

Wound Infection Following Operation of Obstetrical Cases

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The present study was carried out to find out the possible etiopathology of wound infection and to take possible measures to reduce the rate of wound infection. Here fifty patients who developed post operative wound infection were randomly selected for the study. The prospective study was carried out in the department of Obstetrics and Gynaecology of Dhaka Medical College Hospital (DMCH). Information was collected from the patients regarding preoperative, preoperative, postoperative findings and bacteriological studies. In this series it was clearly shown that there was close relationship between anaemia, malnutrition, diabetes mellitus and wound infection. So, great importance should be given for adequate preoperative assessment and preparation of the patients. In this series it was also shown that prolonged labour, premature rupture of membrane, intervention for delivery before admission were important predisposing factors for wound infection. Serosanguinous and foul smelling discharge were present in 68% of patients and culture of wound discharge showed in 64% cases and *Escherichia coli* was the most frequent organism. *Staphylococcus* was found as the second most common organism followed by *Pseudomonas*, *Klebsiella*, *Pneumonia*, *Acinobacter* and *Proteus*. Most of the wound infection was evident between the period 3rd to 6th post operative day. It indicates that the prime source of infection is the operation theater. Antibiotics were used both in the pre and post operative period. The oral antibiotics were replaced with parenteral antibiotics, when the patients were allowed to take food.

[Dinajpur Med Col J 2017 Jan; 10 (1):57-65]

Key words: Wound infection, obstetric

Introduction

Despite advances in operative techniques and a better understanding of the pathogenesis of wound infection and wound healing, post operative wound infection (surgical site infections) continue to be a major source of morbidity and mortality for patients undergoing

operative procedures.¹ The overall incidence of wound sepsis in India is from 10%-33%. However, the incidence of wound complications in the obstetric population varies with rates ranging from 2.8% to 26.6%.^{2,3,4}

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Surgical site infections (SSI) are common in both developing and developed world. The incidence of SSI in the present study was similar to that of other published reports. Presence of patient related high risk factors like overweight, anemia, previous laparotomy scars and factors responsible for sub optimal operation theatre environment, like high humidity, large patient turnover, below standard sterilization of the equipments and poorly followed aseptic and antiseptic measures by health care workers, were responsible for development of SSI. The majority of surgical site infections can be prevented by the pre-, intra- and postoperative phases of care. Surgical site infections have a significant effect on quality of life of the patient. They are associated with considerable morbidity and extended hospital stay.⁵

The Rahman et al.⁷ study highlights on the possible etiology of wound infection. It is evident that wound infection has a close relationship between anaemia, raised blood sugar, emergency operations specially caesarean section and multiparity. Staphylococcus aureus was found the most common microorganism causing wound infection. Though surgical care is very important to prevent wound infection, but some pre and post operative steps can reduce post operative wound infections also. If we can eradicate anaemia in pregnancy, control diabetes, avoid prolonged labour, use potent antibiotics in cases of rupture of membrane, do timely intervention, provide well equipped obstetrics ward with clean environment, then incidence of wound infection can be lowered. As the size of the population in the current study was small and it was limited to one hospital, so it could not represent the picture of wound infection of whole population of Bangladesh.

Methods

The prospective observational study was carried out in Department of Obstetrics & Gynaecology, Dhaka Medical College Hospital. Patients were operated for obstetrical causes (caesarean section & hysterectomy due to ruptured uterus) at DMCH during above study period. Fifty patients among them that developed wound infection were selected by random sampling (SRS) for this study. Detailed history was taken and clinical examination done on each study population having post operative wound infection. But if needed, immediate resuscitative measures were instituted first. Particular attention was paid to the haemoglobin status, diabetes, drug use (especially steroids or any immunosuppressive drugs) and presence of concurrent disease. The clinical examination stressed particularly on vital parameters, general physical build, nutritional status, anaemia, jaundice and septic focus. Relevant diagnostic investigation as far as possible were done and recorded. All routine investigations were not possible because of lack of urgent laboratory facilities. Pre-operative management given to the patients was recorded. For operation the following common procedures were followed: in the operation theater, after removing patient's own cloth & wearing OT gown anesthesia was given. Then skin was cleaned with Povidone solution (1% iodine in 70% alcohol) from mid chest to mid thigh. Before giving incision antibiotics was given parenterally.

