http://jmscr.igmpublication.org/home/
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v7i11.08

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Evaluation of Portsmouth POSSUM in predicting the mortality of patients undergoing major abdominal surgeries

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Abstract

Background: *The Physiological and Operative Severity Scoring system for enUmeration of Mortality and morbidity (POSSUM) and its modification, Portsmouth POSSUM scoring system has been proposed as risk adjusted surgical scoring system for standardizing method for the patient data, so as to allow the direct comparison in spite of differing patterns of population and referral patterns[1,2]. Application of Portsmouth POSSUM scoring system in developing countries like India especially in under developed areas like Chidambaram where most people belongs to poor socio economic status because of frequent attacks by cyclones, poverty being more since most of local residents are farmers and fisherman and resource availability being less and delayed presentation being more common because most areas being remote to health facilities is limited. Hence the prospective study was taken up to assess the validity of Portsmouth POSSUM scoring system and risk factors responsible for poor outcome.*

Methods: *50 cases undergoing major abdominal surgeries in Department of General surgery, Rajah Muthiah Medical College and Hospital, Chidambaram were studied. The expected mortality rate was obtained using the formula. The observed and expected mortality ratio (O: E ratio) was then obtained by dividing the expected number of deaths with observed number of deaths in each category. Chi square test with Yates correction was then applied to obtain the p value to note any significant difference between predicted and actual death. The distribution of both physiological and operative parameters between the two groups dead and alive was obtained by cross tabulation and the pattern was expressed by means of percentages. The distribution was then compared by using Chi-square test to find out any difference between the two groups with respect to the risk factor concerned. In case of continuous variables like Physiological score, operative score and predicted mortality, Independent samples t test have been applied to find out the difference between the two groups.*

Results: *In our study we assessed the validity of Portsmouth POSSUM in 50 major abdominal surgeries by comparing the observed and expected mortality rate. The predicted mortality was significantly higher among those died than those who were alive. The observed: expected ratio was found to be 1.The physiological score was found to be significantly different between the dead and alive, while the operative score was found to be similar between the two groups in our study. The physiological score was found to influence the outcome more than the operative score in the present study. The above results indicate that the Portsmouth POSSUM scoring system predicts the mortality accurately among the study participants.*

Conclusion: *The present study suggests that Portsmouth POSSUM is accurate predictor of postoperative mortality in our study population.*

Keywords: *P-POSSUM, Portsmouth POSSUM, major GI surgeries, mortality, surgical scoring audit.*

Introduction

The basic and main aim of surgical intervention is to bring reduction in mortality and morbidity rates in patients. We can assess the efficiency of the particular procedure and the quality of care the patient getting by comparing the influence on adverse outcome. But using crude mortality rate and crude morbidity rates is fallacious, because there exists differences in general health of local population and the patient's variable presenting conditions[3-5].

Risk scoring helps to quantify the patient's risk of adverse outcome based on severity of disease derived from data available at the time of admission[6,17]. Determining the outcome of surgical procedure is necessary to plan and execute the most appropriate and effective treatment methods.

There are different calibrated systems which help to obtain mortality and morbidity estimates for various classes of patients. One among them was physiological and operative severity scoring system for enumeration of mortality and morbidity (POSSUM). This was created by Copeland and collaborates as statistical model to predict surgical risk based on exponential analysis.

Physiological and operative severity scoring system for enumeration of mortality and morbidity (POSSUM) was proposed as risk adjusted scoring system[15] that allows direct comparison between the observed and expected adverse outcome rates. Hence it is also called as a surgeon based scoring system [1,2].

The PORTSMOUTH-POSSUM is the modification of POSSUM scoring system, using the same variables and grading system as POSSUM scoring system but different equation which gives better fit to observed mortality rate, which is important to measure outcome[12]. It is used in various specialty surgical departments and mostly in developed countries.[7,10,11,13,14,16] It differs from setup in developing countries in patient characteristics, presentation and available resources.[8,9] Hence it is needed to test the validity of P-POSSUM scoring system in our Indian scenario especially in under developed areas like Chidambaram where most people belongs to poor socio economic status because of frequent attacks by cyclones, poverty being more since most of local residents are farmers and fisherman and resource availability being less and delayed presentation being more common because most areas being remote to health facilities. These factors lead to more complication rates in patients thereby causing increased morbidity and mortality.

PORTSMOUTH-POSSUM scoring system includes both physiological and operative parameters hence it has been proposed to address these concerns.

