

## Risk Scoring for Burst Abdomen Prediction in Patients with Midline Laparotomy

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### ABSTRACT

**Background:** Burst Abdomen is a preventable condition in which many risk factors play their role and lead to life threatening complications. The aim of the present study is to identify the different risk factors and high risk patients for burst abdomen for decreasing the rate of burst abdomen post operatively. **Patients and methods:** An observational analytical study included 110 patients and carried out in General Surgery Department, Faculty of Medicine, Zagazig University Hospitals. The patients were divided into 2 main groups: post-midline laparotomy burst abdomen patients and post-midline non complicated laparotomy with burst abdomen patients. Evaluation of different risk factors between the two groups was performed. **Results:** There is statistically significant relation between occurrence of burst abdomen and both smoking and obesity. There is statistically significant relation between occurrence of burst abdomen and all of direct trauma, diabetes, intra-abdominal infection and jaundice. There is non-significant relation between occurrence of burst abdomen and other risk factors. There is statistically significant relation between occurrence of burst abdomen and postoperative ileus, pulmonary complications and wound infection. Diabetes, wound infection, smoking and direct trauma increased risk of burst abdomen by 47.205, 58.547, 40.559 and 39.874 folds respectively. **Conclusion:** Intra-abdominal infection is the most important factor in predicting burst abdomen. Patient factors like anemia, diabetes, smoking, peritonitis due to bowel perforation act as determinant for wound dehiscence. Postoperatively abdominal burst can be prevented by improving the nutritional status of the patient, early mobilization of the patient and simple investigations like Hemogram, RBS, RFT, LFT, chest x-ray may help to detect predisposing factors.

**Keywords:** Burst abdomen; smoking; Intra-abdominal infection; Diabetes .

### INTRODUCTION:

Burst Abdomen is a preventable condition in which many risk factors play their role and lead to life threatening complications. Burst abdomen (abdominal wound dehiscence) following emergency laparotomy results from multifactorial causes. The main outcome measure found significant as the risk factors of burst abdomen in this study were peritonitis, jaundice, diabetes, smoking, obesity in the preoperative period. And wound infection, pulmonary complication, and postoperative ileus in the post-operative period (1).

Many causes of wound disruption are avoidable. Good and active resuscitation of patients before surgery with emphasis on fluid and electrolytes balance, antibiotic cover, and proper intake and output monitoring, will pay in the end. Strict post-operative care with stress on prevention of wound infection, chest complications, and ileus, can avoid a tragic outcome (2).

Acute wound failure has been discussed under various names i.e. wound dehiscence, burst abdomen, wound disruption and evisceration. It is a very serious complication of abdominal surgery, with very high mortality rate and no single cause being responsible: rather it is a multifactorial problem. Two basic events seen in wound dehiscence are decreased wound strength and increased collagenolysis, most commonly due to infection (3). The mortality rate following wound dehiscence ranges from 9%-43%. Prevention is therefore an important step in decreasing this dreaded complication. It is very important that patient and patient attenders should be fully informed about this complication following emergency laparotomy (4).

The current opinion in centers in the West for closure a midline incision is toward running mass closure with nonabsorbable or slowly absorbable suture using a suture length : wound length ratio of 4 :

1. Continuous running sutures ensure that tension is distributed evenly along the length of the wound (5).

Despite advances in perioperative care and suture materials, incidence and mortality rates have not changed over the past decades. This is attributable to risk factors among patient population outweighing the benefits of technical achievements (6).

The aim of the study is to identify the different risk factors and high risk patients for burst abdomen for decreasing the rate of burst abdomen post operatively.

#### **Patients and Methods:**

An observational analytical study included 110 patients and carried out in General Surgery Department, Faculty of Medicine, Zagazig University Hospitals during the period from July 2019 to January 2020.

Written informed consent was obtained from all participants and the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University.

#### **Inclusion criteria**

All mature patients undergoing laparotomy by midline incision for various indications.

#### **Exclusion criteria**

Patients had laparotomy not through midline incision and patient died or lost in the early post-operative period.

All patients were subjected to full history taking, general and local examination to evaluate site, size and type of burst abdomen either partial or complete. All patients had pre-operative laboratory investigations such as: Complete blood count (CBC) for Hb %, Liver functions for albumin (LFT), Kidney function test (KFT), Coagulation profile (PT, PTT and INR) and Arterial blood gases (ABG).

