

Mortality at Ibn Sina Surgical Gastroenterology Unit as predicted by POSSUM with brief literature review

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Background: Failure to identify the high risk factors for surgery and/or anesthesia is a serious medico-legal pitfall particularly if unexpected consequences ensue.

Aim: Compare the mortality rate at Ibn Sina Surgical gastro-intestinal unit using POSSUM predicted mortality with the observed mortality.

Methods: A prospective collection of data for patients admitted in 6-month period. Demographic data, symptoms, co-morbid illnesses, physical examination, results of investigations, operative findings were recorded as well as the follow up for one month. The data was fed to a POSSUM computer program to determine the predicted mortality. The univariate and multivariate analysis was done with SPSS.

Results: 252 patients were studied. They were 132(52.4%) males. Mean (\pm SD) age 49(\pm 12.29) range 10-90 years. 216(85.7%) patients underwent surgery. The overall observed mortality was 32(12.7%) patients. 10(27.8%) patients died before surgery. The highest mortality was 9(27.3%) in cases of carcinoma head of pancreas. Carcinoma of the stomach has observed mortality of 6(42.9%) patients while its predicted mortality range from 1.7% to 35.7% with mean of 17.9%.

Multivariate analysis showed that factors which have significant association with the observed mortality are the physiological score P 0.0001, age P 0.0001, predicted mortality P 0.0001 and inoperability P 0.0020.

Conclusion: POSSUM has under-predicted mortality in gastric, oesophageal and cholangiocarcinoma. The outcome of management of other types of cancer as oesophageal and colorectal cancer as well as the benign diseases of the gastrointestinal tract is consistent with the predicted values of the POSSUM. Therefore POSSUM is a good risk adjusted criteria for predicting mortality in GIT surgical diseases at Ibn Sina Hospital.

Introduction:

Identification and assessment of risk factors that may affect the outcome in surgery is the corner stone for quality assurance of patient care. Failure to identify the high risk factors for surgery and/or anesthesia is a serious medico-legal pitfall particularly when unfavourable consequences ensue.

The American Society of Anesthesiologists (ASA) score widely in use is simple but subjective¹.

The Acute Physiology And Chronic Health Evaluation (APACHE) is a good scoring system for the critically ill patients in the ICU, but it is too complex for general use¹. The Physiologic and Operative Severity Score for the enumeration of Mortality and Morbidity (POSSUM) was first reported in 1991 by Copeland et al². It is an objective and quantitative method for assessment of surgical risk in patients.

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POSSUM has 12 physiological and 6 operative factors, which are easily obtainable from proper history, examination, relevant investigations and operative data¹.

We have designed this prospective study to find out the predictive operative mortality in the Gastrointestinal Surgical Unit, at IBN SINA Hospital in six months period, using POSSUM as a system to compare the actual observed mortality.

Patients and Methods:

A prospective collection of data for patients admitted in 6-month period from January 2004 through June 2004. Demographic data, symptoms of the present illness, history of other co-morbid illness, previous history of surgical operation, blood transfusion, jaundice and loss of weight were obtained. Clinical examination included measurement of blood pressure, pulse rate, and examination of cardiovascular, respiratory system, presence of enlarged lymph nodes and abdominal masses. Investigations including total WBC, haemoglobin, fasting blood sugar, blood urea, serum sodium, potassium, electrocardiogram, chest x-ray, ultrasound of abdomen and echocardiogram and CT scan or

Magnetic Resonance Cholangio-pancreatography (MRCP) were added where appropriate.

The operative data included indication for surgery, type of operation and whether it was elective or emergency. The extent of the operation was graded whether it is moderate like cholecystectomy, major like cholecystectomy with common bile duct exploration or very major like total gastrectomy and abdomino-perineal resection with excision of the mesorectum.

During hospital stay complications as bleeding, atelectasis, renal impairment, evidence of sepsis, derangement of serum electrolytes, deep venous thrombosis, vascular and neurovascular events were recorded. Hospital mortality was defined as death within 30 days of surgical intervention.

Statistical analysis:

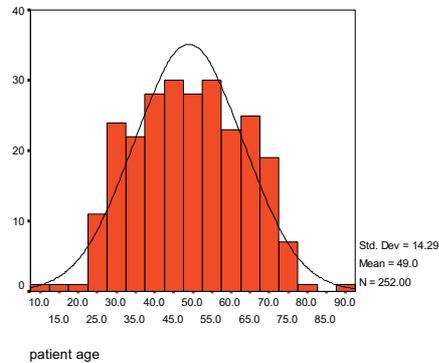
Data was fed to a computerized POSSUM model, in which each patient was assigned a risk score for preoperative physiological status and operative severity score using the established POSSUM criteria. The physiological data included age, systolic blood pressure, Glasgow Coma Scale, respiratory rate, blood urea, pulse rate, ECG, Hb, WBCs, cardiac or respiratory signs and/or symptoms, and serum electrolytes. Each physiological variable was further classified into four degrees of severity. The operative data included the operation severity being moderate, major or very major, multiplicity of surgical procedures, total blood loss, peritoneal soiling, stage of the cancer and mode of surgery being elective or emergency. These data were analyzed for predicted mortality only with the POSSUM equation. Death within 30 days of surgical intervention was the primary end result measure. Comparisons were made between predicted and the observed mortality rates using a Statistical Package of Social Sciences (SPSS). Univariate and multivariate analysis was performed to find the significant factors that determine the actual observed mortality. Significance was taken at P 0.05

