Original Article

DOI: 10.7860/JCDR/2024/74316.20390

Surgery Section

Factors Associated with Burst Abdomen in Patients of Midline Laparotomy, Assessed using Risk Scoring System: A Retrospective Observational Study

MOHANESH SADH[1], PEEYUSH KUMAR[2], LALIT KUMAR BANSAL[3], POOJA RAMESH[4], ATUL JAIN[5]

ABSTRACT

Introduction: Burst abdomen can result in evisceration (protrusion of abdominal viscera), requiring immediate treatment. If, left untreated, it can cause perioperative mortality. Some studies have been conducted in the past to develop risk scoring systems to identify patients who have a significant risk of developing a burst abdomen. The Rotterdam score considers all three risk factors (i.e., preoperative, intraoperative, and postoperative) and is a standard scoring system for predicting the risk of burst abdomen in the Western population. The Krishna Institute of Medical Sciences (KIMS) 14 score compares only preoperative and intraoperative factors.

Aim: To evaluate the demographic and clinical profile of patients developing burst abdomen following laparotomy for peritonitis and to assess their Rotterdam and KIMS 14 risk scores.

Materials and Methods: This retrospective observational study was conducted in the Department of Surgery at GTB Hospital, New Delhi, India, from January 2024 to March 2024. The case sheet records of patients operated on in the last three years (January 2021 to December 2023) were evaluated. A total of 100 patients were enrolled as per inclusion and exclusion criteria. A total of 50 patients were classified as cases (who developed burst abdomen) and 50 patients as controls (who did not have burst abdomen). The outcome measures included demographic and clinical data of patients, associated co-morbidities, preoperative status, and intraoperative findings (organ affected, type of contamination, postoperative complications). The Rotterdam score and KIMS 14 score were calculated. For qualitative variables, the Chi-square test or Fisher's-exact test was used. Statistical significance was set at $p<0.05$.

Results: Most subjects in the dehiscence group were males (40), and the rate was higher in the older age group (17 patients). The maximum number of dehiscences occurred postoperatively on day 6, with a mean of 6.66±2.66 days. The duration of surgery exceeding two hours was higher (80%) in the dehiscence group. The total leucocyte count (11074.00±6238.35/mm^3) and liver enzymes {Serum Glutamic Oxaloacetic Transaminase (SGOT) 68.72±58.90 U/L and Serum Glutamic Pyruvic Transaminase (SGPT) 68.22±75.62 U/L} were elevated in the dehiscence group. The incidence of Surgical Site Infection (SSI) in the postoperative period was higher (98%) in the dehiscence group. The mean Rotterdam and KIMS 14 scores were higher in patients who developed wound dehiscence (Rotterdam score of 5.05 and KIMS 14 score of 11.76) compared to patients who did not develop dehiscence (Rotterdam score of 3.73 and KIMS 14 score of 8.92). The p-values were 0.001 and 0.002 for the Rotterdam and KIMS 14 scores, respectively.

Conclusion: Rotterdam and KIMS 14 scores were found to be statistically significant in patients developing burst abdomen. The mean score in both scoring systems was higher in patients who developed burst abdomen.

Keywords: Evisceration, Rotterdam risk score, Wound dehiscence

INTRODUCTION

A burst abdomen is diagnosed when all layers of the abdominal wall (including the rectus sheath) give way postoperatively [1], usually between postoperative days 7-10, with the highest reported incidence on day 7 [2]. The causes of a burst abdomen can be divided into preoperative, intraoperative, and postoperative factors. This condition is a severe postoperative complication commonly seen after laparotomy, with mortality rates as high as 45% [3]. The literature indicates that the incidence ranges from 0.3 to 3.5% [3]. A burst abdomen can result in evisceration (the protrusion of abdominal viscera), which requires immediate treatment. If left untreated, it can cause perioperative mortality. Patients with a burst abdomen often experience prolonged hospital stays and have a high incidence of developing incisional hernias, which may necessitate subsequent reoperations. Despite advances in patient care, including enhanced perioperative care, improved surgical techniques, and better suture materials, the incidence of burst abdomen has not significantly decreased [4].

Some studies have been conducted in the past to develop risk scoring systems to identify patients at significant risk for developing a burst abdomen [3-5]. The Rotterdam score considers all three risk factors (i.e., preoperative, intraoperative, and postoperative) and is a standard scoring system for predicting the risk of burst abdomen in the western population [4]. The KIMS 14 score compares only preoperative and intraoperative factors and is a relatively new scoring system studied in the Indian population [5].

