Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2015; 3(2B):650-653 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjams.2015.v03i02.024

Research Article

Comparison between POSSUM and P-POSSUM Scores in Prediction of Post-Operative Mortality and Morbidity in Patients Undergoing Emergency Laparotomy at Omdurman Teaching Hospital

Sarah Mohammed Ahmed Yosif[1*], Aamir Abdullahi Hamza[2], Seif Ibrahim Mahadi[3]
[1]Senior registrar, Omdurman Teaching Hospital, Khartoum, Sudan
[2]Professor of General Surgery, University of Bahri, Khartoum, Sudan
[3]Assistant professor of General Surgery, University of Khartoum, Khartoum, Sudan

***Corresponding author**
Sarah Mohammed Ahmed Yosif
Email: sarah.m.ahmed@hotmail.com

Abstract: Comparison of operative morbidity rates after emergency laparotomy between units may be misleading because it does not take into account the physiological variables of patients' conditions. Surgical risk scores have been created and the most commonly used is, the Physiological and Operative Severity Score for the enUmeration of Mortality (POSSUM) or one of its modifications the Portsmouth-POSSUM (P-POSSUM), usually require intra-operative information. The Objective is to evaluate the POSSUM and P-POSSUM scores in predicting post-operative morbidity and mortality in patients undergoing emergency laparotomy. This is a prospective, cross-sectional and hospital-based study that was conducted at Omdurman Teaching Hospital from Mar. 2013 - Mar.2014. Included were adult patients who presented at the causality and underwent emergency laparotomy. Observed and predicted mortality and morbidity were calculated using POSSUM and P-POSSUM equations and statistical significance was calculated using cui square test. A total of 119 patients were included in this study, with a mean age of 22.4±17.4 years. The Observed (O) mortality was 17 (14.3%), while POSSUM predicted 37 (31%), and P-POSSUM 27 (22.6). The O/E ratio for POSSUM was 0.46 and for P-POSSUM was 0.63 and this mean that they both over-estimate mortality. When the results were tested by chi square test, the P value was found to be 0.738 and 0.479, for POSSUM and P-POSSUM respectively and P-POSSUM respectively, which showed no significant correlation for observed and expected mortality. The Observed morbidity was 34(28.8%), while POSSUM expected morbidity was 80(67.2%), O/E ratio is 0.43 and this again over-estimate the morbidity. POSSUM is over-predicting the rate of morbidity and test of correlation showed no significance with P value of 0.656.In conclusion, POSSUM and P-POSSUM were found to be over estimate mortality and morbidity in patients undergoing emergency laparotomy, and it cannot be used in surgical audit.
Keywords: POSSUM and P-POSSUM, Physiological score, Operative score, Observed morbidity, Predicted morbidity, Observed mortality, Predicted mortality.

INTRODUCTION

Urgent or emergency laparotomy is a common procedure having mortality rate considerably greater than that of elective laparotomy [1]. Measuring the outcome of emergency laparotomy is crucial for both the patient and health providers, in which improvement in the health service can be achieved.

Comparison of morbidity and mortality rates is an essential component of surgical audit. For a good audit, it is important to compare the risk-adjusted mortality and morbidity rates instead of crude rates as the outcome is directly related to the risks associated with surgery. For this purpose several risk scoring systems have been devised [2]. POSSUM was first described by Copeland et al. [3] in 1991 as a method of normalizing data so that direct comparison of patient's outcome can be made despite differences in case mix [4]. It uses 12 physiological factors and 6 operative factors for the score. Depending on the severity of abnormality, each factor is assigned 1, 2, 4 or 8 points. The point's score for the physiological 12 factors of the patient are summed to obtain the total Physiological Score (PS). Similarly, the operative sores (OS) is obtained by the summation of points of the variables of the operative score. The risk of mortality of an individual patient is then calculated by using the formula: Log (R/1-R) = -7.04 + (0.13 x Physiological Score) + (0.16 x Operative Score); Where R is the predicted risk of mortality [5].