Results:-

A total of 252 patients were admitted to the surgical gastrointestinal unit in the period from 1st of January 2004 through 31st. June 2004. They were 132(52.4%) males and 120 (47.6%) female with mean (\pm SD) age 49(\pm 12.29) range 10-90 years (Fig 1). There were 162(64.29%)

patients with different benign gastrointestinal diseases and 90(35.71%) patients with different GIT malignant diseases. The age distribution of the GIT diseases is plotted in figure2. Table 1 shows the significance of the high risk factors.

Fig 1: Age distribution of the study population



216(85.7%) patients underwent surgery. The overall observed mortality was 32(12.7%) patients. 22(10.2%) of them died within one month after surgery and 10(27.8%) died before surgery.

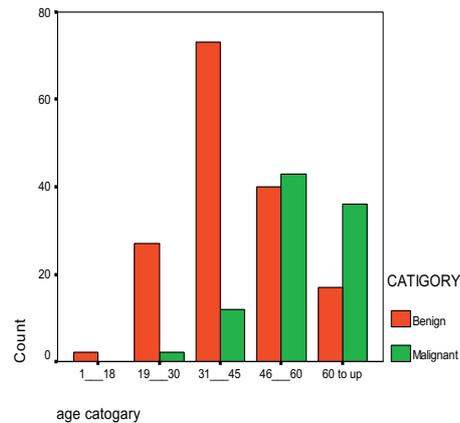


Fig 2: Age versus pattern of GIT disease in 6 months

The highest postoperative frequency of death was due to carcinoma head of pancreas followed by gastric cancer. Observed mortality in carcinoma head of pancreas was 9(27.3%) patients. Carcinoma of the stomach showed an observed mortality of 6(42.9%) patients, and POSSUM predicted mortality ranged from 1.7% to 35.7% with mean of 17.9% (table 1).

One out of the 6 patients who underwent oesophageal cancer surgery died with observed mortality rate 16.7% which is comparable with POSSUM predicted mortality for oesophageal

cancer surgery that ranges from 10.3-19.8 with a mean predicted mortality 15.3.

14 patients were admitted with colorectal cancer (eight colon cancer and six rectal cancer patients). All of them under went surgery with one observed hospital mortality due to advanced colon cancer making an observed mortality 7.1 in colorectal cancer. The POSSUM predicted mortality in colon cancer ranges from 5.3-35.7 and for rectal cancer ranges from 6-13.6 with mean predicted mortality in colorectal cancer 12.2.

Table 1. The observed and POSSUM predicted mortality

Disease	Observed Mortality	POSSUM Predicted Mortality
Carcinoma Of Pancreas	27.3%	6.75%
Carcinoma of the Stomach	42.9%	17.9%
C. Calcular Cholecystitis	2.5%	2.7%
CBD Exploration	4.2%	4.3%
Major Bile Duct Reconstruction	16.7%	15.3%
Hassab Operation	14.3%	17.2%
Colorectal Cancer	7.1%	12.2%
Cholangio-carcinoma	42.9%	8.87%
Oesophageal Cancer	16.7%	3.2%

The observed mortality before surgery was noted in 10 (27.8%) patients. They comprise 61.1% of patients who were considered so critical so that surgical intervention was not offered to them. The observed mortality is statically significantly higher in unoperated patients in contrast to the operated patients (P 0.003). Patients who died before surgery were three cases of advanced adenocarcinoma of the head of pancreas, two cases of advanced adenocarcinoma of the stomach, two cases of advanced proximal cholangiocarcinoma, one case of postvagotomy and gasterojejunostomy, which was operated and referred to us in a critical status, one case of abdominal TB, and one case of advanced gall bladder tumor.

Table 2: Multivariate analysis of factors related to observed mortality at the Surgical GIT Ibn Sina Hospital

Variable	Multivariate
Type of disease	P 0.6560
Age	P 0,0001
Hospital stay	P 0.2380
Physiological score	P 0.0001
Operative score	P 0.1160
Inoperability	P 0.0020
POSSUM predicted mortality	P 0.0001

Discussion

World wide pancreatic cancer ranks the fifth gastrointestinal cancer³, in contrast pancreatic cancer ranks first in this hospital based study. This could be explained by the pattern of referral to this specialized unit. In contrast gastric, colorectal, and oesophageal cancers rank second third and fourth gastrointestinal cancers respectively.

Although we have seen in this study a number of cancer patients below the age of 30, the majority of cancer occur at old age (P 0.0001) and old age is associated with high POSSUM prediction of mortality (P 0.0001). This correlates well with previously published reports⁴.