There is a lack of studies on burst abdomen with scoring systems in the Indian population, as well as a comparison of the Rotterdam and KIMS 14 scores. The goal of this study was to evaluate the profile (demographic and clinical) of patients developing burst abdomen following laparotomy for peritonitis and to assess their Rotterdam and KIMS 14 risk scores.

MATERIALS AND METHODS

The present retrospective observational study was conducted in the Department of Surgery at GTB Hospital, New Delhi, India, from January 2024 to March 2024 after obtaining clearance from the Institutional Ethics Committee (IEC-HR/2019/41/60). In present study, the case sheet records of patients operated on in the last three years (January 2021 to December 2023) were evaluated.

Inclusion criteria: Cases were defined as patients over the age of 18 years who underwent a midline laparotomy for perforation peritonitis and developed a burst abdomen during the postoperative period. Control patients were defined as those over the age of 18 years who did not experience a burst abdomen during the follow-up period.

Exclusion criteria: Patients with previous laparotomies, those who were operated on due to trauma, those chosen for management with an open abdomen, and those who needed surgery again in the postoperative period were all excluded. Cases with insufficient information were also excluded.

Study Procedure

After analysing the data of 792 patients who underwent exploratory laparotomy during this duration, 100 patients were enrolled as per inclusion and exclusion criteria. Total 50 patients were designated as cases and 50 patients as the control group. Patients who underwent midline laparotomy for peritonitis and did not develop a burst abdomen were selected as controls.

Outcome measures included demographic data (age and gender) and clinical data (signs and symptoms at presentation), co-morbidities associated, preoperative status, and intraoperative findings (organ affected, type of contamination, and postoperative complications). Symptoms noted included abdominal distension, non-passage of faeces and flatus, nausea and vomiting, abdominal pain, and fever. Signs noted included jaundice, haematemesis, melena, and weight loss. The Rotterdam Score and KIMS-14 score were also calculated.

Rotterdam score: In a study conducted by van Ramshorst GH et al., a patient with a score of >6, without counting the postoperative risk factors, was considered a high-risk patient; this cut-off was used in the present study [Table/Fig-1] [4].

Criteria	Score
Age (years)	
18-39	0
40-49	0.4
50-59	0.9
60-69	0.9
>70	1.1
Male gender	0.7
Chronic pulmonary disease	0.7
Ascites	1.5
Jaundice	0.5
Anaemia	0.7
Emergency surgery	0.6
Type of surgery	
a) Gallbladder/Bile duct	0.7
b) Oesophagus	1.5
c) Small bowel	0.9
d) Large bowel	1.4
e) Vascular	1.3
Coughing	1.4
Wound infection	1.9
Total	10.6

[Table/Fig-1]: Rotterdam score.

KIMS 14 scores: In a study conducted by Akmal R et al., a KIMS-14 score of more than five was reported to have a sensitivity of 100% and specificity of 94.4% [6]. This cut-off was therefore used in the present study [Table/Fig-2].

Parameters	Score
Hypoproteinaemia	5.0
Uraemia	4.0
Surgery duration	4.5
Perforation or contaminated wounds	3.0
Chest infections/Chronic Obstructive Pulmonary Disease (COPD)	4.0
Anaemia	1.0
Age>60 years	1.0

[Table/Fig-2]: KIMS 14 score.

STATISTICAL ANALYSIS

The data were collected using the case sheets of the patients. For categorical variables, the Chi-square test or Fisher's exact test was used. For continuous variables, a t-test was used. Statistical significance was set at $p<0.05$, with an alpha (Type I error) of less than 5.0% and a beta (Type II error) of less than 20.0%.

RESULTS

The proportion of patients older than 40 years of age was higher in the dehiscence group 17 (34%) compared to the non dehiscence group 10 (20%). Similarly, the proportion of males was higher in the dehiscence group 40 (80%) compared to the non dehiscence group 32 (64%) [Table/Fig-3].

