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RESEARCH ARTICLE

A PROSPECTIVE STUDY ON THE INCIDENCE AND RISK FACTORS OF WOUND DEHISCENCE OF EMERGENCY LAPAROTOMY SURGERIES IN A TERTIARY CARE HOSPITAL

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Abstract

Introduction: Abdominal wound dehiscence is one the major complications of emergency laparotomy. It can range from minor wound gap to more serious emergency condition like burst abdomen and intensive care. It is one of the major causes of morbidity and mortality in emergency surgeries. Several risk factors have been identified as possible causes of wound dehiscence.

Materials and Methods: The prospective observational study was conducted on 80 patients undergoing midline laparotomy in the emergency surgency. Informed written consent was obtained from all the participants after approval from the ethical committee of the institution. Complete evaluation of all patients with thorough history and clinical examination was done. Preoperative investigations were reported and underlying corrections were done. After proper resuscitation and preparation, patients were sent to operation room for surgery.

Results: Out of the 80 cases on which emergency laparotomy were done, wound dehiscence was observed in 13 cases (16.25%). The highest incidence was found in the elderly age group (>60years) and highest in the emergency laparotomies indicated for bowel perforation with peritonitis. Timing of presentation and duration of surgery along with lab abnormalities like anemia, low serum albumin, uremia is thought to predispose to wound dehiscence. Intra-abdominal distension and paralytic ileus was also predisposing factors in post-operative period.

Conclusion: abdominal wound dehiscence especially when done in emergency setting had higher risk of wound dehiscence due to less time for correction of underlying causes and lack of sterile techniques due to higher load of emergency cases. Emphasis has to be given in the reducing the modifiable risk factors.

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Introduction:-

Abdominal wound dehiscence is one the major complications of emergency laparotomy. It can range from minor wound gap to more serious emergency conditions like burst abdomen and intensive care. In all circumstances, it leads to prolonged hospital stay and increases the cost of care. Wound dehiscence occurs when the wound gives away suddenly with copious serosanguinous discharge. After laparotomy, when done especially in emergency, a closed abdominal wound may burst in 5-7 days. All layers of abdomen may give away, leading to discharge, occasionally bowel will also extrude out which may need emergency closure of the abdominal wound using retention sutures or Bogota bag. The reported incidence of complete evisceration is 0.1%-0.6% with associated mortality of 9%-44% [1]. In addition, deep wound infections cause separation of wound in addition to raised intra-abdominal pressure leading to wound dehiscence.

Surgical site infections are the third most common hospital associated infections. About 14-16% of all infections in hospitalized patients are surgical site infections [2]. Prolonged hospital stay, recurrence of dehiscence, incisional hernia and reoperation are few of the several sequelae of wound dehiscence [3].

Several risk factors have been identified as possible causes of wound dehiscence. They can be patient related factors like age, poor nutritional status, poor socio-economic background; medical comorbid conditions like diabetes, anemia, hypoproteinemia, uremia, prolonged steroid or immunosuppressive therapy, emergency surgery, prolonged duration of surgery, postop abdominal distension [4]. Wound dehiscence can be attributed to a combination of various risk factors rather than one single cause. However, wound infection is a known single important risk factor [5].

After many years of studies and advances, new techniques to reduce or altogether prevent the risk of abdominal wound dehiscence were developed. These techniques,when combined with strict postoperative care and control of infection with appropriate antibiotics, have a significant outcome in risk reduction [6]. However, no single technique has been found to be a fool proof and emphasis has to be given in reducing the modifiable risk factors.

Aim And Objectives:-

1. To study the incidence of wound dehiscence of emergency laparotomy surgeries in our hospital
2. To study the risk factors of wound dehiscence of emergency laparotomy surgeries in our hospital

Methods:-

Source of data:

The study was conducted on the patients undergoing emergency laparotomy in the Department of General Surgery of Patna Medical College and Hospital, Patna (Bihar) between July, 2020 and July, 2021.

Study type:

This was a prospective, observational study.

Inclusion Criteria:

1. All patients admitted for emergency laparotomy;
2. All superficial and deep SSI developing within a 30-days period post operation; and
3. Patients who underwent midline laparotomy in emergency setting.

Exclusion criteria:

1. Patients with malignancy who have undergone pre-op or post- op radiotherapy or chemotherapy or immunosuppressive agents;
2. Patients for whom, during closure, margins appear to be malignant or post op histopathology suggested malignancy;
3. Patients who died on table or expired within 7 days post operation; and
4. Patients suffering from Organ space Surgical Site Infections and wound infections occurring beyond the 30days time period post operation.