The mortality of all the patients can be calculated using the exponential method of analysis as described by Copeland, elaborated in detail by Wijesinghe [6]. Later a modification to the predictor

equation had been proposed as the Portsmouth-POSSUM (P-POSSUM) [7] that was claimed to produce a closer fit with the observed in-hospital mortality in low-risk groups [4]. In Malaysia P-POSSUM had been verified with a different population and possibly surgical practice [8].

METHODOLOGY

A prospective cross-sectional study that include patients who fulfilled the criteria of inclusion in the study, from six general surgical units at Omdurman Teaching Hospital from the period of March 2013-March 2014.

Physiological score was collected pre-operatively for all patients following resuscitation, in some patients electrocardiogram and chest X-ray were not requested and patients allocated at the least score in the lowest Category. Pathological score was calculated after surgery and sometimes after the results of histopathology appeared. Follow up of the patients was done 30 days post-operatively either at the refer clinic or through the telephone and morbidity was collected also mortality within that period was defined as a final outcome measure. After obtaining all variables in the score for each patient, calculation of their scores was completed through the online software program designed for that, mean values were calculated and then expected and observed ratios were measured.

RESULTS

A total of 119 were included in the study, with a mean age of 22.4±17.4 years. Male gender 96 (80.7%) was predominant, while female were 23(19.3%) with M: F ratio of 4.2:1, most of the patients were below the age of 60 years (89.9 %.).

Pre-operative diagnosis was equally seen, intestinal obstruction (30.3%), abdominal trauma (32.8%) and peritonitis (36.9%) (Table 1). While intra-operative diagnosis vary considerably, with perforated peptic ulcer disease 14 (11.8%), solid organ injury 14 (11.8%) and small bowel adhesions 9 (7.6%) were the commonest in each group.

Table 1: Preoperative diagnosis in the study population (n=119).

Preoperative diagnosis	Frequency	Percent
Intestinal obstruction	36	30.3
Abdominal trauma	39	32.8
Peritonitis	44	36.9
Total	119	100.0

Mean physiological score was 23.29±6.9 and most of the patients had physiological score of 17-22 in correlation with mortality it is not statistically significant p value 0.342.While the mean operative score was 17.27±4.1, with most of the patients had the score of 17-22 in correlation it is statistically significant P value 0.002.

The Observed morbidity was 34(28.8%), while POSSUM expected morbidity was 80(67.2%), O/E ratio is 0.43 and this over-estimate the morbidity. POSSUM is over-predicting the rate of morbidity and test of correlation showed no significance with p value of 0.656 (Table 2).

Table 2: Comparison between observed (O) and expected (E) morbidity rate using POSSUM scoring system

Morbidity risk (%)	Total	Observed	Predicted	O/E
20.1-40	20	04	06	0.66
40.1-60	21	08	11	0.73
60.1-80	36	08	25	0.32
80.1-100	42	14	38	0.37
Total	119	34	80	0.43

p value 0.656

The mortality rate in this study was 17(14.3%), the most common cause of death in our study is DVT/PE which included nine patients (7.7%), followed by septicemia four (3.3%), then acute renal failure two (1.7%), both deep haemorrhage and wound dehiscence account for one patient for each (0.8%) (Table 3).

Table 3: Causes of death in the study population (n=119)

Cause	Frequency	Percent
DVT/PE[a]	9	7.7%
Septicemia	4	3.3%
Acute renal failure	2	1.7%
Deep haemorrhage	1	0.8%
Wound dehiscence	1	0.8%
Total	17	14.3%

[a] Deep Venous Thrombosis /Pulmonary Embolus

The Observed (O) mortality was 17 (14.3%), while POSSUM predicted 37 (31%), and P-POSSUM 27 (22.6). The O/E ratio for POSSUM is 0.46 and for P-POSSUM 0.63 and this means that they both over-estimate mortality. When the results tested by chi square goodness of fit as proposed by Hosmer and Lemeshow, p value of 0.738 and p value of 0.479, for POSSUM and P-POSSUM respectively, which showed no significant correlation for observed and expected mortality (Table 4 and 5).