Parameters	Group		p-value
	Case	Control	
Age (in years) (Mean±SD)	34.92±15.96	32.12±14.80	0.548
Age group n (%)			
18-40 years	33 (45.2%)*(66%)#	40 (54.8%)*(80%)#	0.381
41-59 years	11 (64.7%)*(22)#	6 (35.3%)*(12%)#	
60-69 years	5 (62.5%)*(10%)#	3 (37.5%)*(6%)#	
≥70 years	1 (50.0%)*(2%)#	1 (50.0%)*(2%)#	
Gender n (%)			
Male	40 (55.6%)*(80%)#	32 (44.4%)*(64%)#	0.075
Female	10 (35.7%)*(20%)#	64.3%)*(36%)#	

[Table/Fig-3]: Comparison of the demographic profile (n=100).
*Denotes percentage between the two groups; #Denotes the percentages within a single group

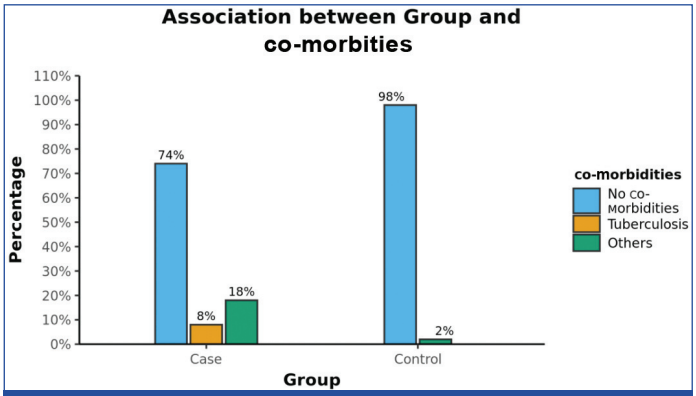
The proportion of patients developing dehiscence had a lower mean duration of symptoms before presenting to the hospital (7.51 days) compared to those who did not develop dehiscence (11.5 days). However, no significant statistical difference was found between the two groups. Most cases of burst abdomen occurred on postoperative day 6 (a total of 10 cases) [Table/Fig-4].

Parameters		Group		p-value
		Case	Control	
Symptoms present	[1]Abdominal distension	15 (51.7%)	14 (48.3%)	0.826
	[1]Non passage of faeces and flatus	20 (47.6%)	22 (52.4%)	0.685
	[1]Nausea and vomiting	19 (45.2%)	23 (54.8%)	0.418
	[2]Abdominal pain	48 (49.5%)	49 (50.5%)	1.000
	[1]Fever	19 (61.3%)	12 (38.7%)	0.130
Symptoms duration (days)	Mean (SD)	7.51 (17.24)	11.50 (24.28)	0.654
	Median (IQR)	4 (2-6)	3.5 (2-5.75)	
Signs present	[2]Jaundice	6 (75.0%)*(12%)#	2 (25.0%)*(4%)#	0.269
	[1]Haematemesis	0	0	1.000
	[2]Melena	1 (100.0%)*(2%)#	0	1.000
	[2]Weight loss	2 (66.7%)*(4%)#	1 (33.3%)*(2%)#	1.000

[Table/Fig-4]: Comparison of symptoms and signs at time of admission (N=100).
*Denotes percentage between the two groups, #Denotes the percentages within a single group; 1: Chi-square test; 2: Fisher's-exact test

In the group of patients who developed dehiscence, five had a history of previous surgery, of which only three patients had a history of laparotomy.

The proportion of patients with co-morbidities was higher in those who developed dehiscence 13 (26%) compared to those who did not develop dehiscence 1 (2%). There was a statistical difference (p-value=0.002) between the two groups with respect to co-morbidities [Table/Fig-5].



[Table/Fig-5]: Association between two groups and co-morbidities (n=50).

In present study, the proportion of patients with a history of smoking was higher in the group that developed wound dehiscence 7 (14%) compared to those who did not develop wound dehiscence 1 (2%). However, this difference was statistically not significant.

In our study, patients developing wound dehiscence had a relatively higher proportion of small bowel aetiology 33 (66%) compared to 22 (44%) in those without wound dehiscence; however, this difference was statistically not significant with respect to small bowel aetiology [Table/Fig-6].

Organ involved	Group		p-value
	Case	Control	
No organ aetiology found	0 (0.0%) (0%)#	2 (100.0%) (4%)#	0.074
Gastric disease	6 (30.0%)*(12%)#	14 (70.0%)*(28%)#	
Small bowel disease	33 (60.0%)*(66%)#	22 (40.0%)*(44%)#	
Large bowel/appendix/ caecum disease	9 (45.0%)*(18%)#	11 (55.0%)*(22%)#	
Gallbladder disease	2 (66.7%)*(4%)#	(33.3%)*(2%)#	

[Table/Fig-6]: Comparison of diagnosis between two groups (n=100).
*Denotes percentage between the two groups; #Denotes the percentages within a single group; Chi-square test was used

The proportion of patients having an intraoperative duration of more than two hours was higher in the group that developed dehiscence 40 (80%) compared to the group that did not develop dehiscence 37 (74%). However, there was no significant statistical difference between the two groups of patients [Table/Fig-7].

