

A Clinical Study on Wound Dehiscence in Patients Undergoing Emergency Exploratory Laparotomy

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Abstract: ***Introduction:** Abdominal wound dehiscence (Acute wound failure or a burst abdomen) refers to the post operative separation of the abdominal musculoaponeurotic layers. It is one of the most dreaded complications faced by surgeons and is of the greatest concern because of the need for intervention, the risk of evisceration, surgical wound infection, recurrence, and incisional hernia formation. Dehiscence most often develops around 7 to 10 days post operatively but may occur even up to 20 days. Despite major advancements in the preoperative care of surgical patients, which includes the introduction of broader spectrum antibiotics and an improved understanding of all the effects of systemic illness on wound healing, the incidence of wound dehiscence has remained constant. It is one of the most serious postoperative complications; the incidence in the adult population is reported to be as 0.3-3.5%, and among the elderly it is as high as 10%. **Aims and Objectives:** To study the incidence and factors contributing to wound dehiscence in patients undergoing emergency exploratory laparotomy patients. To compare the events and factors between dehiscence and non-dehiscence patients to find the factors that have significant. Association with wound dehiscence in emergency exploratory laparotomy patients. To analyze with special reference to pre-operative serum albumin, hemoglobin and obesity as the predictive factors of wound dehiscence in emergency exploratory laparotomy patients. **Methodology:** This is a cohort study with sample size of 50. The study was conducted in the Department of surgery, Kamineni Institute of Medical Sciences, Narketpally, from October 2020- September 2022. The source of data was patients who underwent laparotomy. **Inclusion criteria:** 1) Patients undergoing emergency exploratory laparotomy. 2) Patients aged more than 12 years. **Exclusion criteria:** 1) Patient on steroids, immunosuppressant or anticancer therapy. Patients aged less than 12 years. 3) Patient undergoing re-exploratory laparotomy. **Results:** Male preponderance is noted in wound dehiscence patients. Most of the patients belonged to age group of <45 years. Perforation peritonitis is the most common cause for which emergency laparotomy took place. Next leading cause was malignancy. If there is absence of combination of all the three factors- pre-operative anemia, hypoalbuminemia and obesity, there is higher chance that the patient will not develop wound dehiscence. **Conclusion:** Wound dehiscence is a serious sequel of impaired wound healing. In spite of medical advancement, frequency of wound dehiscence in emergency laparotomy remains high. Multiple factors together predispose to this grave complication. Knowledge of the more common mechanisms and highly contributing factors will help to keep high risk patients under strict surveillance to reduce the incidence of this notorious complication. Various putative risk factors for abdominal wound dehiscence were investigated and significant risk factors for abdominal wound dehiscence identified in this study are pre-operative hypoalbuminemia, pre-operative anemia, intra-abdominal sepsis/wound infection and obesity.*

Keywords: Wound dehiscence, laparotomy

1. Introduction

Abdominal wound dehiscence (Acute wound failure or a burst abdomen) refers to the post operative separation of the abdominal musculoaponeurotic layers. It is one of the most serious post operative complications¹; the incidence in the adult population is reported to be as 0.3-3.5%, and among the elderly it is as high as 10%. It is one of the most dreaded complications faced by surgeons and is of the greatest concern because of the need for intervention, the risk of evisceration, surgical wound infection, recurrence, and incisional hernia formation. Dehiscence most often develops around 7 to 10 days post operatively but may occur even up to 20 days. Despite major advancements in the preoperative care of surgical patients², which includes the introduction of broader spectrum antibiotics and an improved understanding of all the effects of systemic illness on wound healing, the incidence of wound dehiscence has remained constant. In about 20-45% of cases, evisceration becomes a major significant risk factor, which is mostly associated with death during the perioperative period³.