Data collection procedure:
The Prospective observational study was conducted on 80 patients undergoing midline laparotomy in the emergency surgency. Informed written consent was obtained from all the participants, post due approval from the ethical committee of the institution. Complete evaluation of all patients with thorough history and clinical examination was done. Preoperative investigations were reported and underlying corrections were done. After proper resuscitation and preparation, patients were sent to operation room for surgery.

After General Anesthesia, the surgical field was cleaned with surgical spirit followed by 1% povidone iodine. Skin incision made using 23 no. blade and further layers were cut using cautery or scissors. Operative details and peri-operative risk factors were observed and noted. The entire abdomen was closed en mass or layer by layer depending upon the situation. Similarly, suture material used for closure varied from non-absorbable no. 1 or slowly absorbable sutures. In the post operative period all patients were closely monitored and any symptom or sign infection was identified evaluated. Appropriate steps such as antibiotic coverage, drainage of collection and correction of biochemical imbalance were taken.

Results:-

Table 1:- Incidence of wound dehiscence in emergency laparotomy.

Status of laparotomy wound	Number of cases	Incidence (in %)
Wound dehiscence present	13	16.25
Wound healed well	67	83.75
Total	80	100

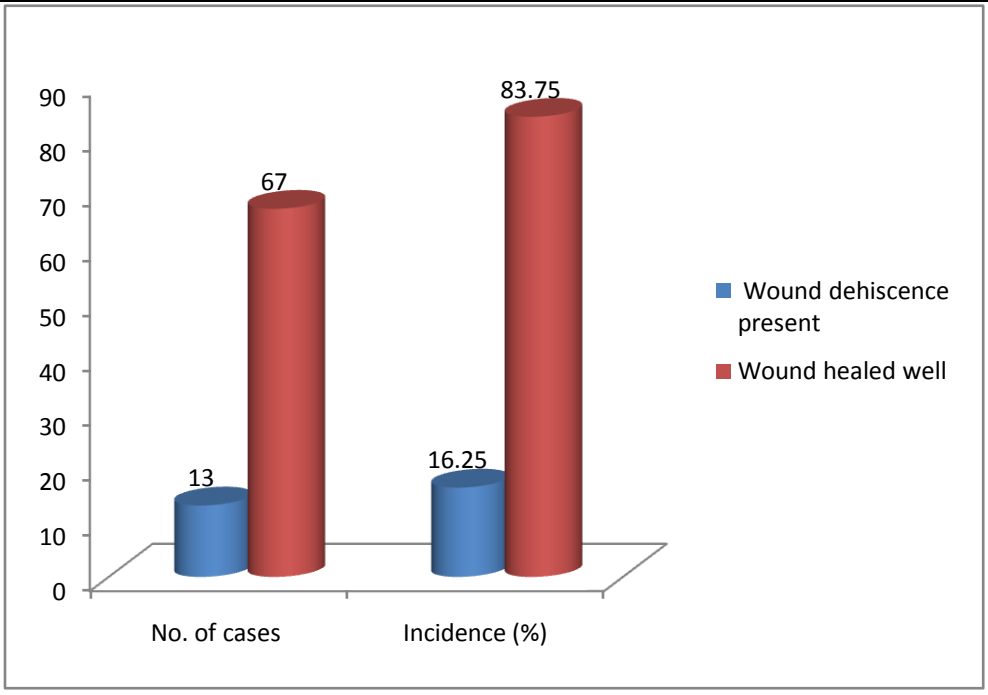


Figure I:- Status of laparotomy wound.

Observation:-

Out of the 80 cases on which emergency laparotomy were done, wound dehiscence was observed in 13 cases (16.25%).

Table 2:- Incidence of wound dehiscence in emergency laparotomy in relation to age.