#### **Operational intervention:**

The patients were divided into 2 main groups according to post-midline laparotomy burst abdomen patients and other group were post-midline non complicated laparotomy with burst abdomen patients.

All patients entered operation room and anesthesia was taken. Sterilization of abdomen and midline exploration was done. Intraabdominal pathology has been dealt with any abnormalities as (peritonitis or trauma). Registration of blood transfusion, blood loss, time of operation and recovery of patient.

#### **Post-Operative care:**

Care at day of operation including remove ryle, urine catheter. All patients had taken analgesia and encouraged to drink Sips of water when pass flatus and to move early as soon as possible. Monitoring of vital data and all patients had laboratory investigations postoperatively.

#### **Follow up:**

All patients were followed during hospital stay, return visits at two weeks up to one month after the operation. Registration of any complications as postoperative ileus, pulmonary complication, wound dehiscence, wound infection, burst abdomen and patient readmission

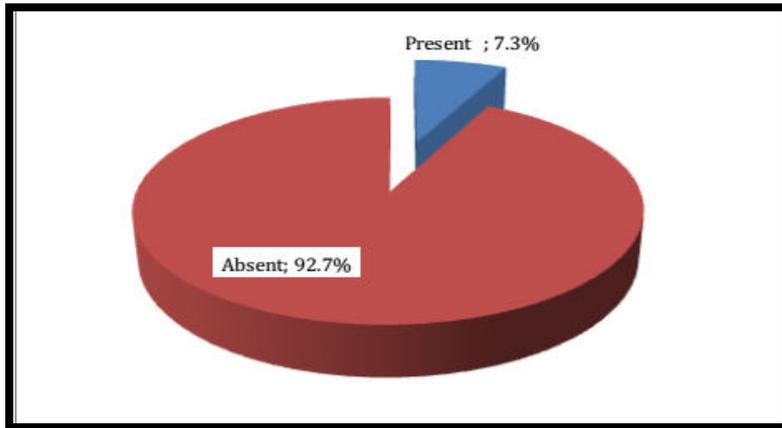
#### **Statistical analysis**

Data analysis was performed using the software SPSS version 20. Categorical variables were described using their absolute frequencies and were compared using Chi square test and Fisher exact test when appropriate. To compare means of two groups, independent sample t test was used to compare means of two groups. The level statistical significance was set at 5% ( $P < 0.05$ ). Binary logistic regression analysis was used to determine potential risk factors of burst abdomen among the studied patients. Highly significant difference was present if  $p \leq 0.001$ .

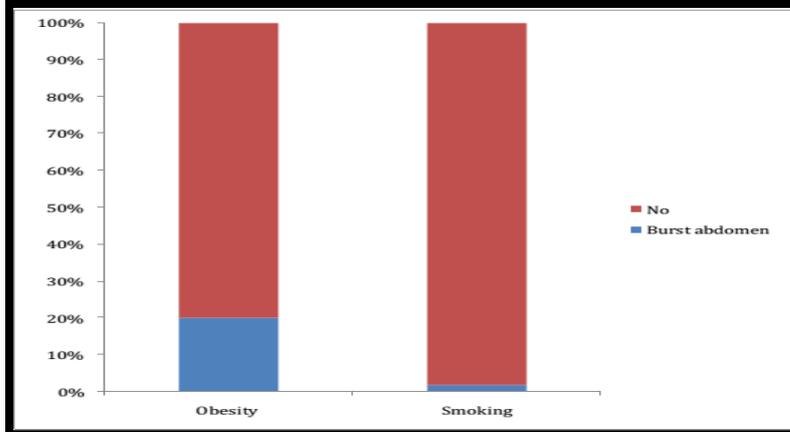
#### **Results:**

This an observational analytical study was done on 110 patients. Age of the studied patients ranged from 40 to 72 years with mean 54.61 years (**Figure 1**). There is statistically significant relation between occurrence of burst abdomen and both smoking and obesity (**Figure 2**). There is statistically significant relation between occurrence of burst abdomen and all of direct trauma, diabetes, intra-abdominal infection and jaundice. There is non-significant relation between occurrence of burst abdomen and other risk factors (**Figure 3**). There is statistically significant relation between occurrence of burst abdomen and postoperative ileus, pulmonary complications and wound infection (**Figure 4**).