2. Aims and Objectives

- To study the incidence and factors contributing to wound dehiscence in patients undergoing emergency exploratory laparotomy patients.
- To compare the events and factors between dehiscence and non-dehiscence patients to find the factors that have significant association with wound dehiscence in emergency exploratory laparotomy patients
- To analyze with special reference to pre-operative serum albumin, hemoglobin and obesity as the predictive factors of wound dehiscence in emergency exploratory laparotomy patients.

3. Methodology

- This is a cohort study with sample size of 50. The study was conducted in the Department of surgery, Kamineni Institute of Medical Sciences, Narketpally, from October 2020- September 2022.
- The source of data was patients who underwent

Volume 12 Issue 1, January 2023

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laparotomy.

Type of study : Cohort study
Sample size : 50 patients

Inclusion criteria:

- Patients undergoing emergency exploratory laparotomy.
- Patients aged more than 12 years.

Exclusion criteria:

- Patient on steroids, immunosuppressant or anticancer therapy.
- Patients aged less than 12 years.
- Patient undergoing reexplorative laparotomy.

Data collection:

Data regarding following aspects were collected:

- Age
- Gender
- Clinical presentation
- Presence of contributing factors-
 - 1) Infection (local/ systemic)
 - 2) Anaemia (defined as blood haemoglobin <13g/dL in males and <12g/dL in females)
 - 3) Hypoproteinaemia (defined as serum total protein <6g/dL)
 - 4) Postoperative cough or vomiting
 - 5) Uremia (defined as serum urea>40mg/dL and/or serum creatinine >1.4mg/dL)
 - 6) As cites
 - 7) Obesity (defined as Body Mass Index>30kg/m²)
 - 8) Comorbid conditions if any
 - 9) Drug use if any

Statistical analysis:

Standard clinical and statistical methods were employed to analyze the data

4. Results

Among 50 patients who underwent emergency exploratory laparotomy, 6 patients developed wound dehiscence.12% of patients developed wound dehiscence.

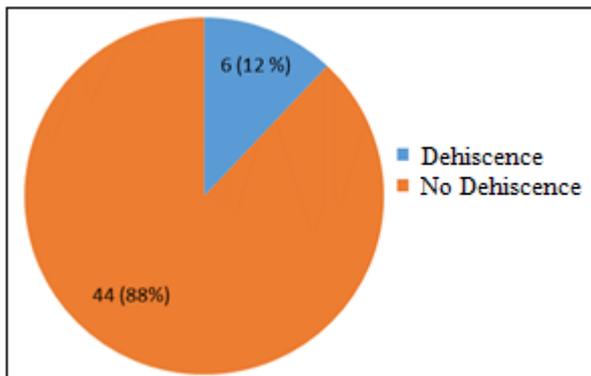


Figure 1: Percentage of patients who developed wound dehiscence

4.1 Sex Distribution

Among 50 patients who underwent emergency exploratory laparotomy, 37 were male and 13 were female with ratio of 2.8:1. Out of 6 wound dehiscence patients 4 were male and 2 were female. The male: female distribution in case of dehiscence is 2:1. That is 37 male patients underwent laparotomy and 4 developed wound dehiscence whereas 13 female patients underwent emergency laparotomy and 2 of them had wound dehiscence.

