Journal of Cardiovascular Disease Research
ISSN: 0975 -3583, 0976-2833 VOL 15, ISSUE 09, 2024

STUDY OF PREDICTORS FOR POST LAPAROTOMY WOUND DEHISCENCE

Dr. Bandhul Tiwari[1*], Dr. Apurb Lal[2], Dr. Salim Tahir[3]
[1*]Assistant Professor, Department of General Surgery, Era's Lucknow Medical College and Hospital, Lucknow.
[2]Junior Resident, Department of General Surgery, Era's Lucknow Medical College and Hospital, Lucknow.
[3]Professor, Department of General Surgery, Era's Lucknow Medical College and hospital, Lucknow.
Corresponding Author: Dr.Bandhul Tiwari
Assistant Professor, Department of general Surgery, Era's Lucknow Medical College and hospital, Lucknow.

Abstract:

Introduction: Dehiscence occurs when wound margins that were previously closed come apart either partially or completely, which is often caused by inadequate wound healing. The same factors that can contribute to poor wound healing, including ischemia, infection, elevated abdominal pressure, diabetes, malnutrition, smoking, and obesity, can also increase the risk of dehiscence.

Aim: To assess the significance of predictors associated with post laparotomy abdominal wound dehiscence.

Material and Methods: A total of 40 patients who were hospitalized for wound dehiscence after laparotomy were screened for inclusion and exclusion criteria eligible patients were enrolled in the study after obtaining informed signed written consent to participate in the same. Demographic profiling was done for the patients. Intra-operative assessment was done for Duration of surgery, types of sutures used, types of surgery. Post Operative findings were accessed at Day 1, Day 3, Day 5, Day 7, Day 14, Day 21 and Day 30 post-operatively.

Results: The Five Most Common Causes of Wound Dehiscence as estimated by Bayes Formula showed that the most common cause was found to be dirty wound (28.30% chances) followed by contaminated wound (22.93% chances), distension (8.93% chances), raised urea/creatinine (7.50% chances) and S.Aureus organism (6.40% chances).

Conclusion: Dirty wound and contaminated wound are found to be two most important predictors of wound dehiscence followed by abdominal distension, raised urea/creatinine and S. Aureus organism contaminating the wound.

Key Words: Dehiscence, diabetes, malnutrition, smoking, and obesity.

INTRODUCTION

Dehiscence occurs when wound margins that were previously closed come apart either partially or completely, which is often caused by inadequate wound healing. This complication is most frequently observed within 5 to 8 days of surgery, during the initial stages of recovery. The same factors that can contribute to poor wound healing, including ischemia, infection, elevated abdominal pressure, diabetes, malnutrition, smoking, and obesity, can also increase the risk of dehiscence[1].Superficial dehiscence occurs when the

wound margins detach and there is an increase in bleeding or drainage at the location. The doctor should examine the wound for any concerning indications, such as infection or necrosis[2]. Early detection is critical for avoiding further dehiscence, infection, and other consequences. Evisceration is a complication of full wound dehiscence in which organs herniate through the open wound.

Abdominal wound dehiscence (burst abdomen, fascial dehiscence) is a serious postoperative complication, with death rates of up to 45% recorded [1- 3]. According to the research, the incidence ranges from 0.4% to 3.5% [4-10]. Evisceration can occur when an abdominal wound dehisces, necessitating prompt care. The severity of this complication is highlighted by the prolonged hospital stay, high frequency of incisional hernia, and multiple reoperations.

