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RESEARCH ARTICLE

CLINICAL STUDY OF ABDOMINAL WOUND DEHISCENCE IN REGIONAL INSTITUTE OF MEDICAL SCIENCES HOSPITAL, MANIPUR

***,[1]Zochampuia, R., [2]Gojen Singh, Kh., [3]Rammuana, R., [4]Bhabatosh, D., [5]Lhuveto, N., [6]Ramesh Singh, L. and [7]Lekhachandra Sharma, K.**

[*1,3,4,5]Junior Resident, Department of General Surgery, Regional Institute of Medical Sciences, Imphal, India
[*2,6]Assistant Professor, Department of General Surgery, Regional Institute of Medical Sciences, Imphal, India
[*7]Professor, Department of General Surgery, Regional Institute of Medical Sciences, Imphal, India

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ABSTRACT

Wound dehiscence is disruption of any or all of the layers in a wound. Dehiscence may occur in up to 3% of abdominal wounds and is very distressing to the patient. Wound dehiscence is an acute wound failure. Acute wound failure has been discussed under various names i.e. wound dehiscence, burst abdomen, wound disruption and evisceration. Despite advances in perioperative care and suture materials, incidence and mortality rates in regard to abdominal wound dehiscence have not significantly changed over the past decades. This may be attributable to increasing incidences of risk factors within patient populations outweighing the benefits of technical achievements. This study was conducted to find out the incidence and identify the risk factors involved in causing abdominal wound dehiscence. 40 patients who developed abdominal wound dehiscence after laparotomy in department of surgery, RIMS Hospital were selected for cross sectional study during the study period of October 2013 to September 2015. Analysis was done with IBM SPSS version 16 and data were described using mean and percentages. Out of 1728 laparotomies during the study period which included 1008 cases of emergency laparotomies and 720 cases of elective laparotomies, 40 developed wound dehiscence, so incidence rate of abdominal wound dehiscence was 2.3% in this study; 1.9% for elective laparotomy and 2.6% for emergency laparotomy. The common risk factors identified were emergency laparotomy, age <30 years and age above 60 years and male sex. Low socio economic status was also a common cause of wound dehiscence. Hypertension and diabetes were present in some cases. Anaemia, hypoalbuminemia and kidney function derangement were also common among wound dehiscence patients. Another important finding was presence of malignancy. Wound infection, sepsis and raised intra abdominal pressure (coughing, vomiting) were also an important cause of abdominal wound dehiscence. Further studies with larger sample size and controlled studies were recommended to support this finding.

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INTRODUCTION

Wounds and their management are fundamental to the practice of surgery. Any surgical intervention will result in a wound. The surgeon's task is to minimize the adverse effects of the wound, remove or repair damaged structures and harness the process of wound healing to restore function. (Holmes, 1999) Wound dehiscence is disruption of any or all of the layers in a wound. Dehiscence may occur in upto 3% of abdominal wounds and is very distressing to the patient. (Kini, 2013)

Corresponding author: Zochampuia, R.
Junior Resident, Department of General Surgery, Regional Institute of Medical Sciences, Imphal, India.

Wound dehiscence is an acute wound failure. (Gurlyik, 2001) Acute wound failure has been discussed under various names i.e. wound dehiscence, burst abdomen, wound disruption and evisceration. (Sahlin *et al*., 1993) Wound dehiscence is described as partial or complete disruption of an abdominal wound closure with or without protrusion and evisceration of abdominal contents. Abdominal wound dehiscence or burst abdomen occurs before cutaneous healing. Incisional hernia is abnormal protrusion of a viscus through the musculo-aponeurotic layer of surgical scar, i.e. which lies under a well healed skin incision. (Savage and Lamont, 2000) Total evisceration consists of protrusion of the abdominal viscera due

