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ORIGINAL ARTICLE

APACHE II Scoring System and its Probability Impact in Poly Trauma Patients at a Tertiary Care Center

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ABSTRACT

Background: Trauma is one of the most significant causes for in hospital mortality. Different predictors are available to predict the patient outcome like revised trauma scoring system (physiological), Injury severity scoring system (Anatomical scoring system), APACHE II, AIS etc.
Aim: To assess pobability of APACHE II score in evaluating mortality for poly trauma patients within first 24 hr of hospitalization.
Method: Cross sectional study was conducted at surgical unit in Lahore General Hospital, Lahore from Jan, 2019 to Dec, 2020. APACHE II for each patient was calculated with devised software APACHE II Score- MDCalc. After fulfilling the inclusion and exclusion criteria, 300 patients were included in the study from emergency department of a tertiary care hospital. All the data was entered in proforma and was analyzed in SPSS 23.
Results: Mean age was 32.53 ± 11.67 years with 205 (68.33%) male and 95(31.67%) were female patients. Out of 300, in hospital mortality occurred in 88(29.33%) while other 212(70.66%) were alive within 24 hours after admission. 88(29.33%) patients out of 300 had probability APACHE II score ≥ 12 and rest 212(70.66%) had ≤ 12. The sensitivity, specificity, PPV, NPV, and diagnostic accuracy of APACHE II was 90.16%, 94.2%, 88%, 92.84% and 90.74%.
Conclusion: By using APACHE II scoring system for poly trauma patients we can devise an efficient treatment and resuscitation plan to reduce the probability of hospital mortality.
Keywords: Trauma, prediction, mortality, APACHE II.

INTRODUCTION

Trauma is defined when body is injured due to external force whereas poly trauma is labelled when at least 2 different organ systems or organs are affected with at least one is life threatening leading to anatomical and functional impairment with difficult predictive evaluation and questionable outcome[2]. More than 600,000 deaths have been reported per year and millions faced disability due to trauma[1]. Prevalence of poly trauma has been reported 10%, which may lead to death due to physiological deterioration with 1st hour. Rapid and systemic approach is needed initially[4]. Different scoring systems have been reported like 'Acute physiology and Chronic Health Evaluation (APACHE) score, simplified acute physiology score (SAPS), Mortality prediction model, Revised trauma scoring system, Injury severity score[5]. APACHE II was designed to measure severity of disease in adult patients with sensitivity and specificity of 88% and 90% respectively with 90% accuracy whereas few reported it as 82.5%, 55.2% with accuracy 66% respectively[4].

The burden of trauma and its related impacts are increasing especially in the developing world as it industrializes, adopts motorized transportation and remains the major center for armed conflicts[6]. Incidence and trends vary across the developed world with 1095/100000 trauma related deaths in England and Wales[6]. 25 per 100,000 deaths have been reported in Germany, 52.2 per 100,000 in Italy, 71.5 per 100,000 in Canada by reporting severe ISS[7] . After a poly trauma, 71.3% have been reported with single limb injury or pelvic fracture, half of all poly trauma cases have either head and or thoracic injury[8].

Different scoring systems have been used world over to predict the mortality rate like Abbreviated injury severity (AIS), Injury severity score (ISS), New Injury severity score (NISS), Trauma Injury severity score(TRISS), Revised trauma scoring system (RTS), APACHE and APACHE II etc. AIS score is labeled in injury codes which are more than 2000 with minimum score 1 and maximum to 6[11]. Similarly, in ISS also called anatomical trauma scoring, grading is done from mild to severe degree. Score more than 15 is labelled as severe trauma[1]. RTS is a physiological scoring. In 1985 APACHE II was being introduced considering the first 24 hours stay in ICU restricting the co morbidities in scoring system[9].

Considering mortality, poly trauma with abdominal injury has highest rates across all age groups. In children, poly trauma with thoracic injury refers to the highest mortality. Management as per ATLS guidelines like control of hemorrhage, contamination restriction, resuscitation and deformity management followed by primary and secondary surveys are being followed[10,11]. Damage control surgery has been advocated as the lifesaving entity[12].

The objective of the study was to assess the Probability of APACHE II score in evaluating mortality for poly trauma patients within first 24 hours of hospitalization.

METHOD

Cross sectional study was conducted in surgical unit at Lahore General Hospital, Lahore from Jan, 2019 to Dec, 2020 after Ethical Committee permission. APACHE II for each patient was calculated with devised software APACHE II Score- MDCalc. After fulfilling the inclusion and exclusion criteria, 300 patients were included in the study from emergency department of a tertiary care hospital. All the data was entered in proforma and was analyzed in SPSS 23.