Duration of surgery	Group		p-value
	Case	Control	
Duration of surgery (hours)	2.56±0.92	2.34±1.00	0.1351
Duration of surgery			0.4762
• <2 hours	10 (43.5%)*(20%)#	13 (56.5%)*(26%)#	
• ≥2 hours	40 (51.9%)*(80%)#	37 (48.1%)*(74%)#	

[Table/Fig-7]: Comparison of the duration of surgery (hours) between the two groups (n=100).
*Denotes percentage between the two groups; #Denotes the percentages within a single group; 1 denotes t-test was used; 2 denotes Chi-square test

In our study, bilio-purulent contamination was the most common type of contamination observed in both groups of patients. There was no specific type of contamination that showed a higher proportion in the group of patients who developed dehiscence [Table/Fig-8].

Intraoperative contamination	Group		p-value
	Case	Control	
No contamination	12 (70.6%)*(24%)#	5 (29.4%)*(10%)#	0.062
Bilio-purulent	20 (44.4%)*(40%)#	25 (55.6%)*(50%)#	0.315
Faeco-purulent	12 (60.0%)*(24%)#	8 (40.0%)*(16%)#	0.317
Purulent	11 (50.0%)*(22%)#	11 (50.0%)*(22%)#	1.000
Serous	0 (0.0%)*(0%)#	2 (100.0%)*(4%)#	0.495

[Table/Fig-8]: Comparison of intraoperative contamination between the two group of subjects (n=100).
*Denotes percentage between the two groups; #Denotes the percentages within a single group; Fischer-exact test was used

In our study, SSI was present in a higher proportion in the group of patients who developed dehiscence 49 (98%) as compared to the group of patients who did not develop dehiscence 21 (42%). This difference was statistically significant, with a p-value of less than 0.001.

The mean total leucocyte count in the group of patients who developed dehiscence was 11,074/mm^3, compared to 8,346/mm^3 in the group of patients who did not develop dehiscence. This difference was statistically significant, with a p-value of 0.042.

The mean SGPT value was found to be 68.22 U/L in the group of patients who developed dehiscence, compared to 45.00 U/L in the group of patients who did not develop dehiscence. This difference was statistically significant, with a p-value of 0.008.

Haemoglobin levels, platelet counts, total bilirubin levels, direct bilirubin levels, and Alkaline Phosphatase (ALP) values did not show a statistically significant difference with respect to burst abdomen in our study [Table/Fig-9].

Laboratory investigation	Group		p-value
	Case	Control	
Haemoglobin (g/dL) (Mean±SD)	11.86±2.66	11.46±1.90	0.387[1]
Haemoglobin n (%)			0.476[2]
<10 g/dL	13 (56.5%)	10 (43.5%)	
≥10 g/dL	37 (48.1%)	40 (51.9%)	
TLC (/mm^3) (Mean±SD)	11074.00±6238.35	8346.00±3843.16	0.042[1]
TLC n (%)			0.523
<11000/mm^3	32 (47.8%)*(64%)#	35 (52.2%)*(70%)#	
≥11000/mm^3	18 (54.5%)*(36%)#	15 (45.5%)*(30%)#	
Platelets counts n (%)			0.160
<1.5 Lacs /mm^3	15 (62.5%)	9 (37.5%)	
≥1.5 Lacs /mm^3	35 (46.1%)	41 (53.9%)	
Direct bilirubin (mg/dL) (Mean±SD)	0.63±0.73	0.49±0.55	0.278[1]
Total bilirubin (mg/dL) (Mean±SD)	1.37±1.37	1.10±0.96	0.336[1]
Total bilirubin n (%)			1.000
<3 mg/dL	46 (49.5%)*(92%)#	47 (50.5%)*(94%)#	
≥3 mg/dL	4 (57.1%)*(8%)#	3 (42.9%)*(6%)#	
SGOT (U/L) (Mean±SD)	68.72±58.90	67.44±213.85	0.003[1]
SGOT (U/L) (Median)	51	26	
SGOT n (%)			0.084
<100 U/L	40 (46.5%)	46 (53.5%)	
≥100 U/L	10 (71.4%)	4 (28.6%)	
SGPT (U/L) (Mean±SD)	68.22±75.62	45.00±89.05	0.008[1]
SGPT (U/L) (Median)	47	26.5	
SGPT n (%)			0.031
<100 U/L	42 (46.2%)	49 (53.8%)	
≥100 U/L	8 (88.9%)	1 (11.1%)	
ALP (U/L) (Mean±SD)	129.26±95.73	213.42±464.82	0.068[1]