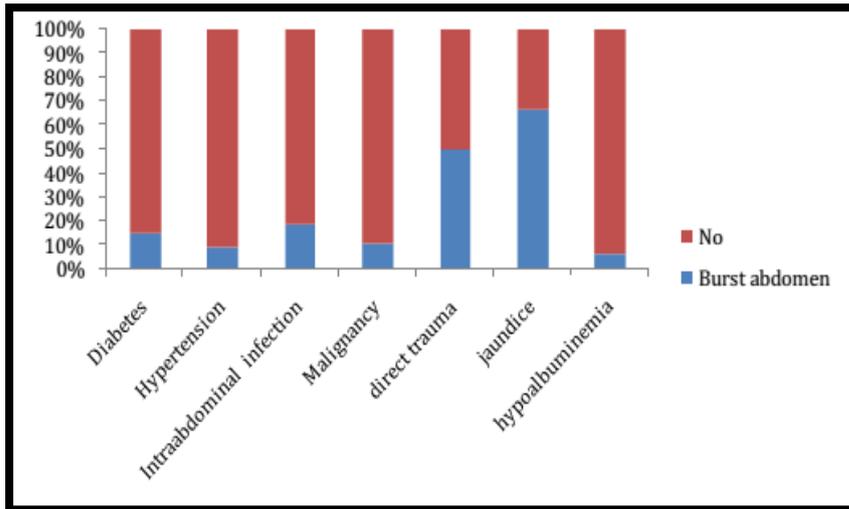
Rrgarding Logistic regression of factors associated with occurrence of burst abdomen among the studied patients, diabetes, wound infection, smoking and direct trauma increased risk of burst abdomen by 47.205, 58.547, 40.559 and 39.874 folds respectively (**Table 1**). Incidence of burst abdomen in each risk factor shown in (**Table 2**).



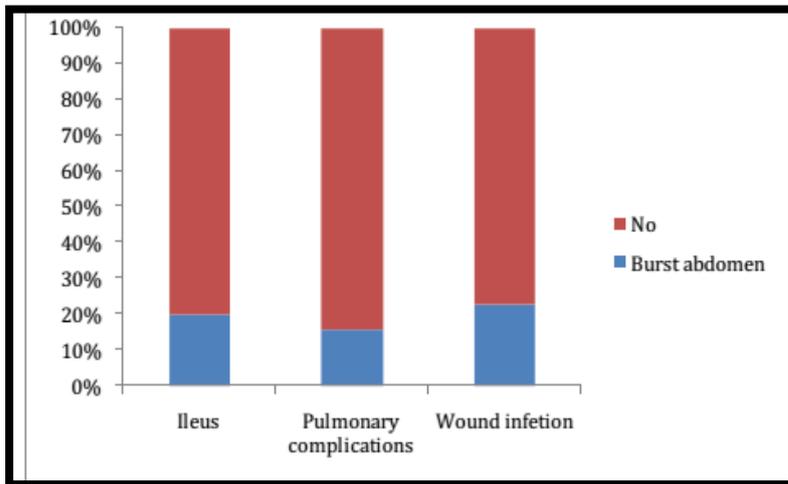
(Figure 1): Pie chart showing distribution of the studied patients according to occurrence of burst abdomen



(Figure 2): Combined bar chart showing relation between occurrence of burst abdomen and both obesity and smoking



(Figure 3): Combined bar chart showing relation between occurrence of burst abdomen and medical history



(Figure 4): Combined bar chart showing relation between occurrence of burst abdomen and wound infection, ileus and pulmonary complications

Table (1): Logistic regression of factors associated with occurrence of burst abdomen among the studied patients:

	B	P	AOR	95% C.I.	
				Lower	Upper
<b>Diabetes (present)</b>	3.854	0.027*	47.205	1.554	1434.1
<b>Wound infection (present)</b>	4.07	0.015*	58.547	2.224	1541.18
<b>Smokers</b>	3.703	0.037*	40.559	1.252	1313.835
<b>Direct trauma (present)</b>	3.686	0.017*	39.874	1.912	831.682

AOR Adjusted odds ratio. CI confidence interval. \*p<0.05 is statistically significant

Table (2): Incidence of burst abdomen in each risk factor:

Risk factors	Total number Of patients	Patients developed Burst abdomen	%
Jaundice	3	2	66
Blunt abdominal trauma	4	2	50
Wound infection	31	7	22.6
Obesity	8	4	20
Post operative ileus	20	4	20
Intra-abdominal infection	27	5	18.5
Anemia	19	3	15.5
Pulmonary complication	45	7	15.6
Smoking	46	7	15.2
Diabetes	48	7	14.6
Non-absorbable sutures	39	5	12.8
Resident operator	36	4	11.1
Malignancy	20	2	10
Hypertension	35	3	8.6
Male gender	71	6	8.5
Age > 55	63	5	7.9
Radiotherapy	16	1	6.25
Hypoalbuminemia	35	2	5.7
Senior operator	74	4	5.4
Absorbable sutures	71	3	4.2
Corticosteroid therapy	25	0	0

## DISCUSSION

Wound dehiscence after abdominal operation is a multifactorial problem in which local and systemic factors are involved: surgical expertise, type of incision, suture material, surgical site infection, nutritional status, persistent cough, abdominal distension, leakage of pancreatic enzymes, anaemia, obesity, diabetes, jaundice, advanced age, emergency surgery, colon surgeries and malignancy have all been suggested predisposing factors to wound dehiscence (7).

This study included 110 patients undergoing laparotomy by midline incision for identifying the different risk factors and high risk patients for burst abdomen for decreasing the rate of burst abdomen post operatively.

In our study, the frequency of wound dehiscence or burst abdomen was 7.3%. Compared to other studies, in **Wilson et al., (8)** and **Col et al., (9)** suggested wound dehiscence or burst abdomen frequency ranges from 1-3%. Also, **Waqar et al., (2)** reported frequency of burst abdomen about 5.9 %.

In contrary, a study of **Makela et al., (10)** in India showed wound dehiscence or burst abdomen frequency from 10 – 30 % frequency. This may be attributable to poor nutritional status of patients, high incidence of wound infection, and delay in presentation to tertiary health care hospitals, presence of diabetes and occurrence of peritonitis.

Our study are in agreement with **Grantcharov and Rosenberg (11)** stated risk factors for burst abdomen as were poor nutritional status, obesity, diabetes mellitus and hypoproteinemia. Also, **Sinha et al., (12)** found that 65% patients with pre-operative hypoalbuminemia, other risk factors included anemia, malnutrition, chronic lung disease and emergency procedure.

Diabetes mellitus is considered a risk factor as it was found in 7 cases of burst abdomen in our study. This in agreement with **Sivender et al., (13)** reported in 29 diabetic cases among 50 cases presented with burst abdomen. Similarly, **Rashid et al., (14)** revealed diabetes was in 10% of cases who developed burst abdomen.

This can explained that diabetes mellitus causes micro-angiopathy, atherosclerosis and increased susceptibility to infection due to decrease the immune response and thus causes wound dehiscence as well as burst abdomen.

Our study are in agreement with **Ramneesh et al.,(15)** found that out of 50 patient who developed burst abdomen 35 of them had peritonitis due to perforation of hollow viscus.

Simillary, **Sivender et al., (13)** documented that intra-abdominal infection is one of the major risk factors for burst abdomen as they found that 60% of their cases who developed burst abdomen had intra-abdominal infection.

Moreover, our study concur with **Waqar et al., (2)** revealed that 3(7%) cases of burst abdomen were smokers; but in our study 7(15.2%) cases of burst abdomen were smokers which is significant risk factor for burst abdomen.

Prior studies have identified several risk factors associated with the development of abdominal wound dehiscence, such as: age (> 65 years old), gender (male), smoking, obesity, chronic steroid therapy, anemia, jaundice, uremia, diabetes, low albumin level, chronic obstructive pulmonary disease, wound infection, and emergency surgery (**16,17,18**).

The results of this study indicate that wound dehiscence is a complex process that is influenced by factors both of a general and local nature, as well as pre-, intra- and postoperative timing. Only the common occurrence of a number of factors lead to the development of this complication. Most of the risk factors do not depend directly on the surgeon, but rather on patient factors such as: gender, age and type of disease to be treated.

#### **CONCLUSION:**

Intra-abdominal infection is the most important factor in predicting burst abdomen. Patient factors like anemia, diabetes, smoking, peritonitis due to bowel perforation act as determinant for wound dehiscence. Postoperatively abdominal burst can be prevented by improving the nutritional status of the patient, early mobilization of the patient and simple investigations like Hemogram, RBS, RFT, LFT, chest x-ray may help to detect predisposing factors.

**NO conflict of interest.**

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