Age	DehiscenceCases (out of 13)	%of dehiscence cases
<15 years	0	0.00
15-30 years	1	7.69
30-45 years	2	15.38
45-60 years	4	30.76

>60 years	6	46.15

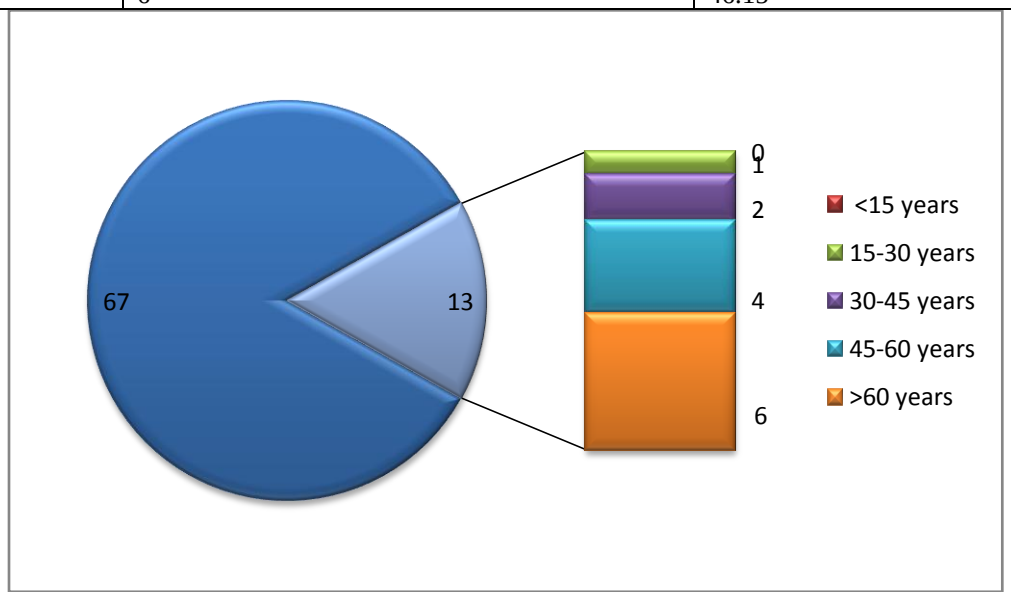


Figure II:- Incidence of wound dehiscence in emergency laparotomy in relation to age.

Observation:
Out of the 13 cases that developed wound dehiscence, maximum incidence was seen in the age group of >60 years of age (46.15%), followed by the age group 45-60 years (30.76%), age group 30-45 (15.38%), 15-30 years of age (7.69%) and no incidence was found in the age group less than 15 years (0%).

Table 3:- Incidence of wound dehiscence with relation to the type of surgery.

Type of emergency surgery	**Dehiscence cases (Out of 13)**	**% of dehiscence**
Abdominal trauma	3	23.07
Intestinal obstruction	2	15.38
Bowel perforation	6	46.15
Intra-abdominal abscess	2	15.38

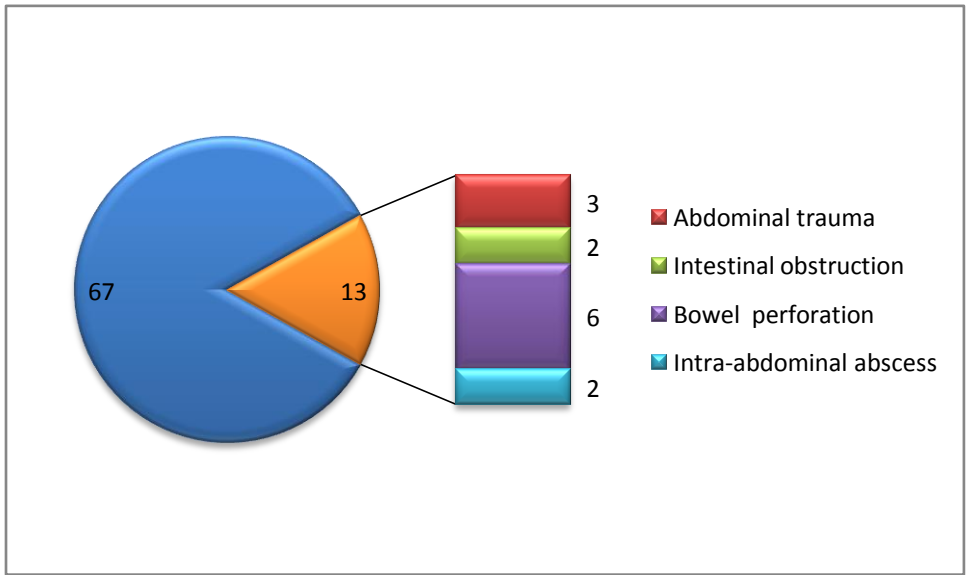


Figure III:- Incidence of wound dehiscence with relation to the type of surgery.

Observation:
6 patients out of 13 who had developed wound dehiscence (46.15%) were operated for bowel perforation with peritonitis. 3 patients (23.07%) of wound dehiscence were operated for abdominal trauma. Intestinal obstruction without peritonitis and intra-abdominal abscess showed equal incidence of wound dehiscence (15.38%).