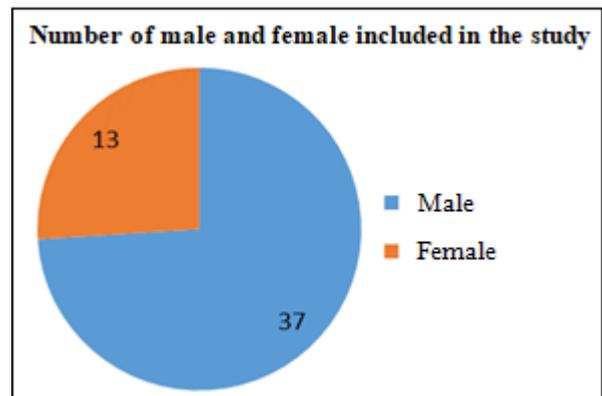


Figure 2: Number of males and females included in the study

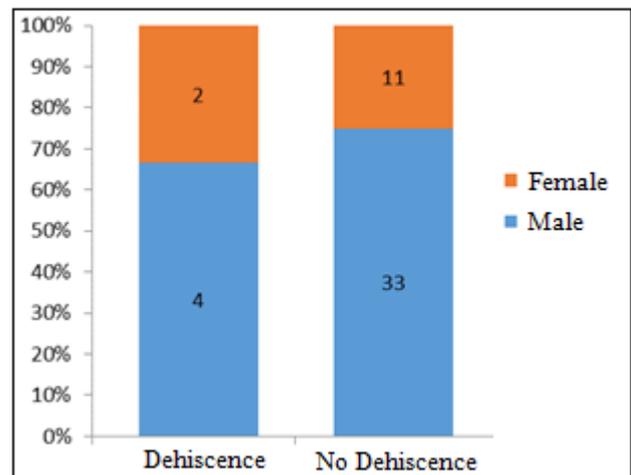


Figure 3: Association between gender and dehiscence (P=0.662)

4.2 Age Distribution

Among patients who underwent emergency laparotomy 5 belonged to group of 11-20 years; 10 belonged to age group of 21-30 years; 16 belonged to group of 31-40 years 6 belonged to 41-50 years, 5 belonged to 51-60 years and 8 belonged to group of > 60 years.

In dehiscence group 66.6% of patients belonged to age group < 45 years.

