHE II Scoring system was developed in 1985 and uses 12 routine physiologic measurements (during first 24 hours of admission), age and previous health status to provide a measure for the severity of the disease. Score is given from 0 to 71. Higher score corresponds to more severe disease and

higher mortality.<sup>1-4</sup> Although newer scoring systems have been developed APACHE II Scoring system continues to be widely used all over the world in assessment of critically ill patients in ICU settings. Present study aims to evaluate the effectiveness of APACHE II scoring system in patients of secondary bacterial peritonitis.

## MATERIALS AND METHODS

The study was a prospective observational study conducted over a period of 12 months (November 2009 to October 2010) in a surgical ICU of a tertiary care centre in Central India. Ethical considerations were met through intuitional ethical committee. A total of 100 patients who were admitted during the study period, with the diagnosis of secondary peritonitis with hollow viscus perforation were enrolled for the study. After obtaining informed consent and establishing the diagnosis of secondary perforation peritonitis by radiological investigation, clinical and laboratory data were recorded.

The following parameters of APACHE II (Acute Physiology and Chronic Health evaluation II) score were assessed and recorded at the time of admission:

Temperature(C), Mean arterial pressure(mm Hg), Heart rate, Respiratory rate (non ventilated), Oxygenation (PaO<sub>2</sub> in mmHg with FiO<sub>2</sub><0.5 record PaO<sub>2</sub>), Arterial pH, Serum Sodium (mmol/L), Serum Potassium (mmol/L), Serum creatinine(mg/dl), Hematocrit (%), White blood count. These values were scored in accordance with the APACHE II chart scoring for abnormally high or low range. The score ranged from 0 to 4 on each side of the normal value. Zero score represents a normal value. An increase to 4 represents an extreme end of high or low abnormal levels. These parameters represents the Acute Physiological scores (APS II).

Age points for adults in the scoring system were included in the study as follows: <44 = 0, 45-54 = 2, 55-64=3, 56-74= 5, >75=6.

Chronic health points (CHP) were added if the patient had a history of severe organ system insufficiency or was immunocompromised. The Glasgow coma score (GCS) ranging from 3-15 was also assessed in the study. APACHE 2 score = Temp + Mean arterial pressure + HR + RR + paO<sub>2</sub> + pH + Na + K + Cr + HCT + WBC + (15 – GCS) + Age points + Chronic health points.

After initial management, relevant surgical procedure was performed to evacuate the purulent material from

the abdomen and to stop the source of infection. CPL (continuous peritoneal lavage) or conservative management was given to those who were unfit for surgery. Statistical analysis- Data was compiled in MS Excel and checked for its completeness and correctness. Then it was analyzed using online statistical calculator and chi square test were applied with value of < 0.05 was considered statistically significant for interpretation of finding.

## RESULTS

All relevant values were scored in accordance with the APACHE 2 chart scoring for abnormally high or low range. The score ranged from 0 to 4 on each side of the normal value; an increase to 4 indicates the extreme end of high to low abnormal levels. Group with APACHE Score (0-4) contained maximum number of patients - 37 patients. Group with APACHE Score (20-24) contains minimum number of patients – 3 patients. No patient had APACHE Score > 24. Rests of 60 patients were in APACHE Score 5-19. (Table-1) Out of 100 patients studied 14 patients died i.e.14% mortality (Table-2) The age group with <44 years contains maximum number of patients, 55 patients and age group 65-74 years contains minimum number of patients 8 patients. Out of 55 patients of Age group <44years 3 patients died i.e.5.77% Mortality and 21% overall mortality. Out of 45 patients with Age group >44 years 11 patients died i.e. 24.44% Mortality and 79% overall-mortality. Association of age with survival was found significant. (Table-3)

APACHE Score	No. of patients	%
0-4	37	37
5-9	31	31
10-14	14	14
15-19	15	15
20-24	3	3
25-29	0	0
30-34	0	0
>34	0	0

**Table-1:** Showing number of patients in each APACHE score group

Final Outcome	No. of Patients	% of patients
Alive	86	86
Death	14	14

**Table-2:** Showing mortality in present study

Age	No. of patients	Survivors	Non Survivors	% Mortality in age group	Overall % of Mortality (out of 14 death)
<44	55	52	3	5.77	21.43
45-54	23	19	4	17.39	28.57
55-64	14	10	4	28.57	28.57
65-74	8	5	3	37.5	21.43
>74	0	0	0	0	0
Chi square test- 9.694, d.f.- 3, p value <0.05 [Significant]					
<b>Table-3:</b> showing number of death in each age group					

APACHE Score	No. of patients	Survivors	Non Survivors	% Mortality in APACHE Score	Overall % of Mortality(of 14 death)
0-4	37	37	0	0	0
5-9	31	31	0	0	0
10-14	14	10	4	28.57	28.57
15-19	15	7	8	61.54	57.14
20-24	3	1	2	66.67	14.29
25-29	0	0	0	0	0
30-34	0	0	0	0	0
>34	0	0	0	0	0
Chi square test- 29.65, d.f.-4, p value<0.0001 [Highly significant]					
<b>Table-4:</b> Showing number of death in each group of patients according to APACHE 2 score					