Despite advancements in perioperative care and suture materials, the incidence and fatality rates of abdominal wound dehiscence have not improved appreciably over the last few decades. This might be due to rising rates of risk factors in patient populations outweighing the advantages of technological advancements. Numerous studies, often retrospective in nature, have been conducted to identify risk factors for this condition, with often contradictory results. However, multivariate analysis has only been undertaken in a small number of studies and on a small number of patients in general.[4-7,10]

Appropriate wound healing takes happen in three stages, allowing the injury to heal and new tissue to replace the injured tissue. Inflammation, proliferation, and maturation are the three stages.[3,4,5] Over two years, the healed wound should reach 80% of its original tensile strength, but not the same degree of pre-injury strength. Poor wound healing can occur when any of the three stages of healing is disrupted. The presence of necrotic tissue, infection, ischemia, smoking, diabetes, malnutrition, glucocorticoid usage, and radiation exposure are all common risk factors for aberrant healing.

When dehiscence is discovered, the amount of wound failure must be determined. Abdominal binders can be used to relieve tension on the wound and prevent additional dehiscence in cases of superficial dehiscence. The current wound failing can be allowed to heal by secondary intention or can be closed by secondary intention. Deep fascia dehiscence is a surgical emergency that must be addressed in the operating room because it can progress to evisceration. If there is symptoms of evisceration, cover the incision with a sterile saline bandage until the herniating organs can be reduced back into the abdomen.

MATERIAL AND METHODS

An observational study was planned to include all the patients diagnosed of Abdominal wound dehiscence in General Surgery Department of Era's Lucknow Medical College & Hospital between 2020 and 2022, of these cases aged>18 years were enrolled in the study after explaining the surgical protocol and obtaining informed consent of the patients. All patients who have developed wound dehiscence after second surgery or third surgery were excluded.

Clinical history, examination, diagnosis, investigations, detail of previous operative procedure (if any) were noted in detail. Intraoperative data was included regarding type of

incision, type of suture used, type of wound, total intra operative time. At postoperative follow-ups, fever episodes, pain, date of drain removal, secretion from wound, abdominal distension, hematoma formation, seroma formation and day of dehiscence were observed on1st ,3rd,5th ,7th,14th , 21st and 28thpostoperative days.

RESULTS

The study involved a total of 40 cases of abdominal wound dehiscence. Maximum cases belong to the age group 31 – 40 years (27.5%) followed by the age group 41 – 50 years (22.5%) and 21 – 30 years (17.5%). The mean age of the study cases was 42.18±15.05 years. Out of 40 study cases, 13 (32.5%) were males and rest 27 (67.5%) were females.14 patients (35%) had normal BMI (18 – 24.9 kg/m^2), 25% subjects had BMI less than 18 kg/m^2 while 22.5% were overweight. Further 15% subjects were obese of class 1 and one was obese of class 2.

The dehiscence was happened at 5th day in maximum number of cases (35%) followed by the 4th day (25%) and 6th day (20%). In 10% cases the day of dehiscence was 3rd and 7th.The E.coli was found in maximum number of cases (37.5%) followed by the Klebsiella (17.5%) and Staph. Aureus(17.5%). Pseudomonas was found in 10% cases and Strp Pyogenes in 7.5% cases. Remaining 10% cases were sterile. The suture material polyglactin was used in 17 (42.5%) cases and polypropylene in 23 (57.5%) cases. Hypoalbuminemia was present in 9 (22.5%) cases. Diabetes was present in 3 (7.5%) cases. Jaundice was present in 8 (20.0%) cases. Urea/Creatinine Level was found to be raised in 17 (42.5%) cases. Out of 40 cases, mostly had ASA grade I (92.5%). Two cases (5.0%) were of ASA grade II and one case (2.5%) was of ASA grade III. The dirty wound was observed in maximum 20 (50%) cases. In 17 (42.5%) cases the wound was contaminated while in remaining 3 (7.5%) cases the wound was clean contaminated.

The Perforation Peritonitis was found in maximum 20 (50%) cases followed by the intestinal obstruction which was found in 15 (37.5%) cases. Other pathologies were blunt abdominal trauma (2.5%), colorectal malignancy (5%) and cholelithiasis with choledocholithiasis (5%).The distension was present in 5 (12.5%) cases. The emergency surgery was done in most of the cases (92.5%) while in remaining 3 (7.5%) cases, elective surgery was done.