Table 4: Comparison of observed (O) and expected (E) mortality rate using POSSUM scoring system

Predicted Mortality (%)	Number of procedures	Observed number of deaths	Expected deaths	O/E number of deaths
<10.1 – 20	61	7	9	0.77
20.1 – 40	32	8	10	0.80
40.1 – 60	13	1	7	0.14
60.1 – 80	08	2	6	0.33
80.1 – 100	05	1	5	0.20
Total	119	17	37	0.46

p value 0.738

Table 5: Comparison between observed (O) and expected (E) mortality rate using P-POSSUM scoring system

Predicted mortality (%)	Number of procedures	Observed number of deaths	Expected deaths	O/E number of deaths
<10.1 -20	95	13	14	0.92
20.1 – 40	12	1	4	0.25
40.1 – 60	03	1	2	0.50
60.1 – 80	07	2	5	0.40
80.1 – 100	02	0	2	0.00
Total	119	17	27	0.63

p value 0.479

DISCUSSION

The term ‘emergency laparotomy’ describes an exploratory procedure for which the clinical presentation, underlying pathology, anatomical site of surgery, and perioperative management vary considerably. The total number of surgical procedures that can be coded within this emergency laparotomy population exceeds 400, reflecting the diverse nature of this surgical cohort. The variation in surgical pathology, coupled with the limited time period in which to optimize co-morbidities, is likely to contribute significantly to postoperative morbidity and mortality [9].

The raw mortality and morbidity rates are inaccurate and misleading for comparative surgical audit. For this purpose different scoring systems were developed to predict risk adjusted mortality and morbidity [10]. In our study the mean age was 22.4±7.4 years, which is lower than 40.4 and 31.7 in studies done by Kitara [11] and Sunil Kumar [12]. Male to female ratio was 4.2 :1, which is compared to Naveed Abas [10] with ratio of 7:1 and highest than reported by Asifa Dian 1.75:1 and Kitara 2:1 [11, 13].

Causes of emergency laparotomy were almost equally distributed between peritonitis, abdominal trauma and intestinal obstruction 36.9%, 32.8% and 30.3%. Asifa Dian found that peritonitis is the most common cause of emergency laparotomy in developing countries 75.68% [13], while Kitara found that the most common cause of laparotomy was intestinal obstruction [11]. The mean physiological score was 23.29±6.9 and operative score was 17.27±4.1, which almost equal to results that obtained on Uganda study [11]. The only physiological score that could predict mortality was ECG with P value 0.045, and blood loss, presence of malignancy and time of operation were found to affect the outcome with p value 0.024, 0.001 and 0.093 respectively, in a study done by Raut *et al*. in India other variables were found to affect the mortality, but both agreed that ECG and blood loss can affect the outcome [14].

Morbidity rate was found to be 34(28.8%), most common complications was found to be wound infection and DVT/PE 9.2% and 8.4% respectively, in Uganda the morbidity rate was found to be 52.3% and the most common to occur was respiratory infection 28.2% and wound haemorrhage 18.2% [11]. In Pakistan wound infection was found to be the most common complication 10% [10]. Observed over expected ratio O/E ratio was 0.43 which overestimate the morbidity with negative predictive value p 0.659, this is matches the study done by Ahmed Omer seven years ago at Khartoum Teaching Hospital [15] and in Pakistan [10] and Turkey [16].

Mortality rate was 14.3% and the most common cause of death was DVT/PE 7.7%. The O/E ratio when analysis done by POSSUM was 0.46 which over-predict mortality and with negative predictive

value p 0.738, when analysis is with P-POSSUM score the O/E ratio was 0.63 with p value of 0.479. This is matches the results at Khartoum Teaching Hospital [15] and Turkey [16], but in Pakistan [10] POSSUM was found to be over-predict the mortality and P-POSSUM is accurately predicting.

Operators who did the laparotomies were grouped into consultant, senior registrar and junior registrar each operate on 15.9%, 50.4% and 33.6% with p value of 0.878, in Uganda they try to correlate the operator with the physiological and operative score and it yield no statistical significance with physiological score but significant with operative score and junior registrar. Time of operation either day or night, duration of surgery and ICU admission does not affect the outcome with p value 0.652 and 0.919 for the last two. Mean hospital stay was 7.8±5.4 which is not statistically significant when correlates with mortality p value 0.1 and it correlates well with morbidity p value 0.000.