Table 4:- Association between wound dehiscence and timing of surgery (after the onset of signs and symptoms).

Timing of surgery after the onset of symptoms (in hours)	Dehiscence cases (out of 13)	% of dehiscence
<6 hours	0	0
6-12 hours	1	7.6
12-36 hours	2	15.38
36-72 hours	4	30.76
>72 hours	6	46.15

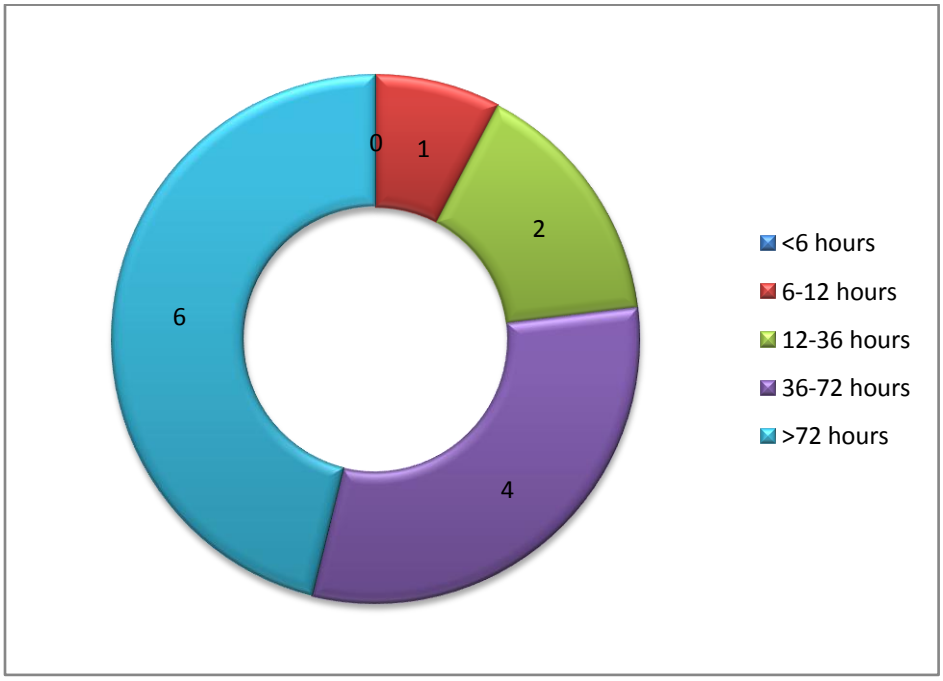
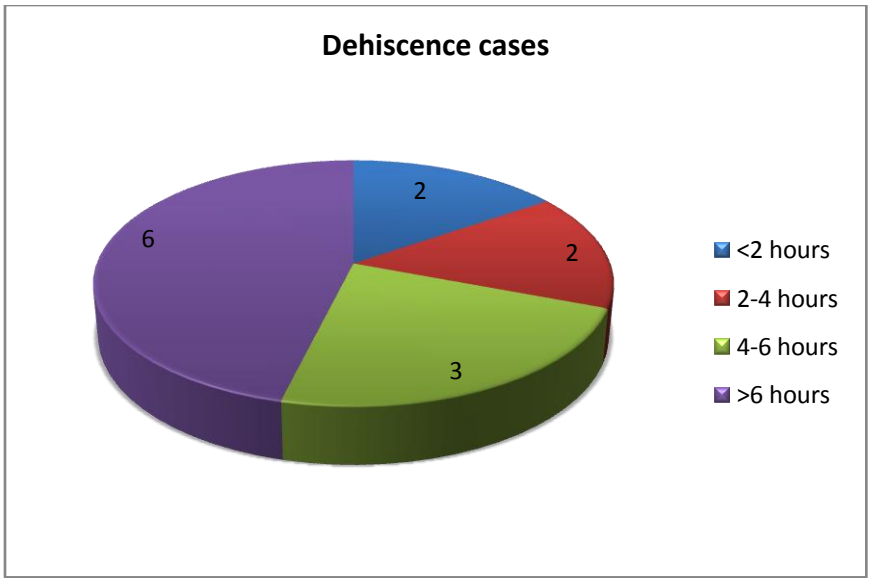


Figure IV:- Association between wound dehiscence and timing of surgery.