The estimation of Effect of Age over Wound Dehiscence using Bayes Formula and using prior information on incidence of wound dehiscence and age proportion of Indian population revealed that the maximum chances of wound dehiscence were in the age group 51-60 years (6.18%) followed by the age group 41-50 years (6.06%) and age group 31-40 years (5.75%). The chances of wound dehiscence is optimal among younger people. The chances of wound dehiscence in males was 1.89% while in females 4.17% chances of wound dehiscence was estimated. The maximum chances of wound dehiscence were in the obese (4.45%) followed by the overweight (3.04%).The maximum chances of wound dehiscence were associated with Staph. Aureus (6.40%) followed by the Strep. Pyogenes (4.79%). There were 3.38% chances of wound dehiscence were associated with Hypoalbuminemia. There were 0.77% chances of

wound dehiscence were associated with Diabetes. There were 2.97% chances of wound dehiscence were associated with Jaundice. There were 7.50% chances of wound dehiscence were associated with raised urea/creatinine. The chances of wound dehiscence with ASA grades I, II and III were 5.00%, 0.48% and 0.68% respectively. There were 28.30% chances of wound dehiscence were associated with dirty wound type, 22.93% with contaminated type and 3.13% chances with clean contaminated wound types. There were 8.93% chances of wound dehiscence were associated with distension.

Table 1: Estimation of Effect of ASA Grade over Wound Dehiscence using Bayes Formula

ASA	No.	%	Prev in Gen Popn	% chances of WD
I	37	92.50	55.50	5.00
II	2	5.00	31.27	0.48
III	1	2.50	11.01	0.68

The estimation of Effect of various ASA grades over Wound Dehiscence using Bayes Formula and using prior information on incidence of various ASA grades in general population revealed that chances of wound dehiscence with ASA grades I, II and III were 5.00%, 0.48% and 0.68% respectively.

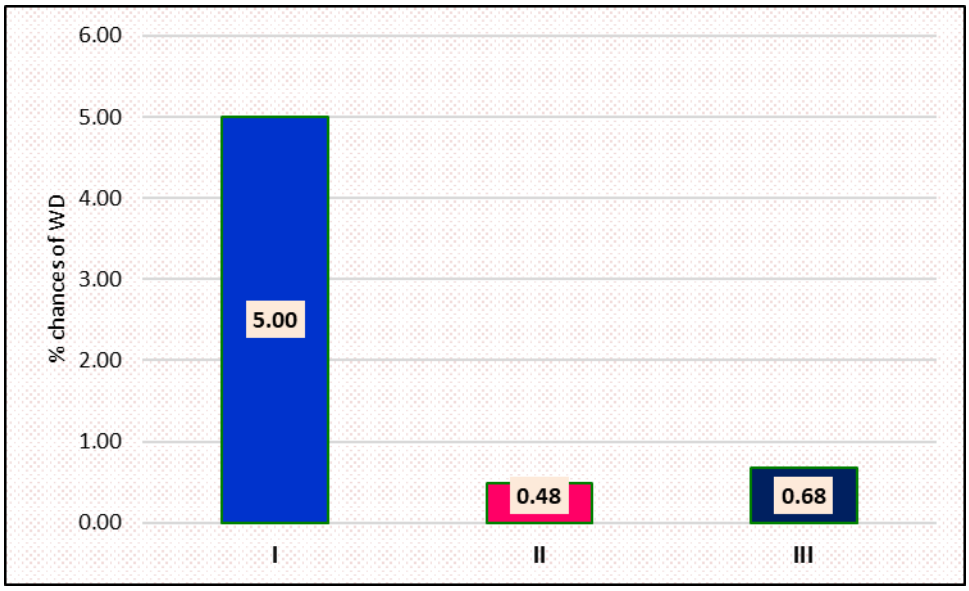


Table 2: Estimation of Effect of Wound Type over Wound Dehiscence using Bayes Formula

WOUND TYPE	No.	%	Prev in Gen Popn	% chances of WD
CLEAN CONTAMINATED	3	7.50	7.18	3.13
CONTAMINATED	17	42.50	5.56	22.93
Dirty	20	50.00	5.30	28.30

The estimation of Effect of wound type over wound Dehiscence using Bayes Formula and using prior information on incidence of various wound types in surgery OPD revealed that 28.30% chances of wound dehiscence were associated with dirty wound type, 22.93% with contaminated type and 3.13% chances with clean contaminated wound types.

