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A PROSPECTIVE STUDY FOR PREDICTORS OF POST LAPAROTOMY ABDOMINAL WOUND DEHISCENCE

General Surgery

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ABSTRACT

INTRODUCTION: Abdominal wound dehiscence, whether partial or complete, is a major morbidity and a leading cause of mortality in abdominal surgeries. Wound dehiscence or evisceration is the most dreaded complication faced by surgeons and of greatest concern because of risk of evisceration, the need for immediate intervention, possibility of repeat dehiscence, surgical wound infection and incisional hernia formation. In this study various predictors or risk factors are taken into account to observe the association with abdominal wound dehiscence.

MATERIAL AND METHOD: The study was done on 50 patients who developed abdominal wound dehiscence post laparotomy after considering the inclusion and exclusion criteria.

RESULT: During the study it was observed that Pre-operative factors like old age, male sex, anemia, malnutrition, obesity, diabetes mellitus, peritonitis, emergency surgery, high ASA score are factors leading to post-operative wound dehiscence. Intra-operative factors like contaminated wound, midline incision, poor suturing technique,improper suture material choice, inexperience surgeons are associated with the increase incidence of wound dehiscence. Post-operative factors like cough, post- operative ventilator support, hypoxia, abdominal distension, wound infection also increase the rate of wound dehiscence.

CONCLUSION: Preventive measures are prophylactic optimization of patient's co-morbid conditions, improving the nutritional status of the patient, proper aseptic technique, optimizing patient lung condition, avoiding other straining conditions like cough, vomiting and by applying proper surgical technique with adequate skill acquisition. Good preoperative preparation reduces postoperative wound complications.

KEYWORDS

Wound, Dehiscence, Burst abdomen, Laparotomy, Predictive factors, Complication

INTRODUCTION:

Wound dehiscence is described as partial or complete disruption of an abdominal wound closure, with or without protrusion and evisceration of abdominal contents[1]. Dehiscence of wound occurs before cutaneous healing. An abdominal wound may occur due to disruption in the anterior abdominal wall caused by either trauma or any surgical intervention in order to gain access to the underlying pathology[2] This abdominal wall disruption may be partial or complete. Partial disruption is when one or more layers have separated but the underlying sheath and peritoneum is intact. Complete disruption is when all the layers have disrupted leading to viscous evisceration. Wound dehiscence or evisceration is the most dreaded complication faced by surgeons and of greatest concern because of risk of evisceration, the need for immediate intervention, possibility of repeat dehiscence, surgical wound infection and incisional hernia formation. Abdominal wound dehiscence is a severe postoperative complication, with mortality rates reported as high as 9 to 44% [3]. Incidence as described in literature ranges from 0.4% to 3.5%. Various risk factors are responsible for development of wound dehiscence such as emergency surgery, intra-abdominal infection, malnutrition (hypoalbuminemia, anaemia), obesity, advanced age, systemic diseases, bad ASA (American Society of Anaesthesiologist) scoring, type and duration of surgery, type and quality of suture materials , intra-operative knot breakage, suture materials rupture or suture cut through etc. Good knowledge of these risk factors is mandatory for 12 prophylaxis. The need for this study is to highlight the risk factors for wound dehiscence, the incidence rate in this hospital and remedial measures to prevent or reduce the incidence of wound dehiscence, and to predict the outcome of the management of abdominal wound dehiscence. This will certainly reduce the mortality and morbidity in the form of prolonged hospital stay, increased economic burden on health care resources and long complication of incisional hernia.

This was a Prospective observational study involving all those who had developed abdomen wound dehiscence after initial surgery. An elaborative study of these cases were done with regard to date of admission, clinical history regarding the mode of presentation, significant risk factor, investigation, type of surgery, type of incision and postoperatively close monitoring with some signs & symptoms.