In this study malignancy increases with age and there is as well an increased mortality rate in malignant gastrointestinal tumours (P 0.0001) with age. In contrast POSSUM prediction of mortality is statistically significantly higher in malignant than benign diseases (P 0.0001) Also, the period of hospitalization is significantly longer in malignant diseases than in benign diseases (P 0.0001).

The POSSUM predicted mortality in colon cancer ranges from 5.3-35.7 and for rectal cancer ranges from 6-13.6 with mean predicted mortality in colorectal cancer 12.2. Therefore, it seems our results and the standard of management of colorectal cancer in our unit is acceptable.

Our findings show a well matched observed mortality in chronic calcular cholecystitis 2.5% with the POSSUM predicted mortality which was 2.7%. It is also comparable to results of published series⁽⁵⁾ which reported mortality in cholecystectomy significantly influenced by age i.e. ranging from 0.3% for those

less than 50 years to 1.6% for 50-65 years and 43% in elderly patients⁽⁶⁾. Also we found that common bile duct stones observed mortality was 4.2% which is consistent with the POSSUM predicted mortality (4.3%). This is in keeping with similar findings from UK⁽²⁾, USA⁽⁷⁾ and China⁽⁸⁾. However, POSSUM was reported by Prytherch et al⁽⁹⁾ from Portsmouth Hospital to have over predicted death by more than five fold in low risk groups. Open cholecystectomy for calculus cholecystitis has mortality of 0.3 – 1.0%, but the mortality is higher in the elderly patients reaching 5 – 6%⁶. Those with acalculus cholecystitis have a mortality rate ranging from 10 – 50%, which far exceeds the expected 1% mortality rate observed in patients with calculus cholecystitis⁶ because commonly acalculus cholecystitis occurs in severely ill patients on total parenteral nutrition in the ICU. The difference in mortality rate in open and laparoscopic cholecystectomy was reported to be not significant⁽¹⁰⁾. Mini-incision cholecystectomy was reported to have 0.12% mortality rate⁽¹¹⁾. On the other hand, bile ducts injuries carry a significant mortality and morbidity. Bismuth classified biliary duct injuries into five classes according to the site and remaining proximal stump⁽¹²⁾. Major biliary duct injury following open or laparoscopic cholecystectomy, carries a serious consequences, which include a demanding complex operative repair that usually result in long hospital stay with an increase risk of death, an increase number of perioperative diagnostic and therapeutic studies, frequent readmissions (often as emergencies), and re-stricture which is considered a lifelong hazard⁽¹²⁾.

POSSUM in this study under predicted mortality in cholangiocarcinoma because out of seven patients, three died within one month and one died before surgery. POSSUM estimated a predicting mortality for cholangiocarcinoma ranging from 2.8-17.2. Also, in this study, POSSUM under predicts mortality rate in carcinoma of the stomach by two folds. The POSSUM predicted mortality for carcinoma of the stomach ranges from 1.7-35.7 with a mean predicted mortality rate 19.3 while the observed mortality was 8 (44.4%). Surgical resection can cure less than 10% of all cases of cholangiocarcinoma⁽¹³⁾. Total resection is possible in 25% to 30% of tumors located in the distal bile duct, which represent a better resectability rate than for tumors in more proximal site⁽¹⁴⁾. The operations for bile duct cancer are usually

extensive and have a high operative mortality (5% - 10%) and low curability⁽¹⁴⁾.

The high observed mortality of the cholangiocarcinoma and gastric cancer in this study is probably due to the extremely late presentation. Similar assumption was also reported from the Scottish Audit for Gastric and Oesophageal Cancer (SASOC)⁽¹⁵⁾ with 9.2% mortality rate and a 60% one year survival were associated with gastric resection alone but removal of spleen, pancreas or liver resection was associated with a significantly higher mortality rates, 18.3, 23.3 and 40%, respectively.

This mortality rate is very much comparable to reports from USA⁷, UK², Mexico, China and Malaysia⁴, where their reported overall mortality rate of 15.4%, 12%, 13.33%, 11.3% and 6.1% respectively. In Maidstone General Hospital⁴ the overall observed mortality was 11.1%. Therefore, the overall observed mortality, in our surgical gastrointestinal unit, is correctly predicted by the POSSUM as proved by univariate and multivariate analysis. In this study observed mortality is not increased with the increased hospital stay as proved by univariate and multivariate analysis and this could be explained by the good perioperative care in our surgical wards where strict guidelines are followed for heparinization, antibiotic, nutritional and nursing policies including the activity of the psychologist as well as cooperation of the physiotherapist for chest physiotherapy and early mobilization.

Conclusion:

POSSUM has under-predicted mortality in gastric carcinoma and cholangiocarcinoma, this is probably due to the very late presentation of the patients with too advanced disease to be operated. However, this needs verification by studying large number of cases. The out come of management of other types of cancer as well as the benign diseases of the gastrointestinal tract is consistent with the predicted values of the POSSUM. In this study the overall observed mortality in operated and unoperated cases collectively was 12.7%. The observed operative mortality alone was 10.2%.

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