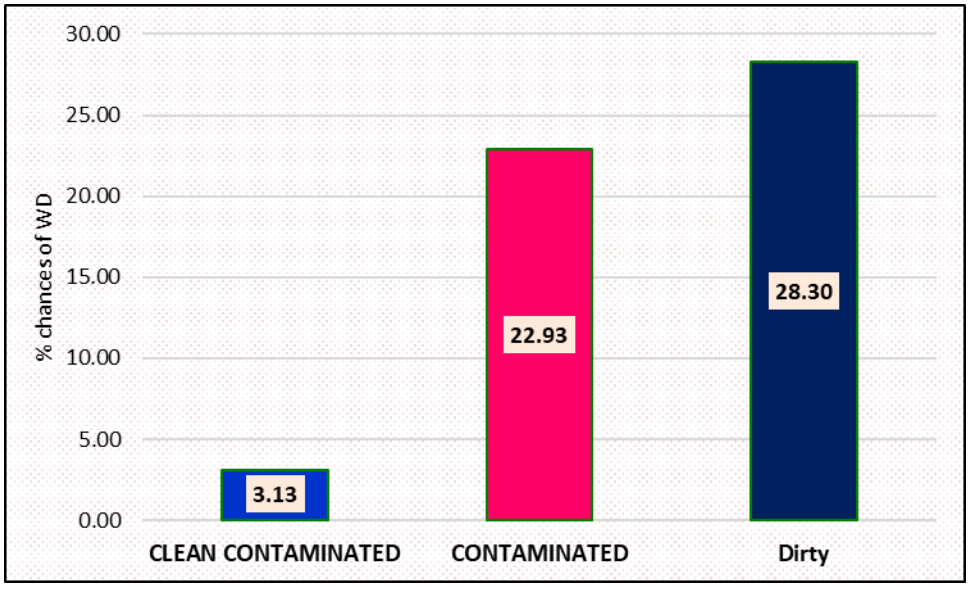


Table 3: Estimation of Effect of Distension over Wound Dehiscence using Bayes Formula

Distension	No.	%	Prev in Gen Popn	% chances of WD
Absent	35	87.50	95.80	2.74
Present	5	12.50	4.20	8.93

The estimation of Effect of distension over Wound Dehiscence using Bayes Formula and using prior information on incidence of distension in general population revealed that 8.93% chances of wound dehiscence were associated with distension.