33.4% belonged to age group > 45 years

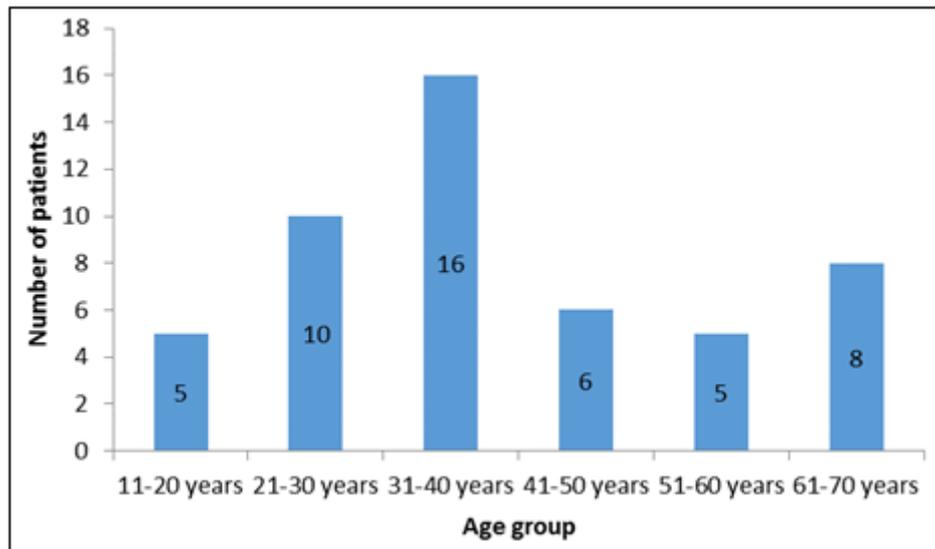


Figure 4: Number of patients belonging to different age groups

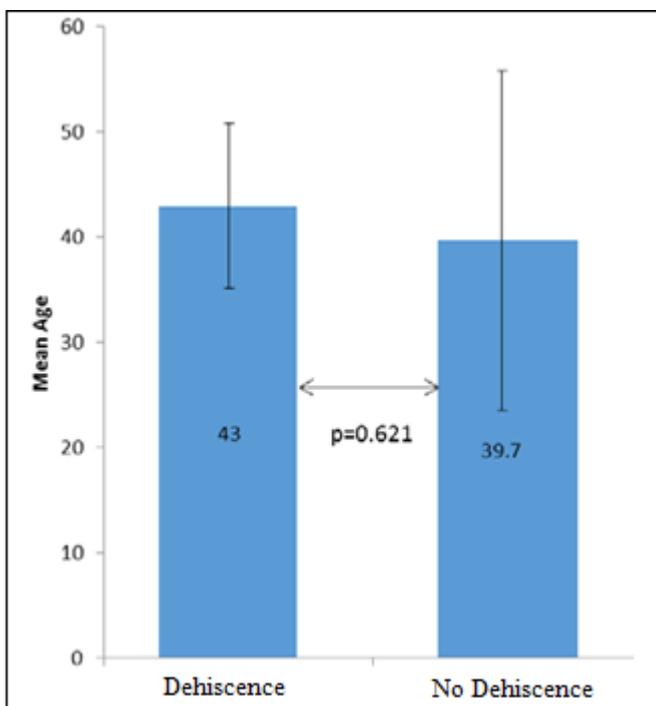


Figure 5: Independent samples t test to compare mean age among those with dehiscence and those without dehiscence (p=0.621)

4.3 Disease Pattern in Emergency Exploratory

Laparotomy

Table 1: Disease pattern in emergency exploratory laparotomy

Disease	Male	Female
Perforation peritonitis	22	5
Intestinal obstruction	3	4
Blunt trauma	6	1
Penetrating Trauma	6	1
Malignancy	0	2

54% of patients underwent emergency exploratory laparotomy for perforation peritonitis. Intestinal obstruction was seen in 18%. 14% underwent surgery for blunt trauma abdomen and penetrating trauma was the causative factor for emergency laparotomy in 14% of patients. Malignancy presenting with acute abdomen was seen in 4% of patients

Among 6 patients who had wound dehiscence, 3 of them had perforation peritonitis, 1 had intestinal obstruction, 2 of them had malignancy.

Out of 27 patients with perforation peritonitis, 3 of them developed wound dehiscence. That is 11.1% of perforation peritonitis patients undergoing emergency exploratory laparotomy were vulnerable to develop wound dehiscence. 14.2% of intestinal obstruction patients were found to develop wound dehiscence. No one developed dehiscence in blunt trauma abdomen and penetrating trauma. Out of 2 patients with malignancy both developed wound dehiscence. In patients who had malignancy, 100% developed wound dehiscence. From this analysis malignancy seems to be the most causative factor which makes the patient vulnerable for dehiscence followed by perforation peritonitis but the number of cases were less.

Table 2: Disease pattern and wound dehiscence in emergency laprotomy

Causative factor for laparotomy	Number of cases Underwent laparotomy	Number of cases Developed dehiscence	% vulnerable to dehiscence
Perforation Peritonitis	27	3	11.1%
Intestinal Obstruction	7	1	14.2%
Blunt trauma Abdomen	7	0	-
Penetrating trauma	7	0	-
Malignancy	2	2	100%

4.4 Disease pattern in wound dehiscence

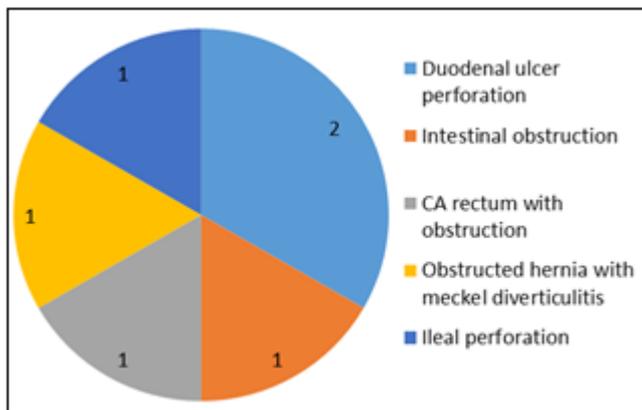


Figure 6: Causes of dehiscence among the patients included in the study

1) Anemia and wound dehiscence:

23 of 50 patients had anaemia as per the set criteria. Among patients who had dehiscence 5 of 6 had anaemia and 1 patient who had no anaemia developed dehiscence. 26 patients who had anaemia did not develop wound dehiscence.