In APACHE II trauma scoring system the parameters to predict the mortality are based on the first 24 hours' values of 12 routine physiologic measurements. These parameters are: body temperature, mean arterial blood pressure, heart rate, respiratory rate, oxygenation, arterial PH, hematocrit, white blood cell count, serum levels of sodium, potassium, creatinine, and GCS), age, as well as previous co morbidities like Ischemic heart disease, liver cirrhosis etc. Blood grouping is done and the patients are resuscitated with blood components as per advice of the hematologist and intensivist. The APACHE II is measured during the first 24 h of ICU admission; the maximum score is 71. A score of 25 represents a predicted mortality of 50% and a score of over 35 represents a predicted mortality of 80%.

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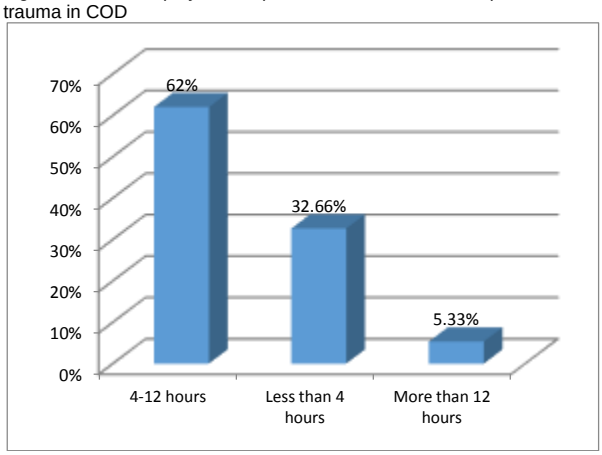
RESULTS

Total of 300 patients were included in the study with ages ranging from 18 to 60 years. Mean age of patients was 32.53 ± 11.67 years.162 (54.0%) were from 18-40years old whereas 138(46.0%) were from 41-60 years of age. Gender distribution was 205 (68.33%) male and 95(31.67%) were female patients. Mean duration of injury was 2.93± 2.76 hours with minimum and maximum duration of 1 and 12 hours respectively. A total of 98(32.66%) cases had injury since less than 4 hours, 186(62%) cases had injury since 4-12 hours and 16(5.33%) cases had injury more than 12 hours.

Fig. Distribution of polytrauma patients with time duration presentation after trauma in COD



Mean APACHE II score was 14.20±12.01 with minimum and maximum score of 0 to 71. Out of 300, in hospital mortality occurred in 88(29.33%) while other 212(70.66%) were alive within 24 hours after admission. APACHE II score was ≥ 12 score in 88(29.33%) cases whereas 212(70.66%) had score less than 12.

DISCUSSION

Trauma has been mentioned as the major killer after malignancy related deaths world over and in age groups less than 45 years at the top in developed countries[102,103] . Trauma induced deaths has been divided into three categories as “sudden Deaths” which at the spot, second one is “Early Deaths” which occur from minutes to few hours after trauma and the third one is “late mortality” which happen from days to weeks[10] .

Evaluation of traumatic patients is done by trauma scoring systems which has improved he number of preventable deaths. APACHE II was introduced in 1985 having physiological measurements with age and excluding co morbidities. Mean age of our study was 32.53 ± 11.67 years has been in comparison with a retrospective study done by Mica L et al in 2012 with mean age of 39.2±16.2 in patients with poly trauma[14] but male were in more number 63.91% as in comparison with our study which is due to the reason with exposure. Similarly, a study done by Norouzi V et al in 2013 reported his results regarding cases as 714 patients (71.4%) were male and 286 patients (28.6%) female with the mean age of 35.68 years which is again in comparison with our study[1].

In our study 97(36.1%) patients died after admission in ICU whereas Mr. Ho KM et al in 2015 has reported in his study that1276 (13.3%) after trauma faced death in ICU[20]. Meanwhile a study was done Agarwal et al 2016 who has reported mortality score of 40% on day of admission[15] .

In our study, APACHE II score was ≥ 12 score in 99 (36.5%) cases whereas 171 (63.5%) had score less than 12. The sensitivity and specificity of APACHE II has been reported as 90.91% and 72.50%[15]. H o K et al in year 2007 have reported better prediction regarding mortality of poly trauma patients by APACHE II scoring than SOFA score which was done in Australian Population Intensive care unit. Similarly, Katsaragakis S et al in their prospective cohort study done in 2000 has concluded that APACHE II has performed better than SAPS II score in predicting the trauma outcome[17]. At the same time Wagon W et al in 1995 analyzed APACHE II in Canadian ICU on 1724 patients, both the predictive and observed deaths were almost the same[18]. Meanwhile Rowan KM et al in 1994 conducted a cohort study in Britain and Ireland which classified the correct predictive rates of APACHE II as 79%[19].

CONCLUSION

By using APACHE II scoring system for poly trauma patients we can devise an efficient treatment plan to reduce the probability of hospital mortality.

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