to dehiscence of all the planes of the abdominal wall after laparotomy. (Rodriguez-Hermosa *et al*., 2005) Abdominal wound failure is defined as failure of the incision to heal and to maintain a normal abdominal wall anatomy. It can be divided into: Acute and Chronic. Wound dehiscence is an acute wound failure. It ranges from superficial breakdown of skin with intact deeper musculo-aponeurotic layers to a complete failure of wound and an exposure of viscera i.e. burst abdomen. It has an incidence of 2-3 percent and an associated mortality of 25%. (Wong and Kingsnorth, 2002) In some literatures the mortality rate in wound dehiscence/burst abdomen is reported as high as 45%. Incidence as described in literatures ranges from 0.4%to3.5%. (Afzal and Bashir, 2008) Wound dehiscence usually presents with a serosanguinous (pink) discharge. The patient may have felt a popping sensation during straining or coughing. Most patients will need to return to the operation theatre for re-suturing. In some patients it may be appropriate to leave the wound open and treat with dressings or vacuum assisted closure pumps. (Pace and Armitage, 2008) Wound dehiscence most commonly occurs from fifth (5^{th}) to eighth (8^{th}) post operative day when the strength of wound is at its weakest. Risk factors in wound dehiscence can be divided in two broad categories, General and Local. General factors include malnourishment, diabetes, obesity, renal failure, jaundice, sepsis, cancer, patients on steroids. Local factors include inadequate or poor closure of wound; poor local wound healing because of infection, hematoma or seroma, increased intra-abdominal pressure in post-operative patients suffering from chronic obstructive airway disease, during excessive coughing, vomiting, and distension. (Kini, 2013) intrinsic strength of the wound in the first day after surgery is virtually non-existent and gradually increases with time. In third week after surgery the durability equals 20% of the initial strength, and after 6-12 weeks it reaches 70-80%. No single cause is responsible for wound dehiscence and as a rule a combination of factors is operating. If the support system fails before the functional and structural integrity is regained, then the wound edges break apart. Many such factors like anaemia, jaundice, uraemia, diabetes, hypoalbuminemia, chronic obstructive pulmonary diseases, advanced malignancy, steroid use, obesity, wound infection, peritonitis, old age >65, increased intra-abdominal pressure, hypertension, and the experience of the surgeon have been defined. Lord Moynihan rightly said never judge a surgeon unless you see how he closes abdomen.

(Burger *et al*., 2002) Sutures placed during the surgery should allow the tissues the necessary time to regain structural and functional integrity. If the healing process is disturbed, this can lead to partial or complete dehiscence of individual layers of the sutured wound or to wound dehiscence along its entire depth, called total evisceration. In some literatures usually dehiscence or evisceration occurs 4 to 14 days after surgery (on the 8th day on average). The incidence of this laparotomy complication is estimated to be 0.3–3.5%, and as much as 10% in elderly patients. It is obvious that the surgeon's experience plays a major role in affecting the outcome of surgery, this holds for wound care and disruption, as well. The level of experience was also important with regard to timing of surgery, the choice of suture material, type of incision, drains, and ostomy. A significant difference in the dehiscence group was found concerning the type of suture material used, a study comparing interrupted silk suture, continuous polydiaxonone and continuous polypropylene shows that wound dehiscence is minimal in polypropylene. Previously, polyglycolic and silk sutures were commonly used, although they caused more wound failure and infections compared with alternative sutures like polydiaxonone and polypropylene. Anyhow no suture material can reach the ideal of being non-irritating, does not cause infection, and has strength. Some factors like jaundice, obesity, anaemia, emergency surgery and diabetes have recently been challenged. (Riou *et al*., 1992) It is found that wound infection is the most important single factor in the development of burst abdomen and incisional hernia. (Wilson and Clark, 2003) Abdominal wound dehiscence/burst abdomen is among the most dreaded complications faced by surgeons and of greatest concern because of risk of evisceration, the need for immediate intervention, and the possibility of repeat dehiscence, surgical wound infection, and incisional hernia formation.

The basic treatment principle for repair of the disrupted wound is re-suturing of wound edges. The objective of surgery is to replace the eviscerated organs into the abdominal cavity and to prevent recurrent dehiscence and later development of ventral hernias. Critically ill patients are better served by conservative temporary measures and delayed operative closure. (Kulaylat and Dayton, 2008) Wound dehiscence/burst abdomen is a very serious postoperative complication associated with high morbidity and mortality. It has significant impact on health care cost, both for the patients and hospitals. (Waqar *et al*., 2005) Wound healing has been described throughout the recorded history of surgery. Empirically the ancients recognized that foreign bodies and dead tissues must be removed from wounds. (Makela *et al*., 1995) There are variables in the laparotomy incision, including suture technique and type, use of prosthetic material, incision location that may influence wound dehiscence. Wound dehiscence sometimes reflect an error of judgement on the part of surgeon and the elimination of postoperative wound dehiscence may be within the jurisdiction of the operating surgeon. The chances of postoperative wound dehiscence can be predicted. Good knowledge of risk factors is mandatory for prophylaxis. In the sixteenth century, Pare discovered that aiming of healing tissue by pouring boiling oil into acute open wounds impeded healing and led to sepsis. His observations led to the maxim of all surgeons today that do not put anything in a wound that you would not like to put it in your own eye. (Wester *et al*., 2003) The clinician's management of tissue must be as atraumatic as possible. Lister, Semmelweis, Ehrlich, Flemming and Florey realized with increasing sophistication that bacteria were pathogens that prevented healing and led to sepsis and death. Control of bacteria by asepsis, antiseptics and antimicrobials heralded a new era in wound management. (Wester *et al*., 2003) Because of high mortality, medical and surgical preventive measures are essential in primary peri-operative period. (Gurlyik, 2001) Good knowledge of these risk factors is mandatory for prophylaxis. Patients identified as being high risk may benefit from close observation and early intervention. (Burt *et al*., 2007) This study was conducted to determine the incidence of wound dehiscence in RIMS hospital, surgery department and its risk factor associated.