Observation:In view of the timing of the surgery and association of symptoms and signs of wound dehiscence, it was observed that the incidence of wound dehiscence was 0%, 1%, 2%, 4% and 6% when the operations were started within <6. 6-12, 12-36, 36-72 and >72 hours later respectively. The incidence of wound dehiscence increased as the time lapse between the timing of surgery and appearance of clinical features were increased.

Table 5:- Incidence of wound dehiscence based on the duration of surgery.

Intra-operative time	Dehiscence cases	% of dehiscence
<2 hours	2	15.38
2-4 hours	2	15.38
4-6 hours	3	23.07
>6 hours	6	46.15



FigureV:- Incidence of wound dehiscence based on the duration of surgery.

Observation:

In the study, it was found that longer the duration of surgery, greater was the incidence of wound dehiscence. In about 6 out of 13 cases of wound dehiscence, the duration of surgery went for more than 6hours. Surgeries that took 4-6, 2-4 and <2 hours, witnessed 3, 2 and 2 cases of wound dehiscence, respectively.

Table 6:- Incidence of wound dehiscence in different suture material used for closure of rectus sheath.

Suture material used for closure of rectus sheath	Number of cases with wound dehiscence	% of wound dehiscence
Absorbable monofilament (PDS)	2	15.38
Absorbable braided (vicryl)	7	53.84
Non absorbable monofilament (Loop Nylon)	4	30.76

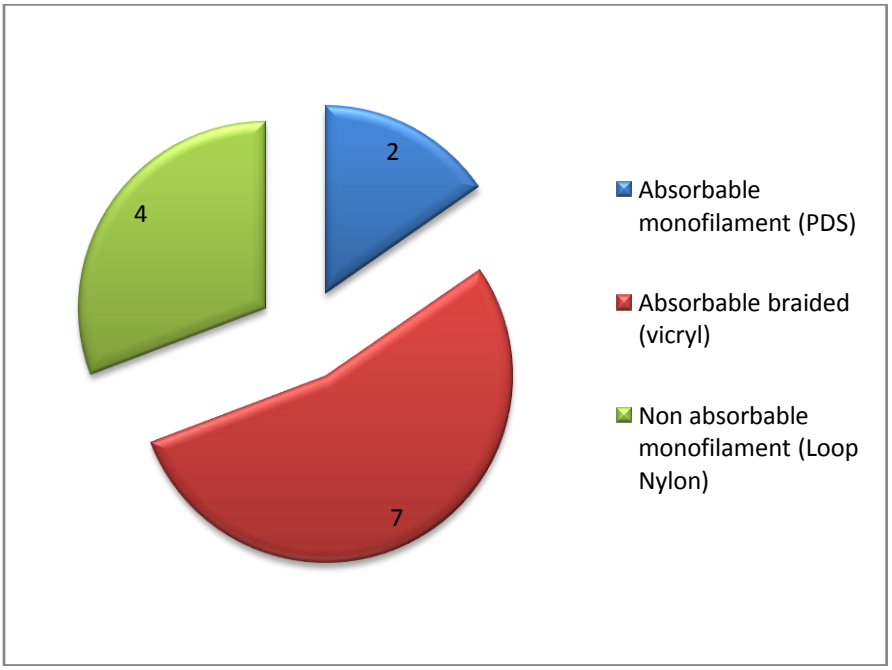


Figure VI:- Incidence of wound dehiscence in different suture material used for closure of rectus sheath.

Observation:-

Out of the above-mentioned sutures used for rectus closure, wound dehiscence was observed maximum in absorbable braided suture (53.84%) followed by non-absorbable monofilament suture (30.76%).

Table 7:- Appearance of wound dehiscence to the post op day.

Post op day	No. of patients who developed first sign of wound dehiscence	% of wound dehiscence
3rd -5th	0	0
6th-8th	7	53.84
9th-11th	3	23.07
12th-14th	2	15.38
Beyond 14th	1	7.69

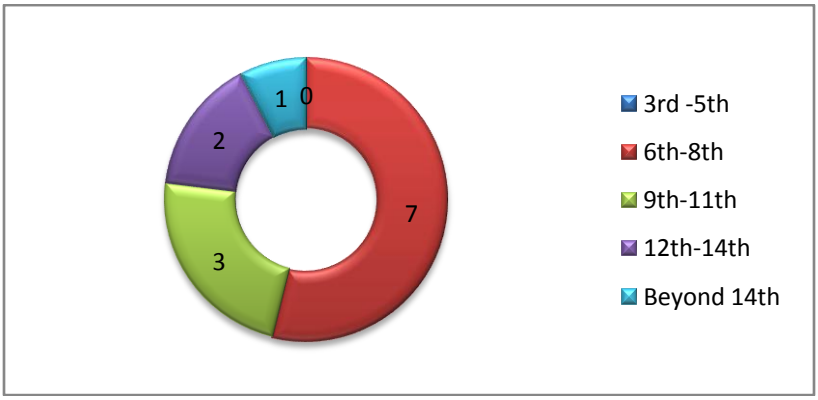


Figure VII:- Appearance of wound dehiscence to the post op day.