Duration of hospital stay in days	No. of patients	%
0-7	7	7
8-14	49	49
15-21	25	25
22-28	13	13
29-35	4	4
>35	2	2
<b>Table-5:</b> Showing No.of patients in each duration of hospital stay group		

### Correlation between Apache 2 Score and Mortality

In this study 100 patients of secondary peritonitis were taken and APACHE 2 Score calculated and Mortality assessed. The association between these 2 variables was found highly significant. APACHE SCORE < 10 contains 68 patients and no patients died i.e. 0 % mortality. APACHE score >10(10-24) contains 32 patients and all 14 patient who died belonged to this group i.e. 100% mortality. P value < 0.0001 i.e. Extremely significant. APACHE-II SCORE 10-14 contains 14 patients and 4 died i.e. 28.57% Mortality&28.57% overall Mortality. APACHE-II SCORE 15-19 contains 15 patients and 8

died i.e.61.4% Mortality & 57.14% overall Mortality APACHE-II SCORE 20-24 CONTAINS 3 patients and 2 died i.e. 66.67% Mortality & 14.29% overall Mortality (Table-4).In majority of cases, duration of hospital stay was 2-3weeks (Table 5)

### DISCUSSION

Other studies were also supported the findings of the current study.<sup>3-8</sup> As Age increases mortality rises from 5.7% to 37%. Correlation Coefficient = 0.339, P = 0.5757. Although statistically not significant but when compared mortality between age<44 years and age >44 years p value <0.001 is statistically significant.<sup>3,4</sup> As APACHE score increases mortality rises from 0% to 66.67% and no mortality occurred in lower score group. Among the factors of APACHE 2 scoring Age, chronic illness, altered heart rate mainly tachycardia, Mean Arterial Pressure mainly hypotension, altered hematocrit and altered serum electrolyte specially hyponatremia, hypokalemia and hyperkalemia are significantly responsible for raised APACHE II Score and have significant correlation with mortality whereas W.B.C. count, Serum creatinine, Rectal temperature

and Glasgow Coma Score were not significantly associated with mortality. Patient belonging to middle score range 10-19 have substantial mortality rate. These are the patients who require most intensive care to improve the outcome. Only 3 patients had score higher than 20 and 2 died. These are probably a subset of critically ill patients who would not have tolerated any procedure. In this study group hospital stay 0-14 days contained maximum number of patients; 56 patients, groups with hospital stays 15-35 days contains 42 patients and group with hospital stay >35 days contains minimum number of patients, 2 patients.<sup>5-8</sup> APACHE 2 Score <10 contains 68 patients and no patient died i.e. 0% mortality and APACHE Score > 10 contains 32 patients and 14 patients died i.e. 100% mortality. ( $p < 0.0001$  extremely significant), APACHE Score 10-14 contains 14 patients and 4 died i.e. 28.57% Mortality, APACHE Score 15-19 contains 15 patients and 8 died i.e. 61.54% Mortality and APACHE Score 20-24 contains 3 patients and 2 died i.e. 66.67 Mortality. As APACHE Score increases mortality rises from 0% to 66.67%. Increasing APACHE 2 Score is either due to age factor, chronic illness e.g. cardiovascular disease (Myocardial infarction, hypertension), respiratory disease including COPD, diabetes and peripheral vascular disease, altered heart rate mainly tachycardia, Mean Arterial Pressure mainly hypotension, altered Hematocrit, and altered serum electrolyte specifically hyponatremia, hypokalemia and hyperkalemia. These factors are significantly responsible for raised APACHE II score have significantly correlated with mortality.

Peritonitis is still one of the most important infectious problems that a surgeon has to face. Despite of the progress in antimicrobial agents and intensive care treatment the present mortality due to diffuse supportive peritonitis is reported from 10-20% continues to be exceptionally high.

Reproducible scoring systems that allow a surgeon to determine the severity of the intraabdominal infections are essential:

1. To evaluate the effectiveness of different treatment regimens.
2. To scientifically provide surgical intensive care to those patients who were higher APACHE II Score.
3. To help and to indicate individual risk to select patients who may require a more aggressive surgical approach.
4. To be able to inform patients relatives with greater objectivity.

In the past 30 years, many prognostic scoring systems have been developed for the critical patients.<sup>9,10</sup> Despite

their design for general application some have proven specifically useful in septic patients.

## CONCLUSION

The result of treatment of peritonitis are specifically difficult to evaluate because these patients may correspond to various etiologies, treatment differ and there is lack of universally valid criteria and definitions, but presently one of the most accepted score is APACHE II which integrates various physiological variables during the first 24 hrs within ICU with age and chronic health status of the patients. The initial stratification of risk factors and a predicative equation estimate patient's outcome. APACHE II Score has over two decades proven to be a reliable guide for grading peritonitis and prognosis. It is universally accepted, easy to apply and is recommended for the management of our patients.

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