Hence it is needed to test whether PORTSMOUTH-POSSUM scoring system can effectively address these concerns while arriving at the expected mortality rate in my scenario.

It would be more beneficial to enroll the major elective and emergency surgeries which was defined by POSSUM scoring system as it constitutes the patients belonging to high risk group where the comparison between observed and expected mortality rate can yield significant results and helps in determining the possible causes for adverse outcome.

This study was undertaken to assess the validity of Portsmouth- POSSUM scoring system in patients undergoing major gastro intestinal surgeries in our setup and to analyse the causes that are responsible for the poor outcome in this high risk patients.

Aims and Objectives of the Study

1. To assess the validity of Portsmouth POSSUM scoring system in predicting the anticipated mortality rate and to compare the anticipated mortality rate with actual mortality rate in general surgical patients admitted in Rajah Muthiah Medical College and Hospital, Chidambaram for major GI surgeries from October 2017 to September 2019.

2. To calculate the incidence of various morbidity parameters as defined by POSSUM scoring system within the follow up period of 30 days from the surgical procedure in my study group.

Materials and Methods

Study Design

This was prospective study carried out in patients undergoing major abdominal surgeries in Department of General surgery of Rajah Muthiah Medical College and Hospital, Chidambaram.

Source of Data

The study was conducted among patients who were undergoing major abdominal surgeries in Department of General surgery of Rajah Muthiah Medical College and Hospital, Chidambaram.

Study Period

December 2017 to September 2019

Sample Size

50 patients who were undergoing major abdominal surgeries in Department of General surgery, Rajah Muthiah Medical College and Hospital, Chidambaram.

Method of Collecting Data

Data were collected from patients who were admitted in general surgical wards for undergoing major abdominal surgeries.

Detailed clinical history, physical examination findings and appropriate investigations were taken Their physiological and operative findings were scored in profoma.

Statistical Methods

The expected mortality rate was obtained using the formula $\log_e(R/1-R) = (0.1692*PS) + (0.155*OS) - 9.065$. Where,

R= Risk of mortality,

PS – Physiological Score,

OS – Operative Score.

The number of expected deaths was calculated by applying the mean expected mortality rate of each category formed to the total number of persons present in the category.

Expected number of deaths = Mean predicted mortality of the category *Number of study participants in the category.

The observed and expected mortality ratio (O: E ratio) was then obtained by dividing the expected number of deaths with observed number of deaths in each category. Chi square test with Yates correction was then applied to obtain the p value to note any significant difference between predicted and actual death. The distribution of both physiological and operative parameters between the two groups dead and alive was obtained by cross tabulation and the pattern was expressed by means of percentages. The distribution was then compared by using Chi-square test to find out any difference between the two groups with respect to the risk factor concerned. In case of continuous variables like Physiological score, operative score and predicted mortality, Independent samples t test have been applied to find out the difference between the two groups.

Inclusion Criteria

Patients who were undergoing any of the following major abdominal surgeries as defined by POSSUM scoring system[1] were included in this study.

- Any laparotomy
- Cholecystectomy with bile duct exploration

Exclusion Criteria

- Age less than 12 years
- Day care surgeries
- Trauma
- Follow up period criteria not met

After getting the ethical clearance from the ethical committee of this hospital, the study was started in patients undergoing major abdominal surgeries in RMMCH. Patients were informed regarding the aims and objectives of study and informed consent was taken prior to inclusion into study. Relevant history and examination findings were collected. Data obtained from relevant investigations using standard procedures. The patients were then scored using POSSUM physiological and

operative parameters and final expected mortality rate were calculated.