ALP n (%)			0.159
<100 U/L	24 (43.6%)	31 (56.4%)	
≥100 U/L	26 (57.8%)	19 (42.2%)	
Blood urea (mg/dL) (Mean±SD)	59.72±44.40	42.80±28.64	0.065[1]
Blood urea n (%)			0.072
<40 mg/dL	21 (41.2%)*(42%)#	30 (58.8%)*(60%)#	
≥40 mg/dL	29 (59.2%)*(58%)#	20 (40.8%)*(40%)#	
Total protein (g/dL) (Mean±SD)	5.57±1.32	5.72±0.89	0.442[1]
Total protein n (%)			0.224
<6 g/dL	32 (55.2%)*(64%)#	26 (44.8%)*(52%)#	
≥6 g/dL	18 (42.9%)*(36%)#	24 (57.1%)*(48%)#	
S. albumin (g/dL) (Mean±SD)	2.83±0.91	2.91±0.45	0.060[1]
S. albumin n (%)			0.227
<3 g/dL	31 (55.4%)*(62%)#	25 (44.6%)*(50%)#	
≥3 g/dL	19 (43.2%)*(38%)#	25 (56.8%)*(50%)#	

[Table/Fig-9]: Comparison of the laboratory investigations between the two groups (N=100).
*Denotes percentage between the two groups; #Denotes the percentages within a single group; for 1 t-test was used; for the rest, the Chi-square test was used

The mean Rotterdam and KIMS 14 scores were higher in patients who developed wound dehiscence (Rotterdam score of 5.05 and KIMS 14 score of 11.76) compared to patients who did not develop dehiscence (Rotterdam score of 3.73 and KIMS 14 score of 8.92). This difference was statistically significant in both scoring systems [Table/Fig-10].

	Group		
Scoring system	Case	Control	p-value
Rotterdam score (Mean±SD)	5.05±0.99	3.73±0.90	<0.001[1]
Rotterdam score category n (%)			0.003[2]
<6	41 (45.1%)*(82%)#	50 (54.9%)*[100%]#	
≥6	9 (100.0%)*(18%)#	0 (0.0%)*[0%]	
KIMS 14 score	11.76±3.96	8.92±4.46	0.002[1]
KIMS 14 score category			0.007[2]
<5	2 (15.4%)*(4%)#	11 (84.6%) (22%)#	
≥5	48 (55.2%)*(96%)#	39 (44.8%)*(78%)#	

[Table/Fig-10]: Comparison of the scoring system between the two groups (N=100).
*denotes percentage between the two groups; #denotes the percentages within a single group; 1 denotes t-test was used; 2 denotes Chi-square test was used

DISCUSSION

The mean age of the patients who developed dehiscence was 34.92 years, with most patients falling within the age group of 18 to 40 years. There was no significant age difference between the two groups.

A study conducted by Jaiswal N and Shekhar S evaluated 82 patients with abdominal wall dehiscence in terms of aetiological factors and current management methods [7]. The mean age of dehiscence in present study was 49 years. Additionally, a study by Singh G et al., involving 40 patients found that the median age of those who developed burst abdomen was 31 years [8], with 20% of the patients being over 60 years of age.

In the present study, 80% of patients who developed burst abdomen were males. In a study of 210 patients conducted by Tiwari VK, 51 developed burst abdomen [9], with 86.27% of these patients being males. A study done by van Ramshorst GH et al., evaluated a total of 1,452 patients retrospectively [4]. Out of 363 patients with burst abdomen, 75% were male. In present study, similar results were observed.

The median postoperative day on which burst abdomen occurred was day 6. Teklewold B et al., in their study of 4,137 patients, found that the majority of patients developed burst abdomen between postoperative days 6 and 10 [10]. In studies conducted by Parmar G et al., and Vardhini KV and Kishan D, the median postoperative day on which burst abdomen developed was day 7 [2,11].

In a study by van Ramshorst GH et al., 9.7% of patients had jaundice at the time of presentation [4]. In a study by Abro S et al., 1% of patients had jaundice, 10% had melena, and 16% had haematemesis [12]. A study conducted by Hameed T et al., found that 1.1% of patients had melena at the time of presentation [13].

The reported incidence of jaundice varied across different studies, ranging from 1% to 9.7%. In present study, it was 12%. Similarly, the reported incidence of melena varied in different studies, ranging from 1.1% to 10%. In our study, it was 2%. Only one study evaluated haematemesis, reporting an incidence of 16%. In our study, no cases of haematemesis were reported.