MATERIALS AND METHODS

Aim

To determine the incidence and risk factors in patients developing abdominal wound dehiscence in RIMS Hospital, Manipur during October 2013 to September 2015.

Methodology

This is a cross sectional study carried out from October 2013 to September 2015 in the Department of General Surgery, Regional Institute of Medical Sciences Hospital, Imphal, Manipur, India. 40 (forty) Patients who had undergone laparotomy either emergency or elective operation and developed abdominal wound dehiscence during the study period were included. The inclusion criteria used were patients of all age group of either sex developing abdominal wound dehiscence after undergoing laparotomy who gave consent for investigations and treatment. The exclusion criteria were those wound dehiscence on sites other than the abdomen, patients who developed wound dehiscence after any gynaecological procedures. Detailed history and thorough physical examination and any other relevant history were recorded. Statistical analysis was done by Statistical Package for Social Sciences (SPSS 16) software.

RESULTS AND OBSERVATION

This study was conducted in RIMS, Surgery Department among 40 patients who developed abdominal wound dehiscence. Total number of laparotomy cases in RIMS, surgery department during October 2013 to October 2015 was 1728 (1008 cases of emergency laparotomy and 720 cases of elective laparotomy). The incidence rate of abdominal wound dehiscence in RIMS Hospital, Manipur is 2.3%. Wound dehiscence in elective surgery was present in 14 cases and 26 in case of emergency. For elective laparotomies incidence comes to 1.9% and for emergency laparotomies it comes to 2.6%.

A)Socio Demographic characteristics

Table 1. Age distribution of respondents

Age (in years)	Number	Percentage
<30	16	40.0
30-39	6	15.0
40-49	4	10.0
50-59	6	15.0
≥60	8	20.0
Total	40	100.0
Median (minimum- maximum)	31 (0.5-78.0)	

The common age groupin this study who developed abdominal wound dehiscence is <30 years age group (40.0%) followed by ≥60 years (20.0%) as shown in Table 1 and Figure 1. Median age was 31 years and range was from 5 months to 78 years. Majority of the patients were males which constituted 65.0% of the patients as shown in Table 2 and Figure 2. Male: female ratio comes to approximately 2:1

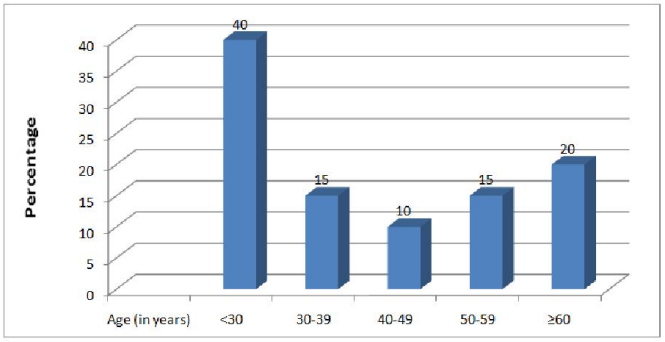

Figure 1. Bar diagram showing age distribution of the patients

Table 2. Sex distribution of respondents

Sex	Number	Percentage
Male	26	65.0
Female	14	35.0
Total	40	100.0

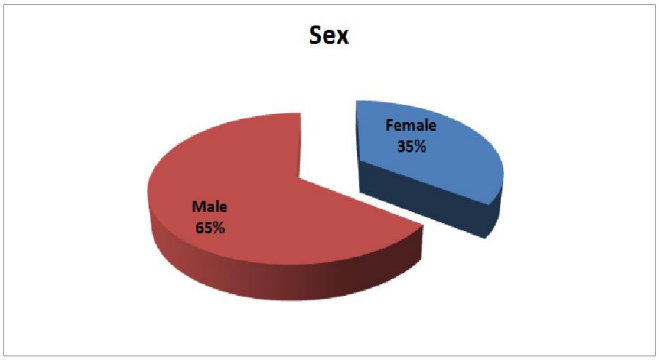

Figure 2. Pie chart showing sex distribution of the patients

Table 3. Distribution of respondents by religion

Religion	Number	Percentage
Hindu	24	60.0
Christian	12	30.0
Muslim	4	10.0
Total	40	100.0

Patients from Hindu religion constituted majority (60%) followed by Christian (30%) and Muslim (10.0%) as shown in Table 3 and Figure 3.