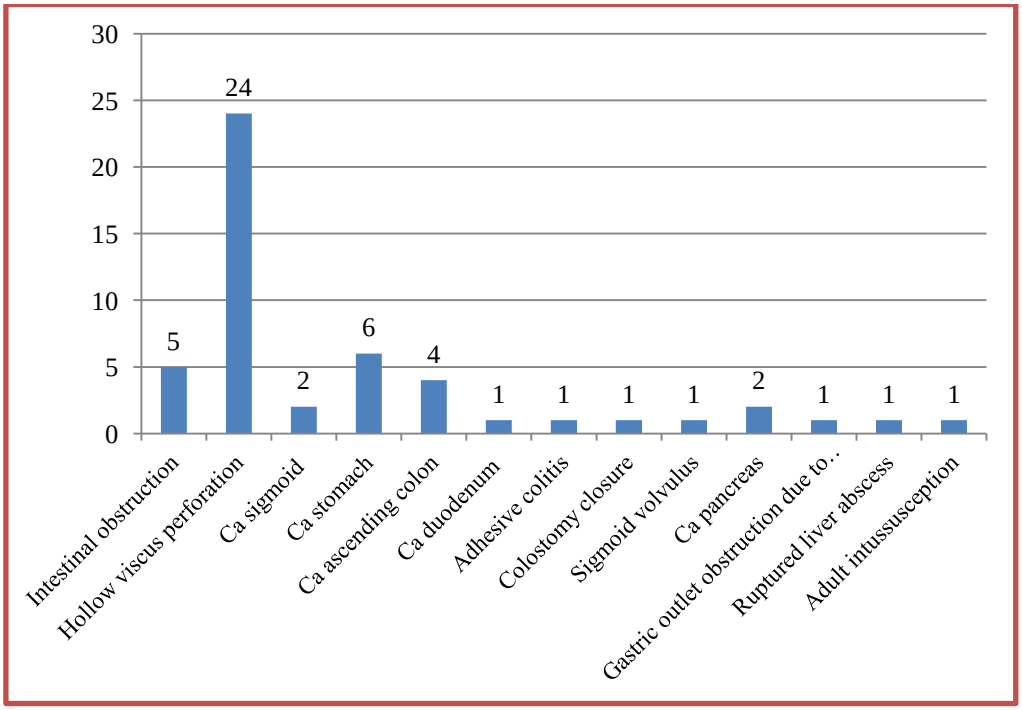
Results

We studied 50 major abdominal surgeries both elective and emergency from October 2017 to September 2019. There were 34 emergency and 16 elective cases. Following are the indications of surgery

Table-1: Indications of Surgery

Indications	Number of patients
Intestinal obstruction	5
Hollow viscus perforation	24
Ca sigmoid	2
Ca stomach	6
Ca ascending colon	4
Ca duodenum	1
Adhesive colitis	1
Colostomy closure	1
Sigmoid volvulus	1
Ca pancreas	2
Gastric outlet obstruction due to cicatrized duodenum	1
Ruptured liver abscess	1
Adult intussusception	1
Total	50

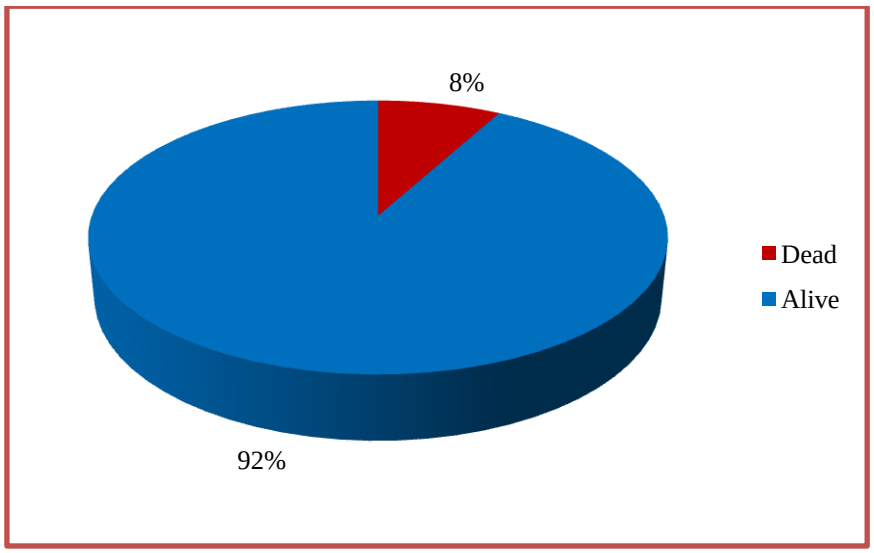
Chart-1: Indications of surgery



Outcome of Surgery: Crude Mortality Rate

Out of 50 procedures studied, 4 of them died resulting in crude mortality rate of 8%