Various studies have assessed the role of co-morbidities in burst abdomen [4,13,14]. A study conducted by Van Ramshorst GH et al., reported that 46% of patients had hypertension and 29% had Chronic Obstructive Pulmonary Disease (COPD) at the time of presentation [4]. Hameed T et al., reported that 3.1% of patients in their study had tuberculosis [13]. Yadav D et al., reported the incidence of tuberculosis at 8%, while 1.3% of patients had hypertension, and none had COPD [15].

In a study conducted by Kenig J et al., it was reported that 51% of patients who developed burst abdomen were hypertensive, while 16% had COPD at the time of presentation. The proportion of patients diagnosed with tuberculosis ranged from 3% to 8%. In our study, it was 8%, which is similar to other studies. However, the proportions of patients with hypertension and COPD were higher in those studies than in ours. This disparity can be attributed to the populations of different geographic areas studied. Genetics, lifestyle, and environmental conditions vary between our study and those of the other authors. This can explain the differences in co-morbidities. Nevertheless, the study by Yadav D et al., which was also conducted in Delhi, India, correlates with our findings in this regard [15].

Gili-Ortiz E et al., evaluated 323,894 patients who underwent abdominal surgeries retrospectively [16]. Among these patients, those with a history of alcohol intake who developed burst abdomen constituted 7.7%, compared to 2% in our study.

In a retrospective study by Abbas SM and Hill AG, 46% of patients who developed burst abdomen had a history of smoking [17]. Conversely, in a study conducted by Kenig J et al., 27.3% of patients had a history of smoking [3]. In our study, the proportion of patients with a current or past history of smoking was 14%.

Authors also examined the organs responsible for peritonitis and their association with burst abdomen. Kenig J et al., reported that 9% of total cases had an aetiology related to the stomach or duodenum, 16% had small bowel aetiology, 41% had large bowel aetiology, and 9% had gallbladder aetiology [3]. Jaiswal N et al., reported that 29.26% of patients had an aetiology related to the stomach or duodenum, 19.51% had small bowel aetiology, and 7.31% had large bowel aetiology [7]. Van Ramshorst GH et al., reported that 8% of patients had gastro-duodenal aetiology, 7% had small bowel aetiology, and 27% had large bowel aetiology [4]. Our results are similar to those of most studies [3,4,7]. Gallbladder aetiology was found to be less than 10% in other studies, while in present study, it was 4%. The aetiology related to the small bowel was higher in our study (66%) compared to other studies. Similarly, the aetiology related to the large bowel was lower than in other studies. This difference can be attributed to the smaller size of our study.

In a retrospective study by Gokak A et al., 86.6% of patients with burst abdomen had an operative duration of >2 hours [5]. Van Ramshorst GH et al., reported that >68% of patients with burst abdomen had an intraoperative duration of >150 minutes [4]. In our study, 80% of patients who developed burst abdomen had a duration of operation exceeding 2 hours, which is consistent with other studies.

Surgical Site Infection (SSI), as defined in the Centre for Disease Control and Prevention (CDC) guidelines, was used to identify patients developing SSI. Riou JP et al., conducted a study on 69 patients to investigate the various local and systemic factors associated with burst abdomen [18]. A total of 69 patients were evaluated, and thirty-one developed burst abdomen postoperatively. In present study, 45% of the patients had SSI. Van Ramshorst GH et al., reported the incidence of SSI at 52% among patients who developed burst abdomen [4].

Ramneesh G et al., conducted a prospective study involving 50 patients who developed burst abdomen to identify the risk factors associated with this condition [19]. They reported that 90% of patients who experienced burst abdomen had SSI.

Rashid MHA et al., reported SSI in 62% of patients during the postoperative period [20]. In their study, 98% of patients who developed burst abdomen had SSI in the postoperative period. This proportion was high compared to other studies, where it ranged from 45 to 90%. This could be due to the fact that all the cases selected for their study were operated on in an emergency setting, which typically has higher SSI rates compared to laparotomies performed in an elective setting. A prospective study by Meena R et al., demonstrated the difference in SSI rates between emergency and elective surgeries [21]. In their study, the overall SSI rate for elective and emergency laparotomies was 20%. This rate increased to 31% in emergency cases. All the patients included in our study had peritonitis, and the majority had intraoperative contamination.