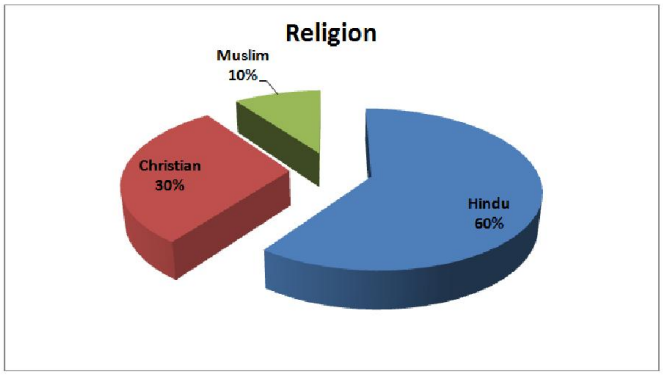

Figure 3. Pie chart showing distribution of the patients by religion

Table 4. Distribution of respondents by address

Address	Number	Percentage
Urban	16	40.0
Rural	24	60.0
Total	40	100.0

Table 4 shows that most of the patients were from rural areas which constituted 60% of the cases.

Table 5. Distribution of respondents by socio economic status

Socio economic status	Number	Percentage
Low (Rs 5000/month)	17	42.5
Middle (Rs 5001-10000/month)	21	52.5
High (>10000)	3	5.0
Total	40	100.0

More than half of the patients were from middle socio economic status. Low socio economic status also constituted 42.5% of the cases as shown in Table 5 and Figure 4.

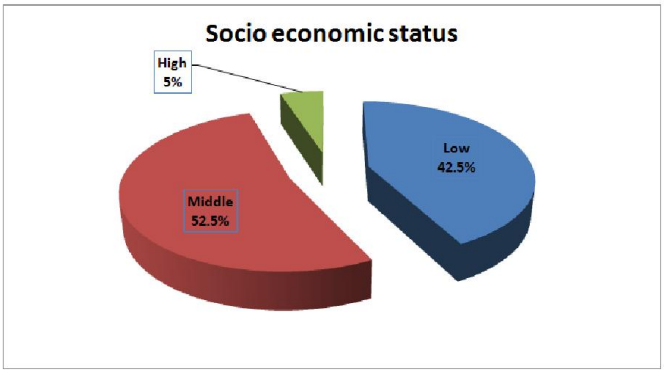

Figure 4. Bar chart showing distribution of the patients by socio-economic status

B)Physical examination

Table 6. Distribution of respondents by BMI

BMI	Number	Percentage
Underweight (<18.5)	6	15.0
Normal (18.5-24.9)	17	42.5
Overweight (25.0-29.9)	8	20.0
Obese (≥30)	9	22.5
Total	40	100.0

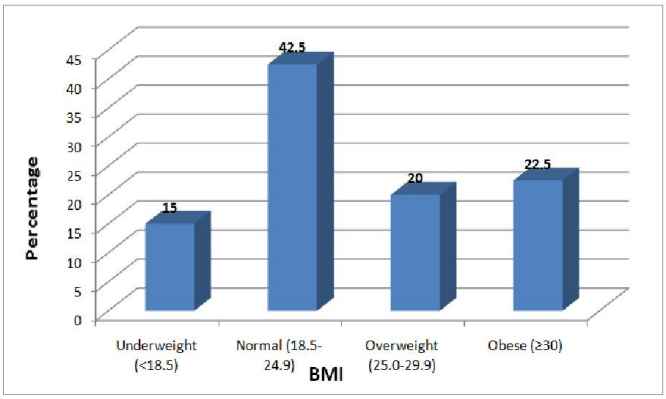

Figure 5. Bar diagram showing distribution of the patients by BMI

As shown in Table 6 and Figure 5, nearly half of the patients had normal BMI, 15% were underweight, 20 % were overweight and 22.5% were obese.