The symptoms like fever, nausea, increased pain at wound site and signs are like any colour changes at wound site, if any discharge then the colour, consistency, post op day of discharge, odour and amount of discharge, any gap in the wound, any abdominal content seen through wound gaping. The day of diagnosis of wound dehiscence recorded with close monitoring was done till the patient was discharged from the hospital. In history, details regarding presenting complaints, duration, associated diseases, significant risk factors like smoking, alcohol, anaemia, malnutrition, obesity, diabetes, chronic cough, was noted.

MATERIALS AND METHODS

Place of study

Department of General Surgery, Midnapore Medical College & Hospital Paschim Medinipur, West Bengal, India.

Period of study

From March 2018 to August 2019 (Eighteen months).

Study design

Prospective observational study.

Sample size

50 (fifty) hospitalized surgical patients as perinclusion criteria.

Study population

Inclusion Criteria

All the patients who developed abdominal wound dehiscence after laparotomy in the Department of General Surgery from March 2018 to August 2019 at MMC & H, Paschim Medinipur, who fulfill the following criteria:

i. Patient of age >12 years and of either sex who have developed abdominal wound dehiscence following either emergency or elective abdominal operation.
ii. Patient with abdominal wound dehiscence who are willing for investigation and treatment.

Exclusion Criteria

i. All patients with wound dehiscence who are less than 12 years of age.
ii. All patients with incisional Hernia.
iii. All patients with wound dehiscence onsites other than the abdomen.

iv. All Female patients who developed wound dehiscence after any gynecological procedures.
v. All patients who have developed wound dehiscence after second surgery.
vi. All patients who refuse investigationand treatment.

Study variables:
i. Age
ii. Sex
iii. BMI
iv. Haemoglobin (Hb%)
v. Hypoalbuminemia
vi. Diabetes
vii. Type of Abdominal Incision
viii. Type of Surgery(emergency/elective)
ix. Type of abdominal wound
x. Post-operative day of wound dehiscence
xi. ASA score
xii. Duration of operation

Data collection and interpretation: Data collection was done from the patients of post laparotomy abdominal wound dehiscence admitted in the Department of General Surgery, MMC & H, Paschim Medinipur.

Laboratory investigations, parameters and procedures: Straight X -Ray abdomen (erect and supine posture), USG of whole abdomen, Blood for complete haemogram, BT, CT, sugar, urea, creatinine, LFT, HIV (1&2), HbsAg, Anti-HCV-Ab, X-Ray chest (PA view).

Outcome definition and parameters: Patient suffering from peritonitis, malignancies, malnutrition, obesity, high ASA score are expected to increase the incidence of post laparotomy wound dehiscence. Actual outcome can be confirmed only after study is completed.

Statistical Analysis
Data entered in spreadsheet format and checked for accuracy. Descriptive statistics done iusing mean, median, standard deviation and proportion.

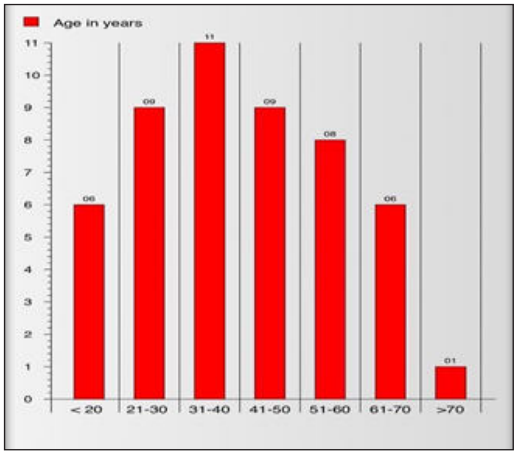
RESULT AND ANALYSIS:

Age Wise Distribution Of Abdominal Wound Dehiscence

Age in years	No. of cases	Percentage
< 20	06	12
21-30	09	18
31-40	11	22
41-50	09	18
51-60	08	16
61-70	06	12
>70	01	02
Total	**50**	**100**

In this study the youngest patient was 13 years old and oldest patient was 73 years. The mean age of patients affected was 41.61years.

