International Surgery Journal
Ghimire S et al. Int Surg J. 2023 Dec;10(12):1896-1900
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20233671

Original Research Article

POSSUM scoring in hollow viscus perforation at National Medical College and Teaching Hospital, Nepal

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Received: 03 November 2023
Revised: 13 November 2023
Accepted: 20 November 2023

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ABSTRACT

Background: Peritonitis as a result of hollow viscus perforation is a common condition in developing countries like Nepal where post-operative period is unpredictable even if patient reaches hospital in time and being operated. Physiological and operative severity score for the enumeration of mortality and morbidity (POSSUM) helps to identify patients at increased risk of developing deaths and complications. It is based on 12 physiological and 6 operative parameters.
Methods: A total of 50 patients of hollow viscus perforation admitted and operated at National Medical College and Teaching Hospital Birgunj, Nepal from July 2020 to June 2021 were included in study. It was a prospective observational study.
Results: During the study 9 patients died and the observed to expected ratio (O: E) 0.3 was obtained. Out of 41 patients who survived 28 suffered complications an observed to expected ratio (O: E) of 0.68 was obtained.
Conclusions: POSSUM scoring system is reliable for predicting post-operative morbidity and mortality and helps to improve prognosis of patients operated for perforated hollow viscus.

Keywords: Hollow viscus perforation, POSSUM score, Mortality, Morbidity, Peritonitis

INTRODUCTION

The notion that every surgeon is accountable for the outcome of the patient has been continuing from the ancient times.[1] The outcome of patient is dependent not only on the surgeon but also on patient's clinical condition, physiological status, severity, nature of surgical intervention, post-operative mangement.[2-4] Peritonitis as a result of hollow viscus perforation is common condition in developing countries like Nepal.[5] The post-operative period is unpredictable even if patient reaches hospital in time and being operated.[6]

Various scoring systems have been used such as American society of Anesthesiologist (ASA) for general risk prediction; acute physiology and chronic health evaluation (APACHE) for intensive care; Goldman index for cardiac related complications perioperatively.[7-9] However, POSSUM is much beneficial to surgeons since, ASA is too simple and highly subjective whereas, APACHE is too complex for general use.[10,11] The physiological and operative severity score for the enumeration of mortality and morbidity (POSSUM) was developed by Copeland et al in 1991, is widely used to predict mortality and morbidity in a variety of surgical settings and provide a valuable tool for risk adjustment and comparision.[12,13] It scores the physiological status of patients and operative findings. All 12 physiological and 6 operative variables required for POSSUM scoring can be recorded easily and reproduced satisfactory with minimal difficulty.[14,15]

There is a need to validate POSSUM in our scenario since limited resources and delayed presentation can affect outcome of patient even with adequate quality care.

This study was undertaken to evaluate various factors and conditions affecting outcome of a patient with perforated hollow viscus.

METHODS

50 patients who underwent emergency laparotomy for one year at National Medical College and Teaching hospital Birgunj, Nepal were included in this study. Data was collected prospectively on a performa prepared for the study. All patients had their physiological score recorded on admission and operative severity score calculated based on findings of the operating surgeon on the performa.

Type of study

It was a prospective observational study.

Duration of the study

The duration of the study was one year (July 2020 AD to June 2021 AD).

Sample size

Sample size calculated was 50 based on the standard sample size formula, where N=total number of cases in a year, and D=allowable error 5%.

$$n = N/(1 + Nd^2)$$

$$n = 57/1 + 57 \times (0.05)^2 = 49.9$$

Inclusion criteria

All patients of both genders aged 18 and above years diagnosed as peritonitis due to hollow viscus perforation and confirmed intra-operatively were included.

Exclusion criteria

Patients with hollow viscous perforation due to trauma; and patients with any other significant illness like tuberculosis, alcoholic cirrhosis, nephroic syndrome, systemic lupus erythematosus which is likely to affect the outcome more than the disease in study were excluded.

Equation for prediction

POSSUM equation for morbidity

$$Ln\ R/1 - R\ = -5.91 + (0.16 \times physiological\ score) + (0.19 \times operative\ severity\ score)$$

POSSUM equation for mortality

$$Ln\ R/1 - R = -7.04 + (0.13 \times physiological\ score) + (0.16 \times operative\ severity\ score)$$

In the above equations, R=predicted risk.[16]

Prior approval of institutional ethics committee was obtained for the study. Informed written consent was taken from the patients willing to participate in the study.

Data collection

An informed consent was obtained from all 50 patients who underwent laparotomy for hollow viscus perforation. Their demographic information's (age, sex, and weight) was recorded. The physiological variables like pulse rate, systolic blood pressure, respiratory rate, cardiac signs and Glasgow coma scale, hemoglobin, white blood count, urea, sodium, potassium, electrocardiography (ECG) and chest X-ray (CXR) were recorded just before surgery. During the surgical procedure six operative variables including operative severity, total blood loss, multiple procedures, peritoneal soiling, cancer and mode of surgery were recorded by the operating surgeons. Their final physiological and operative score calculated from possum data sheet. The predicted mortality and morbidity was calculated by POSSUM equation. After surgery the patient's observed mortality and morbidity were noted for one month and compared with the predicted outcomes. The patients were followed up for 1 month on 1st, 3rd, 7th, 15th, 30th post-operative days for morbidity and mortality.