Table 7. Distribution of respondents by presence of hypertension

Hypertension	Number	Percentage
Present	9	22.5
Absent	31	77.5
Total	40	100.0

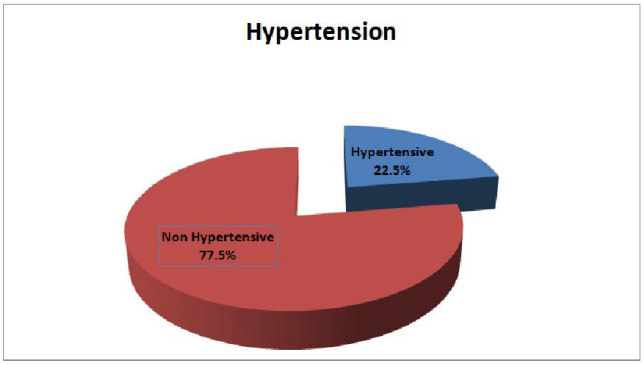

Figure 6. Pie chart showing distribution of the patients by presence of hypertension

Hypertension was present in 22.5% of cases as shown in Table 7 and Figure 6.

C)Laboratory findings

Table 8. Distribution of respondents by presence of anaemia

Anaemia	Number	Percentage
Present	21	52.5
Absent	19	47.5
Total	40	100.0

More than half of the patients had anemia as shown in Table 8 and Figure 7.

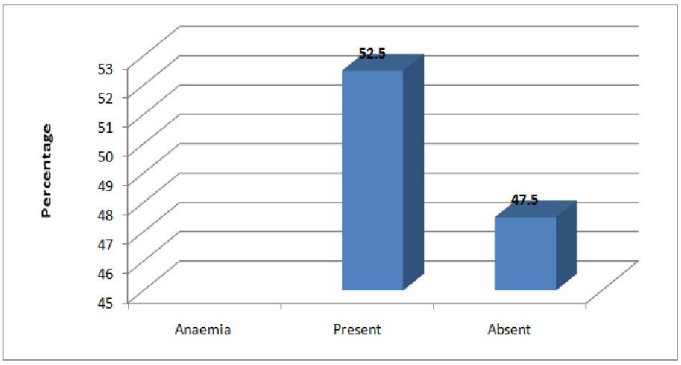

Figure 7. Bar diagram showing distribution of the patients by presence of anaemia

Table 9. Distribution of respondents by Serum albumin level

Serum albumin	Number	Percentage
Low (<3.7 g/dl)	15	37.5
Normal (3.7-5.4 g/dl)	25	62.5
Total	40	100.0

Serum albumin was low in 37.5% of the cases as shown in Table 7 and Figure 8.

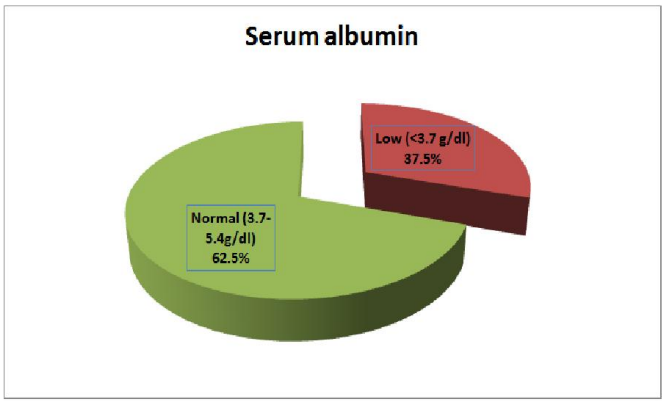

Figure 8. Pie chart showing distribution of the patients by serum albumin level

Table 10. Distribution of respondents by serum bilirubin level

Serum bilirubin	Number	Percentage
High (>1mg/dl)	15	37.5
Normal (0.1-1.0)	25	62.5
Total	40	100.0

Table 10 shows that in 37.5% of the patients, serum bilirubin was high.

Table 11. Distribution of respondents by presence of diabetes

Diabetes	Number	Percentage
Present	12	30.0
Absent	28	70.0
Total	40	100.0

Table 11 and Figure 9 shows that around one third (30%) had diabetes.