Age Wise Distribution Of Abdominal Wound Dehiscence

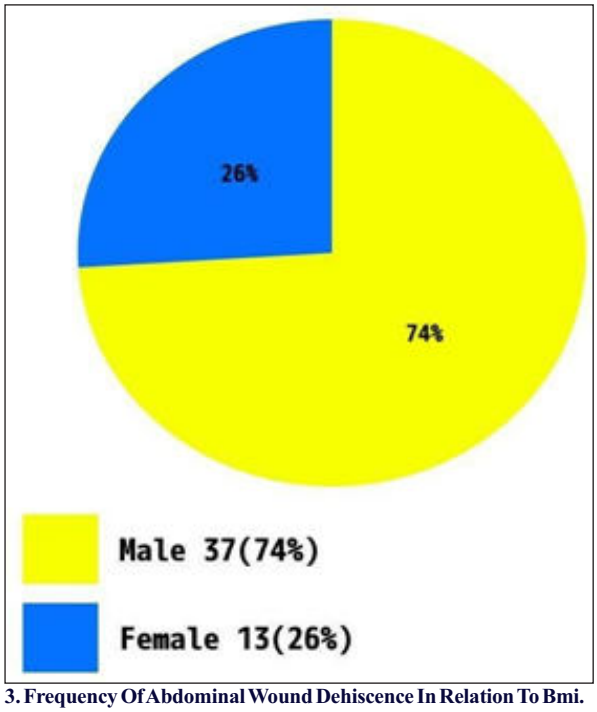


2. Gender Wise Distribution Of Abdominal Wound Dehiscence

Gender	No of cases	Percentage
Male	37	74
Female	13	26

Out of 50 cases 37 cases were male and there were 13 female cases.

Gender Wise Distribution Of Abdominal Wound Dehiscence

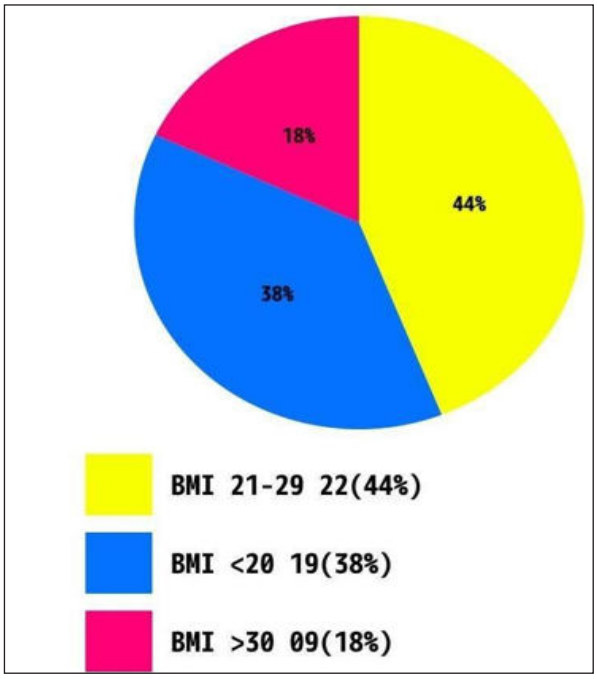


3. Frequency Of Abdominal Wound Dehiscence In Relation To Bmi.

BMI	No of Cases	Percentage
<20	19	38
21- 29	22	44
>30	09	18

Out of 50 cases, 09 patients had BMI more than 30 and 19 patients had BMI less then 20.