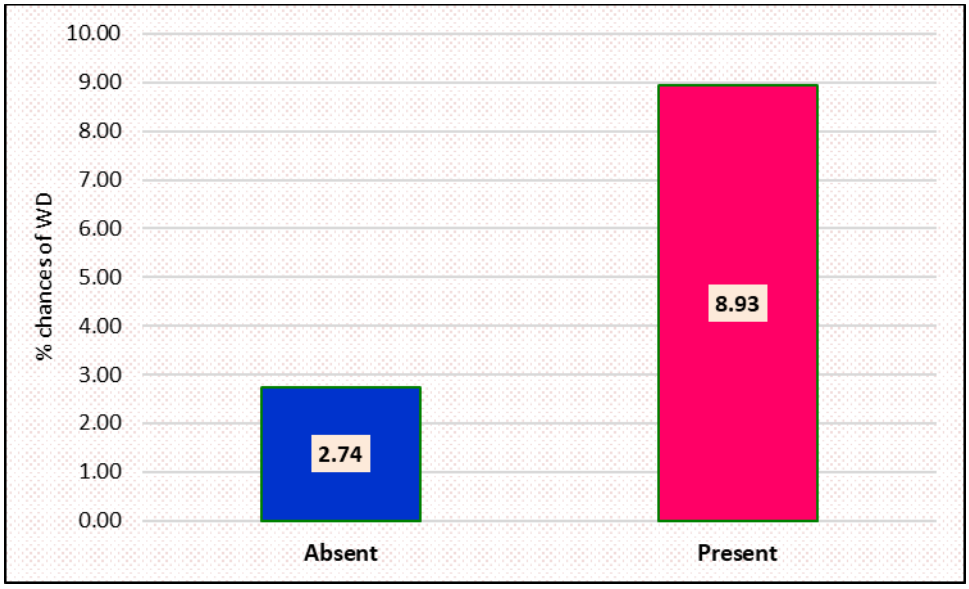
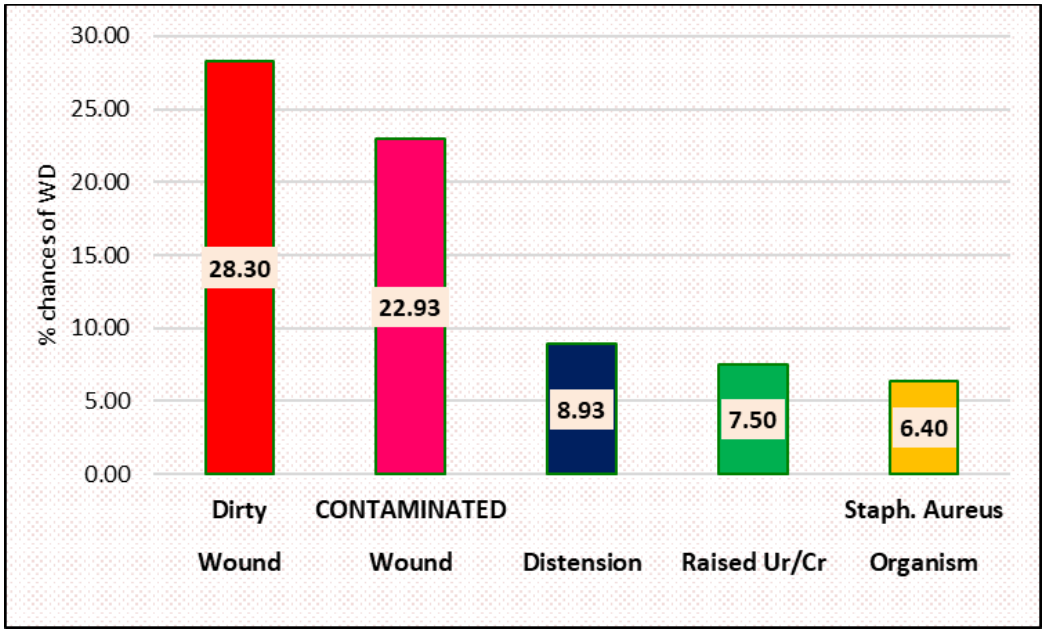


Table 4: Descriptive Summary of Five Most Common Causes of Wound Dehiscence as estimated by Bayes Formula

Variable	Category	No.	%	Prev in Gen Popn	% chances of WD
Wound	Dirty	20	50.00	5.30	28.30
Wound	Contaminated	17	42.50	5.56	22.93
Distension	Present	5	12.50	4.20	8.93
Raised Urea/ Creatinine	Present	17	42.50	17.00	7.50
Organism	Staph. Aureus	7	17.50	8.20	6.40

The Descriptive Summary of Five Most Common Causes of Wound Dehiscence as estimated by Bayes Formula showed that the most common cause was found to be dirty wound (28.30% chances) followed by contaminated wound (22.93% chances), distension (8.93% chances), raised urea/creatinine (7.50% chances) and S.Aureus organism (6.40% chances).