Chart-2: Outcome of Surgery



Observed expected mortality rate

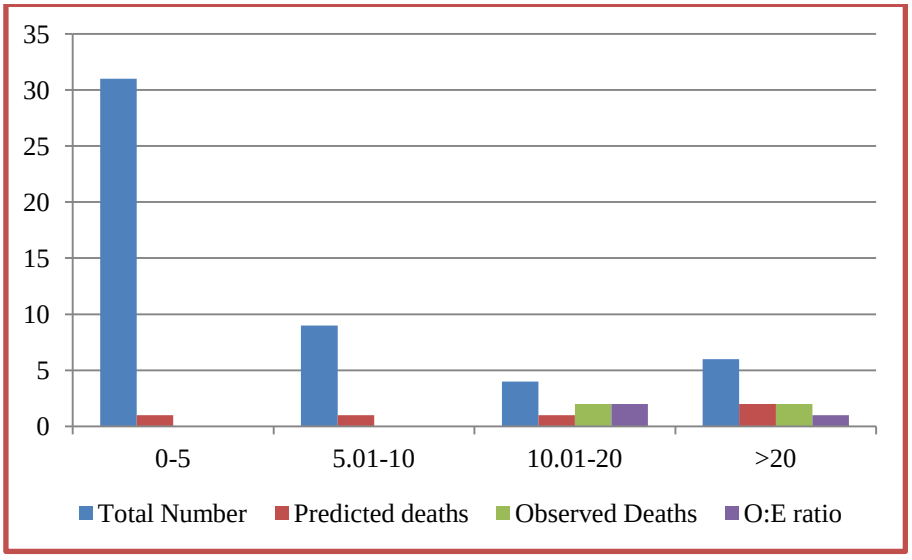
By using chi square test comparison between observed and expected mortality rate were done. An observed to expected ratio of one was obtained and there is no significant difference between the predicted and observed values (P value >0.05)

Table-2: Comparison of Observed and Expected Mortality Rate

Possum Predicted Mortality	Total Number	Mean predicted mortality	Predicted deaths	Observed Deaths	O:E ratio
0-5	31	2.4	1	0	0
5.01-10	9	6.7	1	0	0
10.01-20	4	14.7	1	2	2
>20	6	29.4	2	2	1
Total	50	7.4	4	4	1

Yates Chi square: 0.141 Degree of freedom: 3 P-value: > 0.05

Chart-3: Comparison of Observed and Expected Mortality Rate



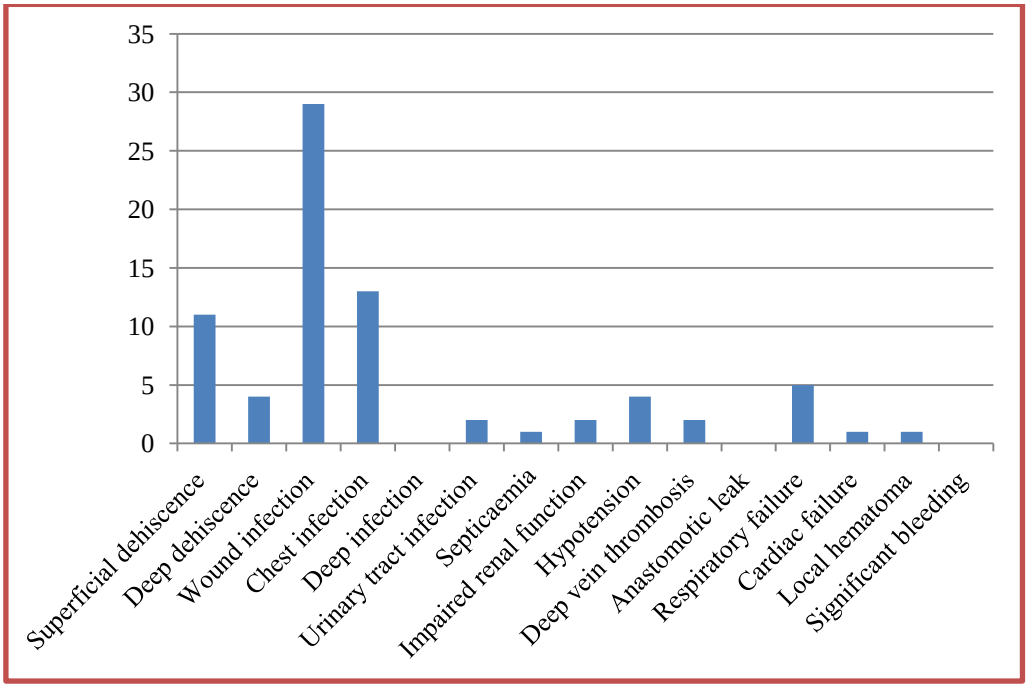
Complications

The complications occurring during the follow up period of thirty days following the procedure are listed below