Table 3: Wound dehiscence and anemia

Anemia	No wound dehiscence	Wound dehiscence
Yes	18	5
No	26	1
Total		6

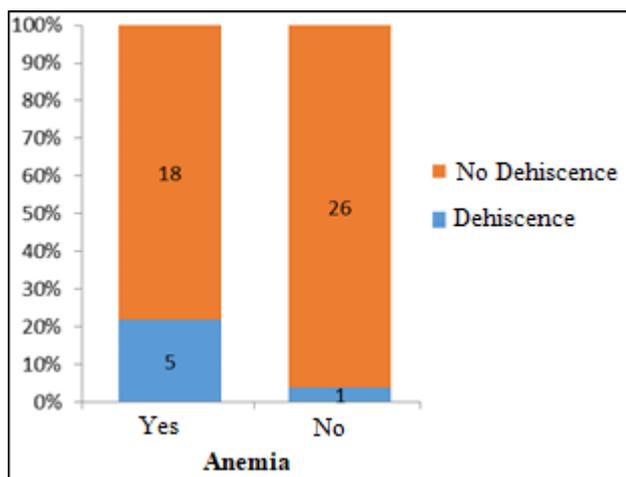


Figure 7: Association between anemia and dehiscence (P=0.050)

P 0.050. and was significant using a chi-square test

2) Hypoalbuminemia in Wound Dehiscence:

Among 50 patients 15 had pre-operative hypoalbuminemia. Out of which 4 developed wound dehiscence and 11 did not have dehiscence.

Table 4: Dehiscence and hypoalbuminemia

Hypoalbuminemia	No wound dehiscence	Wound dehiscence
YES	11	4
NO	33	2
Total		6

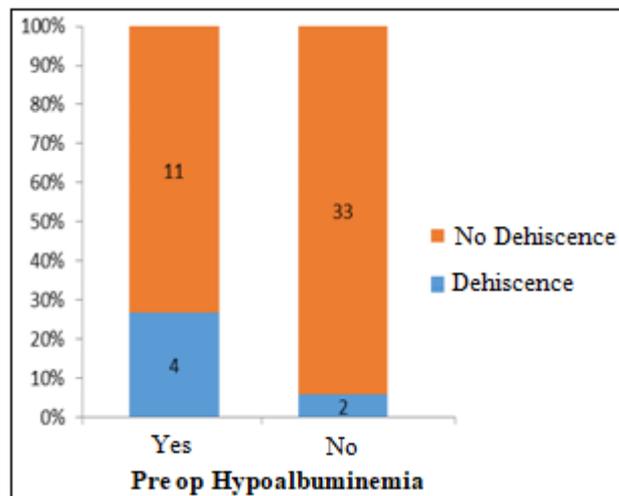


Figure 8: Association between pre operative hypoalbuminemia and dehiscence (P=0.037)

P 0.037 and significant using a chi-square test

3) Diabetes Mellitus in Wound Dehiscence:

7 out of 50 patients had Diabetes mellitus, among which 2 of them had wound dehiscence.

Table 5: Dehiscence and Diabetic Mellitus

Diabetes mellitus	No wound dehiscence	Wound dehiscence
Yes	5	2
No	39	4
Total		6

P=0.146. NOT significant using a chi-square test

4) Bodymass Index in Wound Dehiscence:

4 patients had increased BMI in this study and 2 of them developed dehiscence.