Frequency Of Abdominal Wound Dehiscence In Relation To Body Mass Index

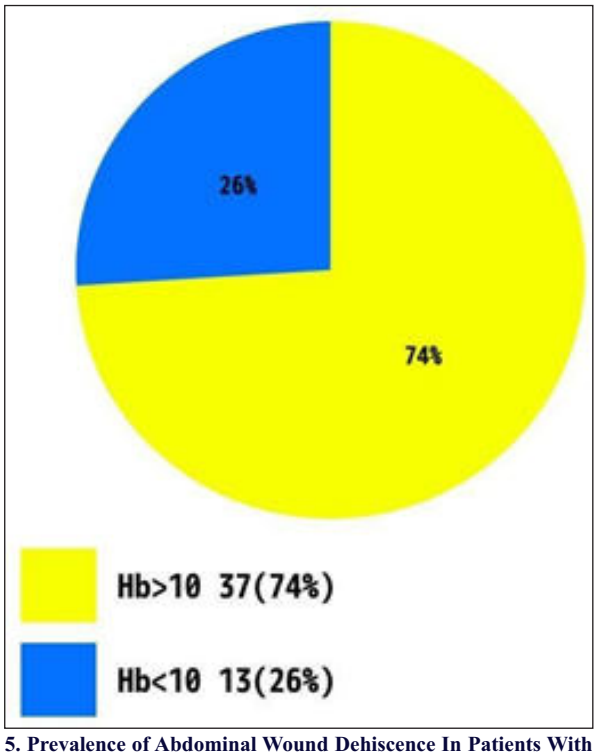


4.prevalence Of Abdominal Wound Dehiscence In Anaemic Patients

Haemoglobin (Hb gm%)	No of cases
≥10	37
< 10	13

Out of 50 cases studied 13 patients were with Hb % <10 gm% and 37 patients were with 10 gm% and more.

Prevalence Of Abdominal Wound Dehiscence In Anaemic Patients



5. Prevalence of Abdominal Wound Dehiscence In Patients With Hypoalbuminemia.

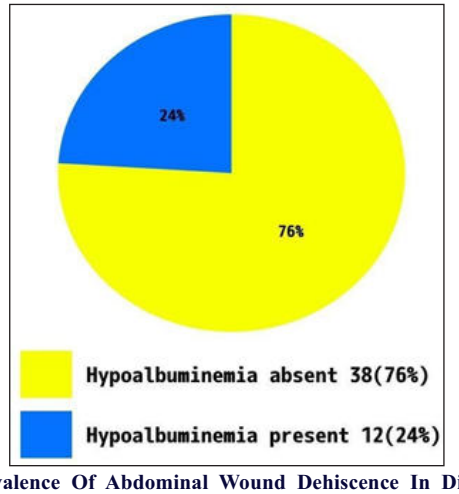
Hypoalbuminemia	Cases	Percentage
Yes	12	24
No	38	76
Total	50	100

Twelve of our patients had serum albumin <3gm%, mean being 2.41+/-0.35.

Impact Of Albumin Level On The Day Of Wound Dehiscence

Albumin	Number	Mean	SD	Significance level
<3	12	8.50	2.32	t=0.684
>3	38	8.08	1.70	P>0.05

Prevalence Of Abdominal Wound Dehiscence In Patients With Hypoalbuminemia.

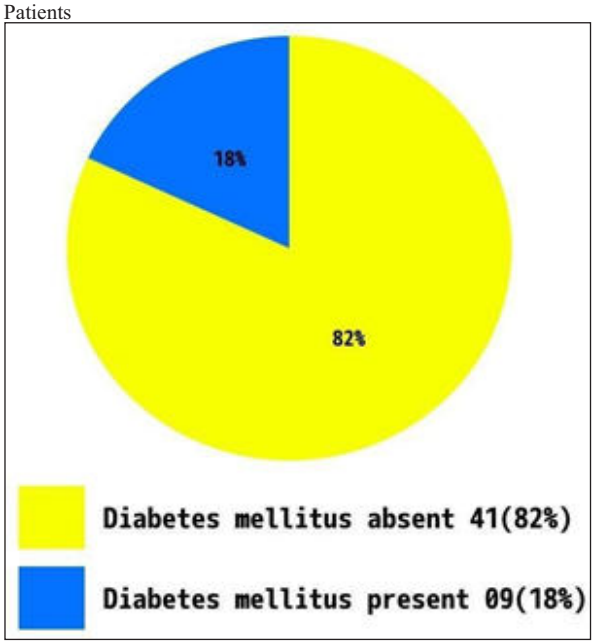


6. Prevalence Of Abdominal Wound Dehiscence In Diabetes Mellitus Patients.

Diabetes Mellitus	No of cases	Percentage
Yes	**09**	**18**
No	**41**	**82**
Total	**50**	**100**