Table-3: Post operative complications

Complications	No of cases
Superficial dehiscence	11
Deep dehiscence	4
Wound infection	29
Chest infection	13
Deep infection	0
Urinary tract infection	2
Septicaemia	1
Impaired renal function	2
Hypotension	4
Deep vein thrombosis	2
Anastomotic leak	0
Respiratory failure	5
Cardiac failure	1
Local hematoma	1
Significant bleeding	0

Chart-4: Post operative complications



Among the complications wound infection was significantly more contributing to morbidity followed by chest infection and superficial wound dehiscence. Respiratory failure requiring emergency ventilation was seen in 5 cases.

Table-4: Comparison of Mean Physiological Score between Dead and Alive

Group	N	Mean	SD	T	df	P-value
Dead	4	28.25	1.70	3.18	48	< 0.05
Alive	46	19.28	5.55			

The mean physiological score among those who were dead was 28.25 ± 1.70 and the mean physiological score among those who were alive was 19.28 ± 5.55. The mean score among dead was found to be more than those who were alive (P value <0.05).

Table-5: Comparison of Mean Operative Score between Dead and Alive

Group	N	Mean	SD	T	df	P-value
Dead	4	17.25	2.87	0.526	48	> 0.05
Alive	46	16.28	3.5694			

The mean operative score among those who were dead was 17.25 ± 2.87 and the mean operative score among those who were alive was 16.28 ± 3.56. The mean score among dead was found to be more than those who were alive (P value >0.05).

Table-6: Comparison of Mean Predicted Mortality by P- Possum Scoring System between Dead and Alive

Group	N	Mean	SD	T	df	P-value
Dead	4	17.08	3.85	2.156	48	< 0.05
Alive	46	6.57	9.60			

The mean predicted mortality by P- POSSUM scoring system among those who were dead was 17.08 ± 3.85 and the mean predicted mortality by P- POSSUM scoring system among those who were alive was 6.57 ± 9.60. The mean score among dead was found to be more than those who were alive (P value <0.05).

The physiological score was found to be significantly different between the dead and alive, while the operative score was found to be similar between the two groups. The predicted mortality was significantly higher among those died than those who were alive. The observed: expected ratio was found to be 1. The above results indicate that the Portsmouth POSSUM scoring system predicts the mortality accurately among the study participants. The physiological score was found to influence the outcome more than the operative score in the present study.

Discussion

The quality of care provided to patient is the basic tenet in medical care which is necessary to bring reduction in adverse outcome. We can assess the adequacy of care provided to the patient and new treatment methods and strategies by comparing the adverse outcome rates. But comparison using crude mortality rate is fallacious. Hence to overcome this POSSUM scoring system, a risk adjusted scoring system was proposed.[3-5]

Portsmouth POSSUM is the modification of POSSUM scoring system has been proposed as better scoring system as it gives better fit to observed mortality rate.[12] But in developing countries like India especially in under developed areas like Chidambaram where most people belongs to poor socio economic status because of frequent attacks by cyclones, poverty being more since most of local residents are farmers and fisherman and resource availability being less and delayed presentation being more common because most areas being remote to health facilities. These factors lead to more complication rates in patients thereby causing increased morbidity and mortality, it is necessary to test the validity of P-POSSUM in predicting the adverse outcome.

In our study we assessed the validity of Portsmouth POSSUM in 50 major abdominal surgeries by comparing the observed and expected mortality rate. The predicted mortality was significantly higher among those died than those who were alive. The observed: expected ratio was found to be 1.

The physiological score was found to be significantly different between the dead and alive, while the operative score was found to be similar between the two groups in our study. The physiological score was found to influence the outcome more than the operative score in the present study.

The above results indicate that the Portsmouth POSSUM scoring system predicts the mortality accurately among the study participants.

Conclusion

We studied 50 major abdominal surgeries both elective (32%) and emergency (68%) surgeries which resulted in 4 deaths (crude mortality rate of

8 %). On applying the Portsmouth POSSUM, the observed: expected ratio was found to be 1. The above results indicate that the Portsmouth POSSUM scoring system predicts the mortality accurately among the study participants.

The present study suggests that Portsmouth POSSUM is accurate predictor of postoperative mortality in our study population.

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