Table 6: Dehiscence and body mass index

BMI	No dehiscence	Dehiscence
>30	2	2
<30	42	4
Total		6

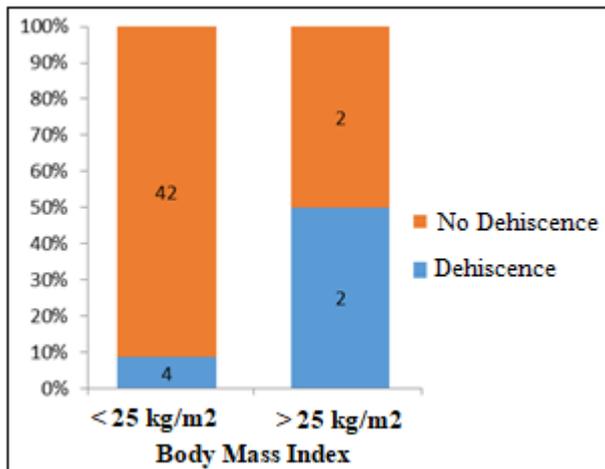


Figure 9: Association between body mass index and dehiscence (P=0.015)

P.015 and significant using a chi-square test

5) Wound Infection/ Sepsis In Wound Dehiscence:

Table 7: Dehiscence and sepsis

Wound infection/sepsis	No wound dehiscence	Wound dehiscence
PRESENT	7	5
ABSENT	37	1
Total		6

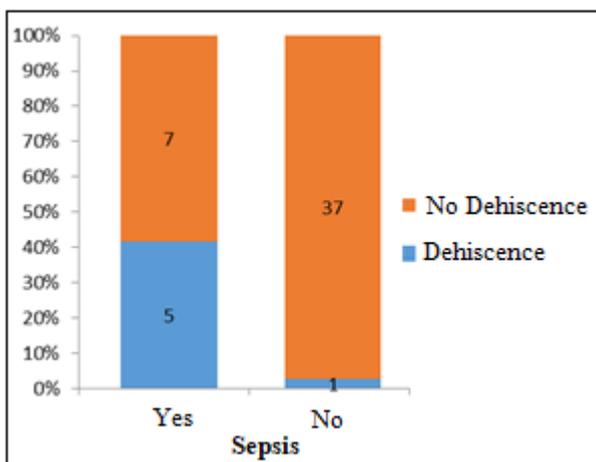


Figure 10: Association between Sepsis and dehiscence

P value is <0.001 and found to be extremely significant.

6) Malignancy vs Wound Dehiscence:

Table 8: Dehiscence and Malignancy

Malignancy	No wound dehiscence	Wound dehiscence
Present	0	2
Absent	44	4
Total		6

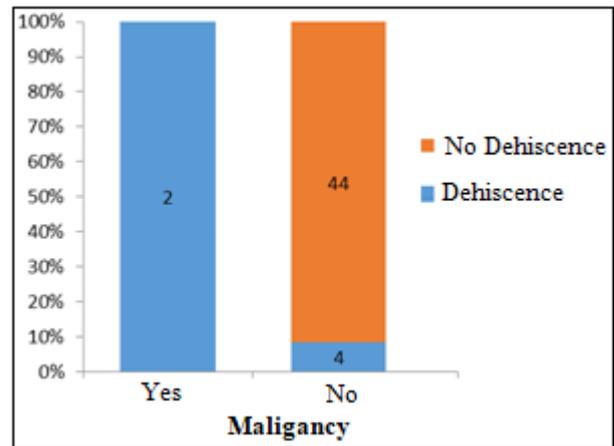


Figure 11: Association between malignancy and dehiscence (P<0.001)

P is <0.001 and significant using a chi-square test

7) Pulmonary Complication Vs Wound Dehiscence:

6 patients had post-operative pulmonary complications. Out of 6 patients with dehiscence 1 had pulmonary complications.