Patients with fasting blood sugar >126 mg% or random sugar >140 mg% were considered diabetics. 09(18%) of our wound dehiscence patients were diabetics.

Prevalence Of Abdominal Wound Dehiscence In Diabetes Mellitus Patients



7. Frequency Of Abdominal Wound Dehiscence In Relation To The Type Of Incision.

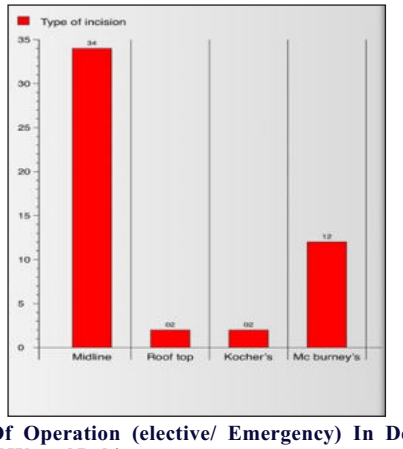
Type of incision	No. of cases	Percentage
Midline	34	68
Kocher's	02	04
Roof top	02	04
Mc Burneys	12	24
Total	50	100

Out of 50 cases 34cases (68 %) were operated with midline incision.12 cases (24 %) were operated using Mc Burney's incision.

Impact of Type of Incision on the Day of Wound Dehiscence

TO Incision	Number	Mean	SD	Significance level
Kocher	2	8.00	1.41	F=0.365; P>0.05
MC Burney's	12	8.25	1.86	
Midline	34	8.09	1.93	
Roof top	2	9.50	0.71	

Frequency Of Abdominal Wound Dehiscence In Relation To The Type Of Incision.



8. Type Of Operation (elective/ Emergency) In Developing Abdominal Wound Dehiscence.

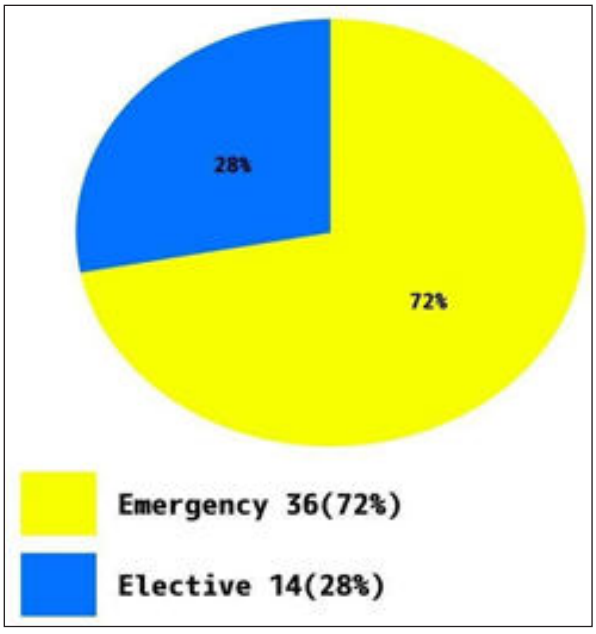
Surgery	No. of cases	Percentage
Elective	14	28
Emergency	36	72

Out of 50 cases 36 cases (72 %) were operated as emergency surgery and 14 cases (28 %) as elective surgery.