Observation:

7 patients out of 13 (53.84%) developed first sign (serosanguinous discharge) of wound dehiscence by post op day 6^{th}-8^{th}. 3 patients (23.07%) developed wound dehiscence on post op day 9^{th}-11^{th}. 2 patients developed wound dehiscence on 12^{th} – 14^{th} post-op day (15.38%) while 1 patient developed wound dehiscence beyond 14^{th} day postoperatively. None of the patients had wound dehiscence before day 5.

Table 8:- Post op surgical complications in relation to wound dehiscence.

Post op surgical complications	Number of cases that developed complication	Number of cases that developed wound dehiscence	% of wound dehiscence cases
Post op paralytic ileus	6	3	23.07
Anastomotic leak	5	2	15.38
Post op abdominal distension	6	3	23.07
Anemia	7	1	7.69
Deranged LFT	1	0	0
Deranged RFT	4	1	7.69
Total no. of cases	32	10	76.92

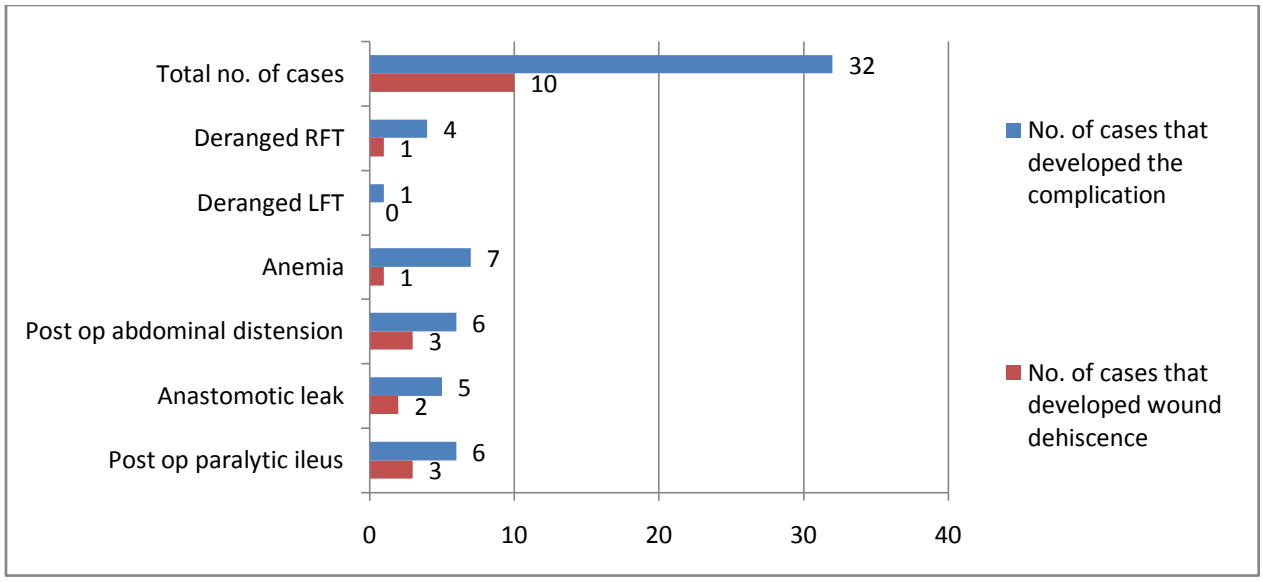


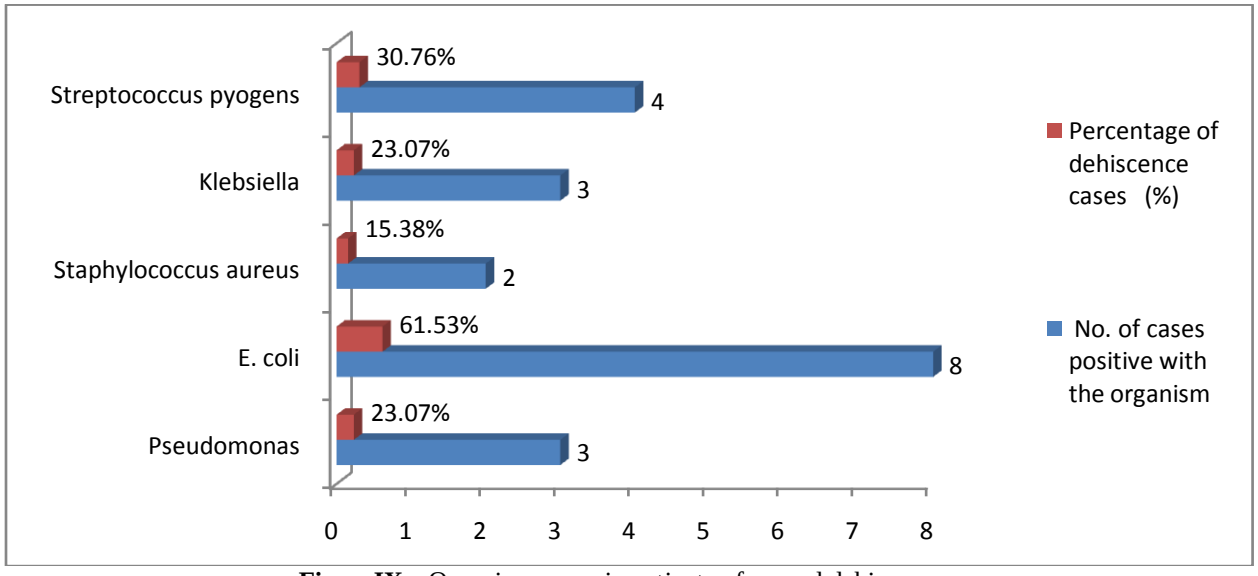
Figure VIII:- Post op surgical complications in relation to wound dehiscence.

Observation:

In some of the cases, the causes were multifactor.However, the most important factors were found to be post op paralytic ileus and post op abdominal distension. It was also observed that all the cases that had post op complications did not have dehiscence and in 3 cases of wound dehiscence, the exact underlying cause of wound dehiscence could not be identified.

Table 9:- Organisms seen in patients of wound dehiscence.

Microorganisms isolated from pus culture	**Number of cases positive with the organism**	**% of dehiscence cases**
Pseudomonas	3	23.07
E. coli	8	61.53
Staphylococcus aureus	2	15.38
Klebsiella	3	23.07
Streptococcus pyogens	4	30.76
Total no. of cases	20	



FigureIX:- Organisms seen in patients of wound dehiscence.

Observation:
Though the antibiogram of pus from the wound of the patients who underwent dehiscence was of mixed bacterial growth, the most common infecting organism was found to be E. coli (61.53%) followed by klebsiella (23.07%). Two cases of wound dehiscence showed no growth on culture. Also, all culture positive cases did not develop wound dehiscence.

Discussion:-

The present study reflects upon the high incidence of wound dehiscence (16.25%) after emergency midline laparotomy. In the study by Talukdar et al [5], incidence of wound infection was found to be 12.68% (27/213); while another study by Wagh et al. [7], it was as much as 26.5% (53/147). A similar study by Hegazy et al [8] in Egypt reported burst abdomen rate to be 12.4% (31/250).

It was found that the age group of more than 60 years had higher incidence of wound dehiscence (46.15%). According to an Egyptian study by Hegazy et al, age was not found to be significant factor in the development of burst abdomen. In an another study by Garg et al [9], the highest incidence of wound dehiscence was found in patients falling in the age group of 31-40 years (22%), although no correlation was established between the increasing age and increased incidence.

Wound dehiscence was found to be the highest in emergency laparotomies indicated for bowel perforation with peritonitis (46.15%). In a study conducted by Wagh et al [7], the highest rate of infection (56.5%) was found in the repair of peptic ulcer perforation and lowest in obstructed hernia operation (0%) and the association between the type of operation and risk of SSI was statistically significant. In a similar study done by Hegazy et al [8], peritonitis (71%) was significant risk factor for burst abdomen (22/31). Consistently, Talukdar et al [5], found peritonitis (18.75%) to be a significant risk factor in wound dehiscence (21/112).