Table 9: Dehiscence and pulmonary complications

Pulmonary Complications	No wound dehiscence	Wound dehiscence
Present	5	1
Absent	39	5
Total		6

P is 0.293 and not significant

8) Post-Operative Day of Wound Dehiscence

Among 6 patients 1 of them developed wound dehiscence on post-op day 4. Two patients on post-op day 5. 1 patient on post-op day 6. On post-operative day 7 wound dehiscence was noted in one patient. One of them had dehiscence on post-op day 8. So dehiscence was noted from day 4 to maximum of post-op day 8 in this study. So on calculation mean post-operative day of wound dehiscence is 5.8 days that is post-op day 6.

Table 10: Prevalence of comorbidities among the patients in the study, and association with dehiscence by chi square test

Comorbidity	Percentage	Chi square	P value
Preop hypoalbuminemia	30%	4.365	0.037
Anemia	46%	3.826	0.05
Diabetes Mellitus	14%	2.117	0.146
BMI>25kg/m ²	8%	5.945	0.015
Pulmonary disease	64%	1.106	0.293
Sepsis	24%	13.16	<0.001
Ascites	2%	0.139	0.709
Malignancy	4%	15.278	<0.001
Chronic kidney Disease	12%	0.141	0.708

5. Summary

In this study 50 patients underwent emergency exploratory laparotomy and 6 of them had wound dehiscence. The incidence of wound dehiscence in the present study is 12%.

Male preponderance is noted in wound dehiscence patients with ratio of 2.8:1, but female patients are found to be more

vulnerable for wound dehiscence with 15.38% of female developing wound dehiscence out of 13 female patients who underwent emergency exploratory laparotomy.

In the current study, most of the patients belonged to age group of <45 years. Wound dehiscence is common in patients less than 46 years of age in this study due to more patients belonging to less than 46 years of age

Perforation peritonitis is the most common cause for which emergency laparotomy took place. In wound dehiscence group, 3 out of 6 patients had perforation peritonitis. Next leading cause was malignancy with 2 out of 6 patients.

Pre-operative anemia and hypoalbuminemia showed p-value 0.050 & 0.037 respectively found to have extremely significant association with wound dehiscence.

Diabetes mellitus was seen in 2 out of 6 wound dehiscence patients and p value obtained was 0.146 which means an insignificant association with wound dehiscence.

Increased BMI had p value more than 0.015 and found to have significant association with wound dehiscence.

Wound infection, 5 out of 27 wound dehiscence patients had p value less than 0.001 and showed significant association with wound dehiscence.

Even when 100% of malignant patients had wound dehiscence, malignancy show significant association with wound dehiscence on statistical analysis, the number of cases were less.

In current study mean value of post-operative day of wound dehiscence is 5.8 days.

If there is absence of combination of all the three factors- pre-operative anemia, hypoalbuminemia and obesity, there is higher chance that the patient will not develop wound dehiscence.

6. Conclusion

Wound dehiscence is a serious sequel of impaired wound healing. In spite of medical advancement, frequency of wound dehiscence in emergency laparotomy remains high. Multiple factors together predispose to this grave complication. Knowledge of the more common mechanisms and highly contributing factors will help to keep high risk patients under strict surveillance to reduce the incidence of this notorious complication. Various putative risk factors for abdominal wound dehiscence were investigated and significant risk factors for abdominal wound dehiscence identified in this study are pre-operative hypoalbuminemia, pre-operative anemia, intra-abdominal sepsis/ wound infection and obesity. Elderly patients, female sex and malignant patients showed higher vulnerability for wound dehiscence. Our aim to check the predictive ability of factors- pre-operative anemia, hypoalbuminemia and obesity showed that they can be used to predict patients who may not develop wound dehiscence rather than in predicting patients who may develop wound dehiscence. From the results of this study,

we can also conclude that a number of risk factors for abdominal wound dehiscence can be mitigated during the perioperative period. Thus we conclude that if the above predisposing factors are well understood before doing any emergency abdominal surgery, the present incidence and burden on health care system can be reduced further.

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