Kapoor KK and Hassan MMN reported that 53.33% of patients had anaemia, 6.66% had hyperbilirubinaemia, and 60% had hypoalbuminemia at the time of presentation [22]. Gokak A et al., reported an incidence of anaemia at 73.33%, 56.67% had hyperbilirubinaemia, 73.33% had uraemia, and 73.33% had hypoalbuminemia at the time of presentation [5]. Kenig J et al., reported that 60% of study patients had anaemia, while 7% had hyperbilirubinaemia [3]. Jaiswal N et al., reported the incidence of anaemia at 73.17%, with 19.51% of patients having hyperbilirubinaemia and 32.92% having uraemia at the time of presentation [7].

The proportion of patients with anaemia in our study was lower compared to other studies, where it ranged from 53% to 73%. In our study, hyperbilirubinaemia was observed in 8%, which was similar to most other studies.

The two scoring systems used in our study were the Rotterdam score and the KIMS 14 score. Van Ramshorst GH et al., reported a mean Rotterdam score of 5.7 in patients who developed burst abdomen [4]. The authors suggested that patients with a score greater than 6 had a 13.5% higher chance of developing burst abdomen. In their study, 29 patients had a score between 6 and 8, of which 7 (24.1%) patients developed burst abdomen in the postoperative period. Only two study patients had a Rotterdam score greater than 8, and both developed burst abdomen postoperatively.

Kenig J et al., reported a mean Rotterdam score of 4.95 in the group of patients who developed dehiscence [3]. In a study conducted by Sudish D, 100 patients who underwent midline laparotomy were evaluated for the risk factors associated with burst abdomen [23]. The assessment of Rotterdam scoring was also performed. Total 13 patients developed burst abdomen in the postoperative period. Total 12 patients had a Rotterdam score of 6-8, out of which five developed dehiscence. Four patients had a score of >8, and all of them developed dehiscence.

In a study by Van Ramshorst GH et al., the mean Rotterdam score for the case group was 5.7, while the control group had a score of 2.9 [4]. In their study, Kenig J et al., discovered that the mean score for the case group was 4.95 and for the control group was 3.3 [3]. Our study found a score of 5.05 for the case group and 3.73 for the control group, which is similar to other studies. In our study, nine patients had a Rotterdam score of >6, and all of them developed burst abdomen postoperatively; none of the patients in the control group had a Rotterdam score of >6.

Akmal R et al., studied the sensitivity and specificity of KIMS 14 and VAMC scores to predict the probability of developing a burst abdomen [6]. Out of 44 patients who underwent intra-abdominal surgery, eight patients developed burst abdomen postoperatively. The proportion of patients with a KIMS 14 score >5 was 100% in the study patients who developed burst abdomen. In our study, this number was 96%, which was somewhat similar to the study conducted by Akmal R et al., [6].

Limitation(s)

This study was a retrospective analysis conducted on patients with peritonitis and the technique of fascial closure (whether intermittent or continuous) and the type of material used (absorbable vs. non-absorbable) could not be fully retrieved from the retrospective records.

CONCLUSION(S)

The two predictive scores, namely Rotterdam and KIMS 14, were found to be statistically significant in patients developing burst abdomen. The mean scores in both scoring systems were higher in patients who developed burst abdomen. We recommend using these scoring systems for patients undergoing laparotomy to categorise them for better anticipation and management.

The author recommends for further studies to include: The recruitment of cases and controls on a prospective basis, as well as details regarding the type of suture material, technique of closure, distance between the sutures, and the distance between the cut end of the rectus sheath and the point where the suture bite is taken.