Further, incidence of wound dehiscence increased as the time lapse between the timing of surgery and appearance of clinical features were increased. Similar increase in wound infection was found in the study done by Wagh et al. [7], where 40.6 % of the wound infections occurred when the operation was initiated after 72 hours of appearance of clinical symptoms and signs; however, this association was not statistically significant. In another study done by Talukdar et al. [5], 18 patients (n=27) of wound dehiscence had presented to hospital after 48 hours whereas 41 patients out of 186 who did not develop wound dehiscence presented after 48 hours. Thus, delayed presentation to hospital was found to have a significant p-value.

In the study, prolonged duration of surgery had higher cases of wound dehiscence. In a study by Garg et al [9], the highest incidence of wound dehiscence (10/45) was found in the emergency surgeries that took beyond 2 hours for closure. In another study done by Talukdar et al. [5], similar association was found, however it was statistically insignificant.

In our study, rectus sheath when closed with absorbable braided suture showed higher incidence of wound dehiscence (53.84%). In a study by Hegazy et al. [8], the midline laparotomy was closed en mass using non-absorbable no. 1 (polypropylene) or slowly absorbable PDS (double) in continuous single layer fashion. According to the study, no statistical difference was found between prolene group (45.2%) and PDS group (54.8%), indicating that it not a matter of chemical nature of the suture material. Consistent results were observed by Henriksen et al. [10], establishing that no suture material proved to be superior in closure of abdomen.

The present study observed that wound dehiscence was most commonly observed between post-operative day 6-8 (53.84%). In a study by Garg et al. [9], 16 patients (32%, n=50) developed wound dehiscence on 4th day of post-op and no wound dehiscence prior to third day or later than seventh post-op day was observed.

In a study by Bansiwal RK et al. [11], post operative abdominal distension is associated with high rate of abdominal wound dehiscence (22%) (33/150). Garg et al. [9] also established that abdominal distension present in 12% patients led to wound dehiscence. The distension was due to paralytic ileus. In the study by Hegazy et al. [8], post op paralytic ileus was not a significant factor for wound dehiscence but was found to be high in wound dehiscence.

Garg et al. [9] found that post operative wound infection was a single most important common factor observed in 90% patients with abdominal wound dehiscence. Out of the infective wounds, fecal discharge was found in 8 patients (16%) and frank pus in 12 patients (24%).

In the study by Hegazy et al. [8], anemia was found to be a single risk factor for burst abdomen. 15 out of 31 patients (48.4%) had Hb <9gm/dL. Consistent result by Garg et al. [9], 26% of patients were anemic with Hb <10gm/dL, establishing that anemic people had poor wound strength. Anemia was established as an underlying risk factor for wound dehiscence by Gokak et al. [12], but no statistical significance was present.

Hegazy et al. [8], established hypalbuminemia as a risk factor for burst abdomen and was attributed to sepsis, associated with anemia and wound infection. In Garg et al. [9], 16% patients had serum bilirubin >1.0 mg% but no statistical significance was found between jaundice or impaired LFT with wound dehiscence.

CASE1: Wound dehiscence with "salmon colored" fluid discharge indicating an impending burst abdomen on Post operative day-5.

Post operative day14 wound status of the patient after healing by secondary intention.

CASE 2: Burst abdomen on post operative day 12 with evisceration of bowel loops.

Wound status of the patient after bagota bag repair in emergency.

In the study by Garg et al. [9], impaired renal function was present in 19 patients out of 50 patients of wound dehiscence (38%) with blood urea >40mg% but no statistical significance was found between renal impairment and

wound infection. In a similar study between Gokak et al. [12], uremia was second risk factor leading to wound dehiscence.

In our study, the most common infecting organism was found to be E. coli (61.53%). Similar result was found in the study by Garg et al. [9], where the most commonly infecting organism was E. coli (40.0%).

Conclusion:-

This study concludes that wound dehiscence in emergency laparotomy is a major dreadful complication even in a tertiary hospital. Overall, 16.25% of emergency laparotomy developed wound dehiscence; higher dehiscence was found in higher age group. Bowel perforation with peritonitis, fecal contamination of wound, timing of presentation and duration of surgery and some intra-operative risk factors. Intra-abdominal pressure and post op ileus were found to be important post op risk factors of wound dehiscence. The present study makes a crucial finding that even with wound infection and some of the complications, all the cases did not have wound dehiscence. Associated pre-existing co-morbidities like anemia were also found to be important factors. We should have a high index of suspicion and apprehension to spot out the cases which may develop wound dehiscence and treat them, rather better to prevent its occurrence in the first place. The take home message is, as always, prevention is better than cure.

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