Impact of Type of Surgery on the Day of Wound Dehiscence

Type of Surgery	Number	Mean	SD	Significance level
Emergency	36	8.03	1.73	t=0.933
Elective	14	8.57	2.14	P>0.05

Type Of Operation (elective/ Emergency) In Developing Abdominal Wound Dehiscence.

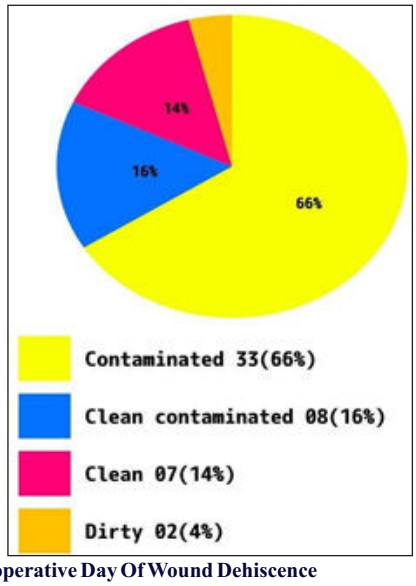


9. Type Of Surgical Wound In Developing Abdominal Wound Dehiscence

Type of surgical wounds	No of cases	Percentage
Clean	07	14
Clean Contaminated	08	16
Contaminated	33	66
Dirty	02	04

In this study, 33 patients (66%) had contaminated wound and 07 (14%) clean wound also associated with wound dehiscence.

Types Of Surgical Wound In Developing Abdominal Wound Dehiscence

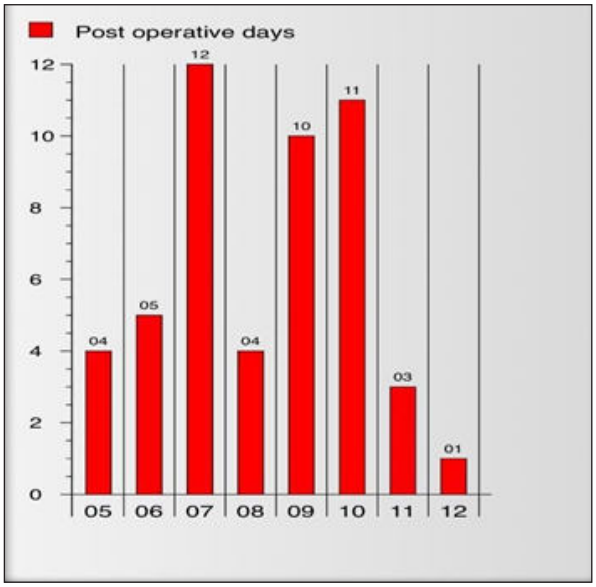


10. Post-operative Day Of Wound Dehiscence

Post op day	No of cases	Percentage
05	04	08
06	05	10
07	12	24
08	04	08
09	10	20
10	11	22
11	03	06
12	01	02
Total	**50**	**100**

The maximum incidence (12) of abdominal wound dehiscence occurred on 7th day, followed by next most common (11) on 10th post-op day. In this study there is no incidence of abdominal wound dehiscence before 05th day and minimum (01) incidence on 12th day.

Post-operative Day Of Wound Dehiscence

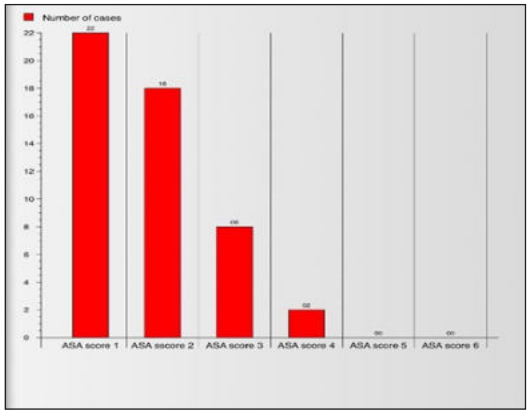


11. Asa Score Wise Number Of Cases

ASA Score	No of Cases	Percentage
1	22	44
2	18	36
3	08	16
4	02	04
5	00	00
6	00	00
Total	50	100

22 patients (44 %) were with ASA score I, 18 patients (36 %) had ASA score II, 08 (16 %) patients had ASA score III and 02 patients had ASA score IV.