Data analysis

All the information's gathered was entered in the statistical package for the social sciences (SPSS) version 10.0 and analyzed. The source of the data was 12 physiological variables i.e. age, pulse rate, systolic, blood pressure, respiratory rate, cardiac signs, and haemoglobin (Hb), white blood cell (WBC), urea, sodium, potassium, and ECG and six operative variables i.e. operative severity, total blood loss, multiple procedures, peritoneal soiling, cancer and mode of surgery were recorded. Demographic variables of the patients included in this study were analyzed using the simple descriptive statistics. Final prediction of the mortality and morbidity of each patient was calculated using POSSUM equation as stated above and recorded. The observed mortality and morbidity was recorded within 30 days post-operatively and compared with predicted outcomes Mortality and morbidity tables were made to calculate the observed/predicted (O/P) ratios. Pearson correlation was used to correlate the observed and predicted morbidity and mortality. Chi-square analysis was made for the test of significance. A p value of 0.05 or less was taken as significant.

RESULTS

Most of the patients found to be diagnosed with appendicular perforation (n=15, 30%) and duodenal perforation (n=27, 54%). Gastric perforation was found in 2 patients (4%). Death occurred in 9 patients with crude mortality rate 18%. Out of 41 patients, 19 patients had at least 1 complication with crude complication being 46% and remaining 22 had no complications. Multi-complain was seen majority (n=12, 24%) and impaired renal function was least (n=1, 2%).

Table 1: Indications.

Indications	No. of patients	Percentage of patients)
Appendicular perforation	15	30
Duodenal perforation	27	54
Gastric perforation	2	4
Ileal perforation	6	12
Total	50	100

Table 2: Age versus outcome.

Age (years)	Alive	Dead	Total
≤60	34	6	40
61-70	5	2	7
≥71	2	1	3
Total	41	9	50

An observed to expected ratio (O: E) of 0.68 was obtained, there was no significant difference between the predicted and observed values (χ^2=2.87, p=0.09) (Table 3).

Table 3: O: E for morbidity rates.

Expected morbidity in %	Total cases	Observed morbidity	Expected morbidity
<30	2	0	1
30-40	1	0	0
40-50	1	0	0
50-60	4	1	2
60-70	3	0	2
70-80	5	1	4
80-90	6	2	5
90-100	28	24	27
Total	50	28	41

An observed to expected ratio (O: E) of 0.53 was obtained, there was no significant difference between the predicted and observed values (χ^2=1.13, p=0.25) (Table 4).

Predicted risk of mortality (PM)

Predicted risk of mortality and morbidity was calculated using the logistic equation and was compared with observed mortality and morbidity.

Table 4: Observed: expected mortality rates.

Expected mortality in %	Total cases	Observed mortality	Expected mortality
<10	4	0	0
10-20	8	0	0
20-30	5	0	0
30-40	5	0	0
40-50	6	0	0
50-60	1	0	0
60-70	4	1	3
70-80	8	1	6
80-90	4	3	3
90-100	5	4	5
Total	50	9	17

The positive predictive value was 98%, negative predictive value was 67%, sensitivity was 93% and specificity was 86% (Table 5).

Table 5: PM versus outcome.

Observed	Expected		Total
	Alive	Dead	
Alive	40	1	41
Dead	3	6	9
Total	43	7	50
Overall percentage	86	14	

The positive predictive value was 68%, negative predictive value was 93%, sensitivity was 88% and specificity was 79% (Table 6).

Table 6: Predicted risk of morbidity.

Observed	Expected		Total
	Uncompli-cated	Compli-cated	
Uncomplicated	15	7	22
Complicated	2	26	28
Total	17	33	50
Overall percentage	34	66	

DISCUSSION

In this current study 50 patient undergoing emergency laprotomy for perforated peritonitis were assessed by comparing the observed and expected morbidity and mortality rates. 9 patient died, crude mortality rate of 18% was observed. POSSUM predicted mortality and morbidity in our study was 17. An observed to expected ratio of (O: E) 0.53 was obtained. There was no significant difference between predicted and observed values (χ^2=1.13, p=0.25).

Similar finding was obtained by Vishwami et al (O: E=0.6), Kumar et al (O: E=0.47), Mohil et al (O: E =0.62) and Yii and Ng (O: E=0.58).[17-20] Hence POSSUM was able to predict the mortality rate following emergency surgery.

Out of 41 patients who survived. 28 patient suffered complication. 13 patients did not show any evidence of complication. An observed to expected ratio (O: E) of 0.68 was obtained. There was no significant difference between the predicted and observed values (χ^2=2.87, p value=0.09). Similar findings were obtained by Mohil et al (O: E=0.68), and Vishwami et al (O: E=0.7).[17,19] Using logistic equation, positive predictive value was 98%, negative predictive 67%, sensitivity 93%, specificity 86% for mortality. For morbidity the positive predictive value was 68%, negative predictive 93%, sensitivity 88% and specificity 79%.

On analysing factors such as blood pressure, Glasgow coma scale, serum potassium, multiple procedures, total blood loss, presence of malignancy and mode of surgery were found to be significant. Complication noted during surgery were septicemia. 10%, wound infection 6%, deep infection 4%, chest infection 4%, pyrexia of unknown origin 4%, urinary tract infection 2%, imparied renal function 2%, multiple complication (wound dehiscence, chest infection and anostomatic leak) in 24%.

Limitations

There are many significant drawbacks to the study as small sample size (n=50), short study duration of a year and unsatisfactory patient compliance for follow-up.

CONCLUSION

POSSUM scoring system is one of the dependable scoring system to assess the post-operative patients for perforated hollow viscus. POSSUM scoring can be used in our set up for better patient's counselling, improving surgical outcome and better management of limited resources and manpower. This system can be applied for the surgical audit in our set up.

ACKNOWLEDGEMENTS

Authors would like to thank all the patients involved in the study and the operating team.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Ghimire S, Singh KN, Alam MS. POSSUM scoring in hollow viscus perforation at National Medical College and Teaching Hospital, Nepal. Int Surg J 2023;10:1896-900.