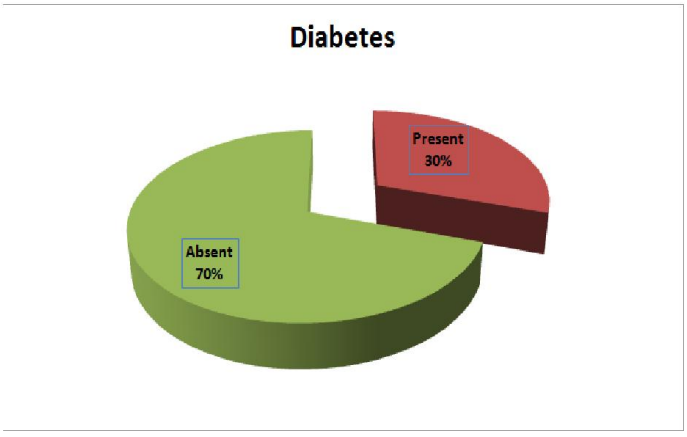

Figure 9. Pie chart showing distribution of the patients by presence of diabetes

Table 12 and Figure 10 shows that serum urea was high in 32.5% of patients but serum creatinine was high in 10% of cases.

Table 12. Distribution of respondents by renal function

Renal function	Number	Percentage
	Serum urea	
Normal	27	67.5
High	13	32.5
	Serum creatinine	
Normal	36	90.0
High	4	10.0
Total	40	100.0

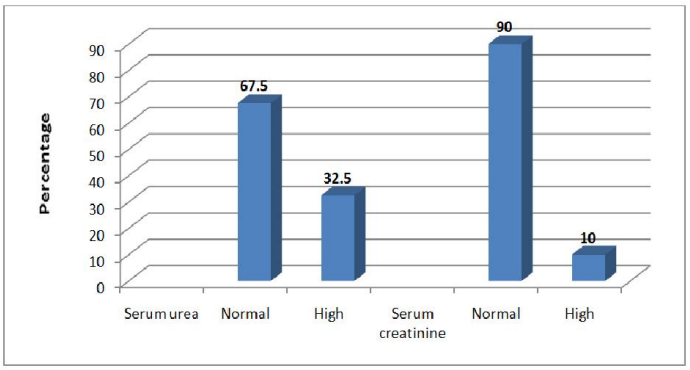

Figure 10. Bar diagram showing distribution of the patients by renal function

D)Others

Table 13. Distribution of respondents by presence of malignancy

Malignancy	Number	Percentage
Present	6	15.0
Absent	34	25.0
Total	40	100.0

Malignancy was present in 6 cases (15.0%) as shown in Table 13.

Table 14. Distribution of respondents by presence of sepsis

Sepsis	Number	Percentage
Present	9	22.5
Absent	31	77.5
Total	40	100.0

Out of 40 patients 9 patients (22.5%) had sepsis which is shown in Table 14.

Table 15. Distribution of respondents by corticosteroid use

Corticosteroid use	Number	Percentage
Present	7	17.5
Absent	33	82.5
Total	40	100.0

Among 40 patients, 7 patients (17.5%) of them used corticosteroid as shown in Table 14 and Figure 11.

Table 16. Distribution of respondents by type of surgery

Type of surgery	Number	Percentage
Elective	14	35.0
Emergency	26	65.0
Total	40	100.0

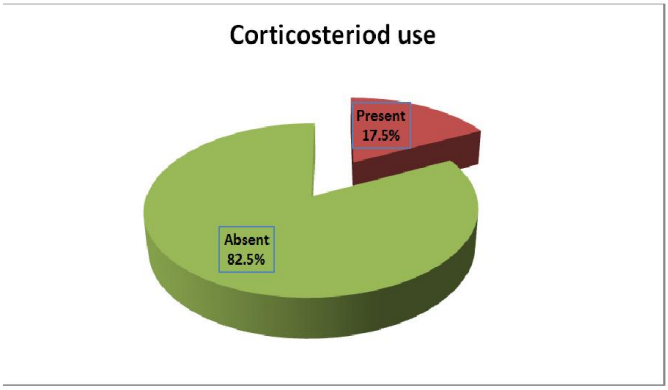

Figure 11. Pie chart showing distribution of the patients by corticosteroid use

Table 15 and Figure 12 show that majority of the patients (65%) had emergency surgery.