REFERENCES

[1] Mathur SK. Burst abdomen. A preventable complication, monolayer closure of the abdominal incision with monofilament nylon. J Postgrad Med. 1983;29(4):223.
[2] Parmar G, Gohil A, Hathila V. Burst abdomen – A grave postoperative complication. Internet J Surg. 2008;20(1):01-09.
[3] Kenig J, Richter P, Lasek A, Zbierska K, Zurawska S. The efficacy of risk scores for predicting abdominal wound dehiscence: A case-controlled validation study. BMC Surg. 2014;14:65.
[4] van Ramshorst GH, Nieuwenhuizen J, Hop WCJ, Arends P, Boom J, Jeekel J, et al. Abdominal wound dehiscence in adults: Development and validation of a risk model. World J Surg. 2010;34(1):20-27.
[5] Gokak AV, Ramesh H, Abhijit DH, Vasant T. KIMS 14: A new scoring system to predict abdominal wound dehiscence following emergency laparotomy. Int Surg J. 2018;4(4):1230-34.
[6] Akmal R, Manawan EE, Saleh MI. Competition test Veteran Affairs Medical Centre (VAMC) Score and KIMS-14 for predicting the dehiscence of abdoment post laparotomy operating wounds. Sriwij J Surg. 2020;3(1):10-22.
[7] Jaiswal N, Shekhar S. Study of burst abdomen: It's causes and management. Int Surg J. 2018;5:1035.
[8] Singh G, Singh R, Sharma L. Clinical study of abdominal wound dehiscence in regional institute of medical sciences hospital, Manipur. Int J Curr Res. 2016;08:8.
[9] Tiwari VK, Silodia A, Kalme M. An observational study to look for the incidence of postoperative burst abdomen in patients of anemia. J Med Sci Clin Res. 2019;7(1):655-58. Available from: https://dx.doi.org/10.18535/jmscr/v7i1.111.
[10] Teklewold B, Pioth D, Dana T. Magnitude of abdominal wound dehiscence and associated factors of patients who underwent abdominal operation at St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia. Surg Res Pract. 2020;2020:e1379738.
[11] Vardhini KV, Kishan D. Incidence and risk factors influencing morbidity and mortality in cases of burst abdomen after emergency and elective midline laparotomies. Int Surg J. 2018;5(11):3471-77.
[12] Abro S, Qureshi SH, Hameed F, Ahmed A, Yousif S. Clinical presentation and surgical outcome in patients presented with peritonitis. J Pharm Res Int. 2021;33:185-90.

[13] Hameed T, Kumar A, Sahni S, Bhatia R, Vidhyarthy AK. Emerging spectrum of perforation peritonitis in developing world. Front Surg. 2020;7:50.
[14] Van Ramshorst GH, Salu NE, Bax NMA, Hop WCJ, van Heurn E, Aronson DC, et al. Risk factors for abdominal wound dehiscence in children: A case-control study. World J Surg. 2009;33(7):1509-13.
[15] Yadav D, Garg PK. Spectrum of perforation peritonitis in Delhi: 77 cases experience. Indian J Surg. 2013;75(2):133-37.
[16] Gili-Ortiz E, González-Guerrero R, Béjar-Prado L, Ramírez-Ramírez G, López-Méndez J. Postoperative dehiscence of the abdominal wound and its impact on excess mortality, hospital stay and costs. Cir Esp Engl Ed. 2015;93(7):444-49.
[17] Abbas SM, Hill AG. Smoking is a major risk factor for wound dehiscence after midline abdominal incision; case-control study. ANZ J Surg. 2009;79(4):247-50.
[18] Riou JP, Cohen JR, Johnson H. Factors influencing wound dehiscence. Am J Surg. 1992;163(3):324-30.
[19] Ramneesh G, Sheerin S, Surinder S, Bir S. A prospective study of predictors for post laparotomy abdominal wound dehiscence. J Clin Diagn Res. 2014;8(1):80-83.
[20] Rashid MHA, Shaha LK, Shashi SS, Faruk I. Risk factors of burst abdomen in emergency laparotomy. Bangladesh Med J. 2017;46(2):38-42.
[21] Meena R, Chakravarti S, Agarwal S, Jain A, Singh S, Dey S. A prospective study of surgical site infection with its risk factors and their correlation with the NNIS risk index. J West Afr Coll Surg. 2023;13:26-33.
[22] Kapoor KK, Hassan MMN. A clinical study of abdominal wound dehiscence with emphasis on surgical management in Bangalore medical college and research institute, Karnataka, India. Int Surg J. 2016;4(1):134-40.
[23] Sudish D. Efficacy of abdominal risk model in predicting the probability of wound dehiscence [Internet] [masters]. Coimbatore Medical College, Coimbatore; 2014.

PARTICULARS OF CONTRIBUTORS:
1. Resident, Department of Surgery, UCMS and GTB Hospital, New Delhi, India.
2. Assistant Professor, Department of Surgery, ABVIMS and Dr. RML Hospital, New Delhi, India.
3. Assistant Professor, Department of Surgery, ABVIMS and Dr. RML Hospital, New Delhi, India.
4. Resident, Department of Surgery, UCMS and GTB Hospital, New Delhi, India.
5. Assistant Professor, Department of Surgery, ABVIMS and Dr. RML Hospital, New Delhi, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Atul Jain,
Assistant Professor, Department of Surgery, ABVIMS and Dr. RML Hospital,
New Delhi, India.
E-mail: docatuljain@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Jul 18, 2024
- Manual Googling: Oct 03, 2024
- iThenticate Software: Oct 05, 2024 (11%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? No
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Jul 17, 2024**
Date of Peer Review: **Sep 09, 2024**
Date of Acceptance: **Oct 08, 2024**
Date of Publishing: **Dec 01, 2024**