DISCUSSION

The various factors leading to abdominal wall dehiscence include general patient profile such as age, gender, nutritional status, pre-operative medical condition such as anaemia, diabetes, jaundice, renal failure, poor ASA (American Society of Anaesthesiologists) scoring, intra-operative knot breakage, suture material rupture or suture cut through, emergency or elective surgery, type and duration of surgery, and post-operative wound infection or increase in intra-abdominal pressure. Abdominal wound dehiscence following laparotomy is a surgical emergency with significant morbidity and mortality, resulting in increased hospital expenditures and a longer hospital stay. Major abdominal wound disruption has a reported prevalence of 1-3% and is related with a death risk of 15-20%. Although various systemic causes, local mechanical factors, and post-operative events have been implicated for abdominal wound dehiscence, the value of each of these factors remains unclear. This study was carried out to assess the significance of predictors associated with post laparotomy abdominal wound dehiscence.

Because of the interconnections of physiological systems, external pressures, and illness with an ageing process that occurs over several years, the elderly patient is more prone to wound healing difficulties. Because wound healing in the elderly is complex, it is difficult to tell whether reported healing issues are due to age or other causes. Our study, also analyzed parameters on the basis of bayesian model to estimate effect of age over wound dehiscence using prior information on incidence of wound dehiscence and age proportion of Indian population which revealed that the maximum chances of wound dehiscence were in the age group51-60 years (6.18%) followed by the age group 41-50 years (6.06%) and age group 31-40 years (5.75%).

Out of 40 study cases, 13 (32.5%) were males and rest 27 (67.5%) were females. According to bayes theorem in males was 1.89% while in females4.17% chances of wound dehiscence. Ramneesh G et al [11] found that coinciding results in which he found that male

predominance (37/50) was observed, with ratio of male to female being 2.84:1.Verma S et al[12] also found that out of 50 cases, 35 were male (70%) and 15 were female (30%).

In our study it was observed that out of 40 study cases, 14 (35%) had normal BMI (18 – 24.9 kg/m2), 25% subjects had BMI less than 18 kg/m2while 22.5% were overweight. Further 15% subjects were obese of class 1 and one was obese of class 2. According to bayes theorem maximum chances of wound dehiscence were found in the obese (4.45%) followed by the overweight (3.04%). In a study by Kapoor KK et al [13] 36 patients were overweight, (BMI> 25), 24 patients were having their BMI below 25. Ramneesh G et al [11]found that of the total of 50 patients, 16 were found to be obese (BMI>30).

In our study the dehiscence happened at 5th day in maximum number of cases (35%) followed by the 4th day (25%) and 6th day (20%). In 10% cases the day of dehiscence was 3rd and 7^{th} .According to Bailey, the maximum incidence is found on the 8th post-operative day. In a study by Mahey R et al [14], the maximum number of cases occurred between 6th to 10th post-operative days, with the maximum on the 7th postoperative day.They maintained antibiotics for one week, and when they stopped, there may be a return of infection and a ruptured abdomen. Patients undergoing major abdominal surgery are in bed for up to 4 or 5 days, receiving intravenous infusions. Then they start moving and trying to pass faeces. All of this raises intra abdominal pressure. The holding-together capacity decreases with time, until stitches have little use after 10 days.

In our study it was observed that the E.coli was found in maximum number of cases (37.5%) followed by the Klebsiella (17.5%) and Staph. Aureus (17.5%). Pseudomonas was found in 10% cases and Strp Pyogenes in 7.5%cases. Remaining 10% cases were sterile. According to bayes theorem maximum chances of wound dehiscence were associated with Staph. Aureus (6.40%) followed by the Strep. Pyogenes (4.79%). Mohammed A et al seventy seven (57%) of the isolates were gram-negative and 59 (43%) were Gram positive.