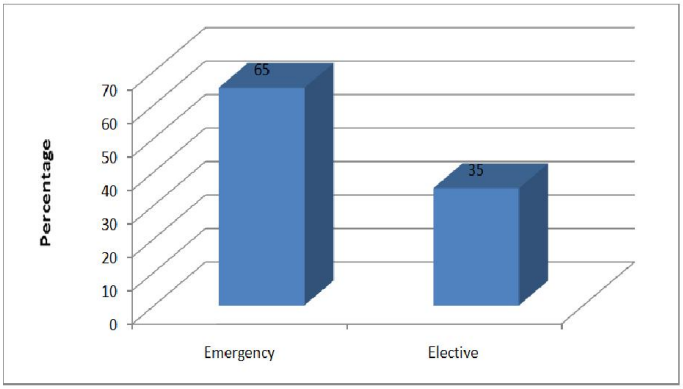

Figure 12. Bar diagram showing distribution of the patients by type of surgery

Table 17. Distribution of respondents by operative timing

Operative timing	Number	Percentage
< 2 hours	11	27.5
≥ 2 hours	29	72.5
Total	40	100.0

Table 17 shows that majority of the patients had operation time of ≥ 2 hours which accounts for 72.5%.

Table 18. Distribution of respondents by wound infection

Wound infection	Number	Percentage
Present	18	45.0
Absent	22	55.0
Total	40	100.0

Wound infection was present in 45% of the patients as shown in Table 18.

Table 19. Distribution of respondents by presence of coughing

Coughing	Number	Percentage
Present	8	20.0
Absent	32	80.0
Total	40	100.0

Coughing was present in 20% of cases as shown in Table 19.

Table 20. Distribution of respondents by presence of vomiting

Vomiting	Number	Percentage
Present	15	37.5
Absent	25	62.5
Total	40	100.0

Vomitingwas present in 37.5% of cases as shown in Table 20.

Table 21. Distribution of respondents by cause of abdominal pain/diagnosis

Cause of abdominal pain	Number	Percentage
Hollow viscus perforation	12	30.0
Intussusceptions	8	20.0
Intestinal obstruction	6	15.0
Colon growth	6	15.0
Penetrating wound	3	7.5
Blunt abdominal trauma	3	7.5
Corrosive stricture oesophagus	1	2.5
Gun injury	1	2.5
Total	40	100.0

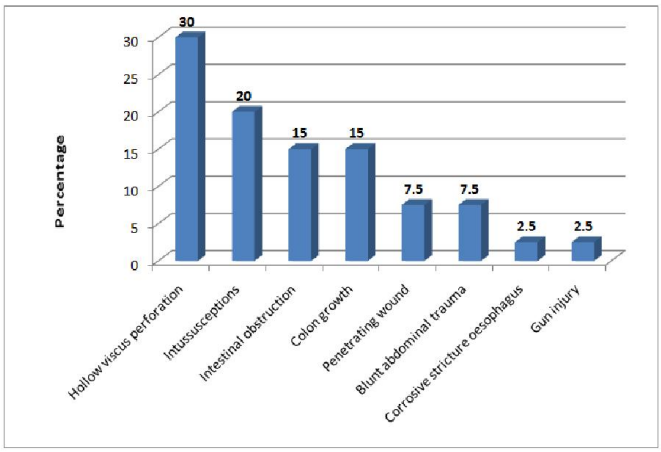

Figure 13. Bar diagram showing distribution of the patients by cause of abdominal pain/diagnosis

Among 40 patients with abdominal dehiscence most of the patients came with hollow viscus perforation (30.0%) followed by intussusception (20%), intestinal obstruction (15.0%) and colonal growth (15.0%).

DISCUSSION

This study was conducted in RIMS, Surgery Department among 40 patients who developed abdominal wound dehiscence. Total number of laparotomy cases in RIMS, Surgery Department during October 2013 to March 2015 was 1728 (1008 cases of emergency laparotomy and 720 cases of elective laparotomy).

The incidence rate of abdominal wound dehiscence in RIMS Hospital, Manipur is 2.3%. This finding is correlating with study by Carlson MA[20] where incidence of abdominal wound dehiscence was 0.3-3.5%. The following are the incidence of wound dehiscence in some studies.

Table. Showing studies with wound dehiscence

Studies	Incidence of wound dehiscence
Mazilu *et al*. (2009)	0.15%
Riou *et al*. (1992)	1%
Waqar *et al*. (2005)	5.9%
Khan *et al*. (2004)	7.9%
Afzal *et al*. (2008)	8.13%