Asa Score Wise Distribution

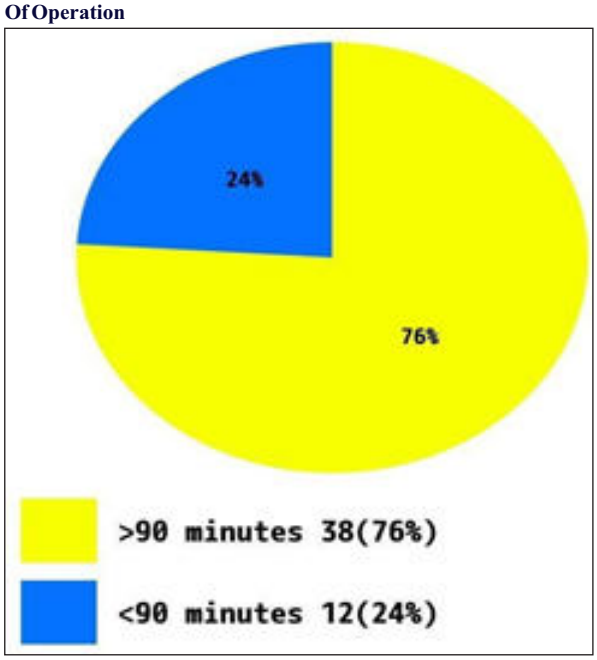


12. Number Of Cases Of Wound Dehiscence In Relation To Duration Of Operation

Duration of operation	No of cases	percentage
>90 minutes	12	24
< 90 minutes	38	76
Total	50	100

24% patient were developed wound dehiscence when duration of operation > 90 minutes

Number Of Cases Of Wound Dehiscence In Relation To Duration Of Operation



DISCUSSION:

Acute wound failure also known as wound dehiscence, burst abdomen, wound disruption and evisceration. It is a very serious complication of abdominal surgery, which carries very high mortality rate. It is a multi-factorial problem. Western studies showed an incidence of 0.4 to 3.5%. In our study most of the patients were in age group 31- 40 years. The mean age of presentation was 41.61 years. In present study wound dehiscence was found more in younger age group as incidence of addiction like alcohol, tobacco smoking alone or along with alcohol. Peptic perforation, appendicular perforation also common in this age group. Smoking is well documented as a negative factor for wound healing and in particular. Age has also been reported as a risk factor in other studies[4,5,6,7,8,].

In our study total 50 patients were included out of which, males were 37 in number and females were 13 in number with the ratio of 2.84:1.The male predominance was probably due to the higher incidence of peptic ulcer perforation, intestinal obstruction and malignancies, increased intra-abdominal pressure in male sex.

In our study, 38% patients had BMI<20 i.e. underweight whereas 18% had BMI>30 overweight or obese. Malnourished patients have hypoproteinemia and hypoalbuminaemia which decrease the wound strength. Obesity is a global issue, and currentestimatesoftheobesity rate areclose to13%of theworld's population, which is equivalent to 1.9 billion adults. Obesity or a BMI over 30 kg/m^2 is a frequently reported significant risk factor associated with infection following surgery.