Hypoalbuminemia probably was due to sepsis, so it is mostly associated with anaemia and wound infection. In our study hypoalbuminemia was present in 9 (22.5%) cases and diabetes was present in 3 (7.5%) cases. According to bayes theorem 3.38% chances of wound dehiscence were associated with Hypoalbuminemia. Jaundice was present in 8 (20.0%) cases, 0.77% chances of wound dehiscence were associated with diabetes. 2.97% chances of wound dehiscence were associated with Jaundice. Verma S et al [12] found that out of 50 cases 8 patients had serum bilirubin >1.2mg/dl and 30 patients had hypoalbuminemia (serum albumin<3.5mg/dl). Previous studies supported that finding. Choudhury et al [15] reported 76.79% of cases had hypoalbuminemia. Urea/Creatinine Level was found to be raised in 17 (42.5%) cases. According to bayes theorem incidence of raised urea/creatinine in general population revealed that 7.50% chances of wound dehiscence were associated with raised urea/creatinine.

Pre-existing systemic illness contributes to higher ASA score and higher wound dehiscence rates because of increase wound infection (Sawyer GS et al[16]). In our study out of 40 cases, mostly had ASA grade I (92.5%). According to bayes theorem ASA grades in general population revealed that chances of wound dehiscence with ASA grades I, II and III were

5.00%, 0.48% and 0.68%respectively. Two cases (5.0%) were of ASA grade II and one case (2.5%) was of ASA grade III. In our study it was also found that the dirty wound was observed in maximum 20 (50%) cases. In 17 (42.5%) cases the wound was contaminated while in remaining 3 (7.5%) cases the wound was clean contaminated. According to bayes theorem 28.30% chances of wound dehiscence were associated with dirty wound type, 22.93% with contaminated type and 3.13%chances with clean contaminated wound types. 8.93% chances of wound dehiscence were associated with distension.

Some other findings of our study revealed that the Perforation Peritonitis was found in maximum 20 (50%) cases followed by the intestinal obstruction which was found in 15 (37.5%) cases. Other pathologies were blunt abdominal trauma (2.5%), colorectal malignancy (5%) and cholelithiasis with choledocholithiasis (5%). Mahey R et al[14] found that cholelithiasis (18%) was the most common disease associated with wound dehiscence followed by appendicitis (16%) and ileal perforation (12%).

Our study also revealed that the emergency surgery was done in most of the cases (92.5%) while in remaining 3 (7.5%) cases, elective surgery was done. Kapoor KK et al observed that out of 60 cases, 52 cases (87%) were operated as emergency surgery and 8 cases (13%) as elective surgery. Venkatesham B et al[13] found that 110 (92%) patients operated in emergency and 10 (8%) operated in elective setting. Muneiah N et al [17] found that out of36 cases, 32 cases (88.88%) were operated as emergency surgery and 4 cases (11.11%) as elective surgery.

When dehiscence is discovered, the amount of wound failure must be determined. Abdominal binders can be used to relieve tension on the wound and prevent additional dehiscence in cases of superficial dehiscence. The current wound failing can be allowed to heal by secondary intention or can be closed by secondary intention. Deep fascia dehiscence is a surgical emergency that must be addressed in the operating room because it can progress to evisceration. If there are symptoms of evisceration, cover the incisions with asterile saline bandage until the herniating organs can be reduced back into the abdomen. Proper surgical technique, especially significant fascial bites during abdominal closure, should be emphasized. Excessive stress on the wound raises the likelihood of dehiscence while also limiting circulation to the healing wound. Small 'pie-crust' incisions paired with wound closure and the use of attachment plates to lessen initial wound stress while allowing for progressive tension loading is advanced approaches for reducing wound tension.

Age, wound infection, hypoalbuminemia, emergency surgery, malignancy, and steroid usage are all patient-specific risk factors for dehiscence. Increasing risk variables found to be associated with a higher chance of dehiscence. Patients with dehiscence had a 16% mortality rate. Anemia, jaundice, COPD, and wound infection are other risk factors. With rising risk variables, the chance of dehiscence increased. Certain preoperative physiologic and physical presurgical rehabilitation programs can be employed to target and improve specific comorbidities in order to reduce the risk of incision site dehiscence.