So, wound dehiscence is lower in some studies like Mazilu *et al*. (2009) and Riou *et al*. (1992) but in some studies it is higher as shown in the table above. Wound dehiscence in elective surgery was present in 14 cases and 26 in case of emergency. For elective laparotomies incidence comes to 1.9% and for emergency laparotomies it comes to 2.6%. This finding is correlating with most of the studies of other researchers where there were more cases of wound dehiscence in case of emergency laparotomies and less in case of elective laparotomies as seen in (Talati Ceydeli *et al*., 2005) where wound dehiscence in emergency laparotomy was 6.4% and in elective laparotomies it was 2.6%. In Waqer *et al*. (2005) study similar finding was observed (4% in elective and 12% in emercency). In a study conducted by Afzal *et al*. (2008) wound dehiscence incidence in elective laporotomy was 1.73% and emergency was 12.45%. This may be because of sterile conditions provided less, inadequate preoperative resuscitation and surgeon's experience or factors in emergency laparotomies which needs further studied. (Col *et al*., 1998; Waldorf and Fewkes, 1995; Yahchouchy-Chouillard *et al*., 2003; Khan *et al*., 2004) Wound dehiscence was found in one fifth ($1/5^{th}$) of elderly cases in this study (20%). This finding was similar with the finding by Waqer *et al*. (2005) where abdominal dehiscence was found in 20% of old age and other studies. (Khan *et al*., 2004; Mazilu *et al*., 2009; Spiliotis *et al*., 2009) Nearly two third of the patients who had wound dehiscence were males. This gave male:female ratio of 2:1. This finding is consistent with the finding by Hanif *et al*. (2000) where the incidence of abdominal wound dehiscence ratio of male to female is 2:1. Rullier *et al*. (1998) studied and concluded that male gender was a risk factor for postoperative complications following emergency operations as well as elective operations. Jorgensen *et al*. (2002) conducted a study and came to the same conclusion that male gender is a risk factor for postoperative complications. The reason is dubious but may be associated with a lesser collagen production and reduced wound-healing capacity in men which needs to be further studied. Patients were mostly from Hindu religion and this may be because of Hindu dominant society. Nearly $2/3^{rd}$ of the cases were from rural areas. Low socio economic status formed nearly half of the patients and so indicative of poor nutritional status leading to wound dehiscence. Underweight was present in 15% of cases and obese in 22.5% of cases. (Riou *et al*., 1992; Waqar *et al*., 2005) Hypertension was present in 22.5% of cases in this study and is supported by Riou *et al*. (1992) study finding that hypertension was significantly associated with wound dehiscence. Anaemia was found in more than half of the patients. Anaemia as important cause of wound dehiscence was supported by Waqer *et al*. (2005) and other studies. (Riou *et al*., 1992) Serum albumin was low in more than one third of cases (37.5%). This finding is similar with the finding of many studies (Riou *et al*., 1992; Col *et al*., 1998) and that around one third (30%) had diabetes. Serum urea was high in 32.5% of patients but serum creatinine was high in 10% of cases. Malignancy was present in 6 cases (15.0%). This finding is consistent with many studies. (Riou *et al*., 1992; Khan *et al*., 2004; Mazilu *et al*., 2009) Among 40 patients, 7 patients (17.5%) of them used corticosteroid. (Spiliotis *et al*., 2015) Majority of the patients had operation time of ≥ 2 hours which accounts for 72.5%.

Wound infection was present in 45% of the patients. Pathogenic organisms may cause a decrease in tensile strength and fibroblast concentration, so that tissue destruction occurs. This finding is supported by Gilmore (1991), Waqer *et al*. (2005) and Alves *et al*. (2002) studies. Out of 40 patients 9 patients (22.5%) had sepsis. This is supported by Afzal *et al*. (2008) and Skover (1991) study which found that wound sepsis is the single most important risk factor for wound dehiscence. Coughing and vomiting was present in 20% and 37.5% of cases respectively. This raised in intra-abdominal pressure is one of the causes of wound dehiscence. This finding is consistent with the finding by Riou *et al*. (1992) and Col *et al*. (1998) and others. (Mazilu *et al*., 2009)

Conclusion

This study aimed to determine risk factors of abdominal wound dehiscence was conducted in RIMS, Surgery Department among 40 patients who developed abdominal wound dehiscence. Out of 1728 surgical operations during the study period which included 1008 cases of emergency laparotomies and 720 cases of elective laparotomies, 40 developed wound dehiscence, so incidence rate of abdominal wound dehiscence was 2.3%; 1.9% for elective laparotomy and 2.6% for emergency laparotomy. The common risk factors identified were emergency laparotomy, age <30 years and age above 60 years and male sex. Low socio economic status was also a common cause of wound dehiscence. Hypertension and diabetes were present in some cases. Anaemia, hypoalbuminemia and kidney function derangement were also common among wound dehiscence patients. Another important finding was presence of malignancy. Wound infection, sepsis and raised intra abdominal pressure (coughing, vomiting) were also an important cause of abdominal wound dehiscence.

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