In this study, 26% patients had haemoglobin <10gm/dl. Anaemia decrease the oxygen carrying capacity of blood and increase the work of heart. It also determines the post-op ventilator requirement and subsequently increases the intra-abdominal pressure and tension on suture line leading to development of wound dehiscence. Simon JS et. Al. reported that mortality and morbidity are significantly increased in patients who undergo surgery with preoperative hemoglobin of less than 8 gm/dl and receive no transfusion [9]

Twelve (26%) of our patients had serum albumin <3.0gm%. Hypoprotenemia contributes to prolonged inflammatory phase and impairs fibroplasia, proliferation, proteoglycan and collagen synthesis, neoangiogenesis and wound remodelling.Diabetes mellitus (DM) was found to be the most common comorbid condition in 09 (18%) patients who had wound dehiscence. Diabetic patient undergoing surgery suffer an increased risk of peri-operative complications, mainly because of higher infection rate, compromised wound healing, ischaemic complications, difficulties in controlling glycaemic levels and longer hospital stay. Persons with DM are at risk for impaired wound healing due to the impact of diabetes on the metabolic and inflammatory pathways. In light of this and current physiological relationship between both pre and post-operative glucose levels and wound healing, it is critical that surgical patients be evaluated pre- operatively and monitored for optimal glycaemic control, this being a key feature of the Enhanced Recovery After Surgery (ERAS) protocol.

In this study, 34 (68%) out of 50 patients of wound dehiscence had undergone laparotomy through midline incision. Anatomical factors which might make a vertical upper abdominal wound more likely to burst because interference with blood supply as it runs transversely. The rectus abdominal muscle has a segmental blood and nerve supply. If incision is little more laterally, the medial part of rectus abdominal muscle get denervated and ultimately atrophied, creating a weak spot in the wall and burst abdomen.

Increased incidence of wound dehiscence in emergency patients may also be attributed to poor patient preparation, complicated inflammatory disease, premorbid factors and operating at odd hours. In our study most of the patients came from a rural setup and presented late in the hospital. All of this increase the chance of wound dehiscence. Our study shows cases of wound dehiscence were maximum in emergency surgery (72

%).In emergency surgery, peritonitis in terms of localized pus or diffuse peritonitis was strong risk factor of wound and tissue complications. Moreover, the performance of the surgeon might be affected at night. Emergency operations are mostly performed by relatively inexperienced young surgeons.

Type of abdominal wound is an important risk factor of abdominal wound dehiscence. In this study 33(60%) patients out of 50 had contaminated wound and 07(14%) also had clean wound. The presence of bacteria in the healing tissue affects all processes of healing and promotes impairment of collagen synthesis and release of proteolytic enzymes, which promotes dehiscence by decreasing the suture holding capacity of the tissue[10].Our study shows that 24% of our dehiscence patients had operation lasting for more than 90 minutes.In our study 18 % patients had post abdominal distension. It has been proved by jenkin et al in his study that facial layers tend to lengthen as the wound distend whereas suture length remain the same leading to breakage of suture, undoing of knot or pooling through tissue.

In the present study, the maximum number of cases occurred between 7^{th} to 10^{th}post- operative day, with the maximum number on the 7^{th} post-operative day. The explanation for the maximum incidence of burst abdomen on 7^{th} post-operative day may be due to holding capacity of the suture is reduced gradually & attains peak around 7^{th} day, due to infetion or sloughing of wound margins.Pre-existing systemic illness contributes to higher ASA score and higher wound dehiscence rates because of increase wound infection[11]. In this study 44% patients had ASA score I and 36 % patients with ASA score II.

CONCLUSION

- Pre-operative factors like old age, male sex, anaemia, malnutrition, obesity, diabetes mellitus, peritonitis, emergency surgery, high ASA score are factors leading to post-operative wound dehiscence.
- Intra-op factors like contaminated wound, midline incision, poor suturing technique, improper suture material choice, inexperience surgeon are associated with the increase incidence of wound dehiscence.
- Post-operative factors like cough, post-operative ventilator support, hypoxia, abdominal distension, wound infection also increase the rate of wound dehiscence.
- Preventive measures are prophylactic optimization of patient's co-morbid conditions, improving the nutritional status of the patient, proper aseptic technique, optimising patient lung condition, avoiding other straining conditions like cough, vomiting and by applying proper surgical technique with

adequate skill acquisition. Good preoperative preparation reduces postoperative wound complications.

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