CONCLUSION

The present study entitled “Study of predictors for post laparotomy wound dehiscence” is carried out with an aim to evaluate the importance of factors that contribute to post laparotomy abdominal wound dehiscence. Specifically, the study objectives to determine the extent to which various predictors are involved in this condition and to compare their correlation with the occurrence of wound dehiscence. The study involved a total of 40 cases of abdominal wound dehiscence. Descriptive Summary of Five Most Common Causes of Wound Dehiscence as estimated by Bayes Formula showed that the most common cause was found to be dirty wound (28.30% chances) followed by contaminated wound (22.93% chances), distension (8.93% chances), raised urea/creatinine (7.50% chances) and S.Aureus organism (6.40% chances).

However this study was carried out in partial fulfilment of requirement of MS (General Surgery) degree and therefore suffers from limitation of time and resources. The study was limited to a small finite sample size. This study was based on samples of a particular regional population and hence cannot be implied to other regions, geographic locations and races.

REFERENCES

1. Fleischer GM, Rennert A, Rühmer M. Die infizierteBauchdecke und der Platzbauch. Chirurg. 2000;71:754–762.
2. Poole GV., Jr Mechanical factors in abdominal wound closure: the prevention of fascial dehiscence. Surgery. 1985;97:631–640.
3. Carlson MA. Acute wound failure. SurgClin North Am. 1997;77:607–636.
4. Webster C, Neumayer L, Smout R, et al. National Veterans Affairs Surgical Quality Improvement Program. Prognostic models of abdominal wound dehiscence after laparotomy. J Surg Res. 2003;109:130–137.
5. Wahl W, Menke H, Schnütgen M, et al. Die Fasciendehiscenz-Ursacheund Prognose. Chirurg. 1992;63:666–671.
6. Gislason H, Grønbech JE, Søreide O. Burst abdomen and Incisional hernia after major gastrointestinal operations—comparison of three closure techniques. Eur J Surg. 1995;161:349–354.
7. Armstrong CP, Dixon JM, Duffy SW, et al. Wound healing in obstructive jaundice. Br J Surg. 1984;71:267–270.
8. Penninckx FM, Poelmans SV, Kerremans RP, et al. Abdominal wound dehiscence in gastroenterological surgery. Ann Surg. 1979;189:345-352.
9. Pavlidis TE, Galatianos IN, Papaziogas BT, et al. Complete dehiscence of the abdominal wound and incriminating factors. Eur J Surg. 2001;167:351–354.
10. Humar A, Ramcharan T, Denny R, et al. Are wound complications after a kidney transplant more common with modern immunosuppression? Transplantation. 2001;72:1920–1923.

11. Ramneesh G, Sheerin S, Surinder S, Bir S. A prospective study of predictors for post laparotomy abdominal wound dehiscence. J Clin Diagn Res. 2014 Jan;8(1):80-3.
12. VermaS, PatilSM, BhardwajA.Study of risk factors in post-laparotomy wound dehiscence. IntSurg J2018;5:2513-7.
13. 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. IntSurg J2017;4:134-40.
14. Mahey R, Ghetla S, Rajpurohit J, Desai D, Suryawanshi S. A prospective study of risk factors for abdominal wound dehiscence. Int Surg J 2017;4:24-8.
15. Choudhury A, Deka RK, Gogoi B, Kumar N. A clinical study of abdominal wound dehiscence including its causes and management J Evol Med Dent Sci. 2017;6:1519–1523.
16. Sawyer GS, Pruett LP. Wound infection. Surgical clinics of North America. 1984;74(3):523.
17. Muneiah S. Abdominal wound dehiscence- A look into the risk factors. IOSR Journal of Dental and Medical Sciences. Volume 14, Issue 10 Ver. I (Oct. 2015), PP 47-54.