CONCLUSION

Both POSSUM and P-POSSUM were found to be over-predicting mortality and morbidity in patients who underwent emergency laparotomies, and it cannot be used in risk adjusted audit.

REFERENCES

1. Cook TM, Day CJ; Hospital mortality after urgent and emergency laparotomy in patients aged 65 years and over, risk and prediction of risk using multiple logestic regression analysis. Br J Anaesth., 1998; 80(6):776-781.
2. Hag MZ, Ahmed N, Nasir II; Surgical audit of emergency surgery with the POSSUM system. Journal of Medical Science, 2012; 20 (3): 116-118.
3. Copeland GP1, Jones D, Walters M; POSSUM: a scoring system for surgical audit. Br J Surg., 1991; 78(3): 355-60.
4. Ng KJ, Yii MK; POSSUM: A Model for surgical outcome in quality care. Medical Journal Malaysia, 2003; 58(4): 519-521.
5. Ahmed N, Aurangzeb M, Alam K, Khitab N, Zarin M; Surgical audit with risk adjusted mortality rates using the POSSUM scoring system. Pakistan Journal of Surgery, 2008; 24 (3):163-167.
6. Wijesinghe LD, Mahmood T, Scott DJA, Berridge DC, Kent PJ, Kester RC; Comparison of POSSUM and Portsmouth predictor equation for predicting death following vascular surgery. Br J Surg., 1998; 85(2): 209-212.
7. Prytherch D, Whiteley MS, Higgins B, Weaver PC, Prout WG, Powell S; POSSUM and Portsmouth POSSUM for predicting mortality. Br J Surg., 1998; 85(9): 1217-1220.
8. Yii MK, Ng K; Risk-adjusted surgical audit with the P-POSSUM scoring system in a developing country. Br J Surg., 2002; 89(1): 110-113.
9. Saunders DI, Murry D, Pichel AC, Varby S, Peden CJ; Variation in mortality after emergency laparotomy: The first report of UK emergency network. British Journal of Anasthesia, 2012; 109 (3): 368-375.
10. Akbar NA, Naqi A, Tayab M, Mohsin MJ, Abbas MA; Evaluation of POSSUM and P-POSSUM in patients undergoing emergency laparotomy, Pak J Surg., 2011; 27(4): 261-264.
11. Kitara D L, Kakande I, Mugisa BD; POSSUM scoring in patients undergoing laparotomy in Mulago Hospital. East and central African Journal of Surgery, 2007; 12(2): 133-142.
12. Kumar S; Comparison of Possum and P-Possum as audit tools in patients undergoing emergency laparotomy for secondary bacterial peritonitis. Global Journal of Medical Research, Surgeries and Cardiovascular System 2013; 13(3). Available from https://globaljournals.org/GJMR_Volume13/2-Comparison-of-Possum.pdf
13. Dian A, Akhtar T, Jaskani S, Hanfi M, Hassan H; An audit of patients undergoing midline emergency laparotomy. Journal of Rawalpindi Medical Collage, 2013; 17(1): 52-53.
14. Raut NR, Maibam C, Singh J, Pevi SR, Singh TAK; Portsmouth physiological and operative severity scores for the enumeration of mortality and morbidity scoring system in general surgical practice and identifying risk factors for low outcome. Journal of Medical Society, 2013; 27(2): 119-123.
15. Omer A Abaker Elnor A, Alarbi YE; POSSUM and P-POSSUM scores for evaluating the outcome of emergency laparotomy in Khartoum Teaching Hospital. MD thesis, Sudan Medical Specialization Board, 2007.
16. Kumar P, Rodrigues GS; Comparison of POSSUM and P-POSSUM for risk adjusted audit of patients undergoing emergency laparotomy. Ulus Travma Acil Cerrahi Derg., 2009; 15(1): 19-22.