Operative Workup

Incision - The types of incisions were Pfannenstiel, lower midline & right paramedian, injury to important structure was carefully avoided. The length of incision was enough to give a good exposure of the lower segment of the uterus and its surroundings. An aseptically clean sharp but blunt end knife was used for incision.

Haemostasis - Homeostasis was made by diathermy coagulation, sometimes by plain catgut.

Protection of Wound Margins - Every effort was made to protect the wound margins from touch by diathermy.

Drainage - Drainage tubes was used in selected cases, such as subtotal hysterectomy and few obstructed labour.

Closure of Incision - Proper surgical Toileting, counting mops and instruments abdomen was closed in proper layers.

Dressing - At the end of operation abdominal skin was cleaned with lotion or spirit then sterile gauze piece was used to cover the wound which was kept in position with elastoplasts or micro pore.

Postoperative Workup

All patients was closely monitored for at least 24 hrs with special attention to consciousness level, pulse, blood pressure, temperature, respiratory rate & rhythm, heart & lungs status, intake output chart, per vaginal bleeding and condition of dressing. Fresh order was done within 6-24 hrs depending on patient health status and presence of bowel sound. Full Course of antibiotic was ensured. Dressing was done and healthy patients were discharged. In case of soaked dressing, patient was examined thoroughly with special attention to the following features:

Types of Wound Infection

Superficial Incisional SSI - Infection involves only skin and subcutaneous tissue of incision.

Deep Incisional SSI - Infection involves deep tissues, such as fascia and muscle layers. This also includes infection involving both superficial and deep incision sites and organ/space SSI draining through incision.

Organ/Space SSI - Infection involves any part of the anatomy in organs and spaces other than the incision, which was opened or manipulated during operation.

Types of Discharge - Serosanguineous or blood stained or pus.

Smell of Discharge - With or without foul smelling. Wound swab was aseptically collected and sent to DMCH laboratory for culture and sensitivity test. Relevant investigations were also being done such as: Hb%, white blood cell count, and differential count, blood-sugar (fasting and two hours after meal). Antibiotic was changed and proper follow up with wound dressing was done. Depending on the wound condition secondary suture or amnion graft will be done in selected cases. There after patients were discharged and advised for follow up.

Results

The rate of wound infection highest in the age group between 21-30 years (48%), followed by 15-20 years (40%) and 31-40 years (12%) (Table I). The rate of the wound infection is highest in parity group 1-2 (70%), followed by 3-4 (24%) and 5-6 (4%) (Table II). Table showed wound infection was more in patients were anaemic, it was 56% when Hb% was below <11 gm/dl (Table III). Wound infection is more common 42% of women who had no antenatal check-up (Table IV). Post operative wound infection was more common (36%) in patients having 25-48 hours of labour pain (Table V). Maximum wound infection is among patients having rupture membrane 25-48 hrs (42%). Intact membrane was present in 6% patients (Table VI). The rate of wound infection is highest among patients who underwent emergency operation 96% and majority is due to obstructed labour (28%) (Table VII). Infection rate is higher (88%) where the operation were conducted by Assistant Medical Officer and relatively lower

(10%) where it was conducted by Registrar and lowest (2%) where operation were conducted by Consultant (Table VIII). Infection rate varies with duration of operation. Up to 1 hour it was 24% where as operations taking more than 1 hour time infection rate is higher and it was 76% (Table IX). The rate of wound infection is highest if subcutaneous Fat >2 cm in thickness (82%) (Table X). The highest rate of wound infection is due to anaemia (56%) (Table XI). Wound infection is developed in 50% patients on 5th postoperative day, followed by 20% on 6th postoperative day, 14% on 7th postoperative day, 10% on 4th post operative day and 06% 3rd post operative day (Table XII). Colour and smell of wound discharge. Colour is serosanguineous in 68% cases and purulent in 32% cases, and foul smelling discharge is present in 34% cases. (Table XIII). Sixty four percent wound discharge have organisms and the rest 36 percent shows no growth. Escherichia is isolated from highest number of patients (28 %) (Table XIV). Hospital stay of the patients varies from 7 to 40 days. Among the 50 patients for half of the patients, the hospital is 11 -20 days and for only 6 percent of the patients, the hospital stay is 31-40 days (Table XV).

Table I: Age distribution of the study population

Age in years	Number	Percentage
15-20	20	40
21-30	24	48
31-40	06	12

Table II: Parity of the study population

Parity	Number	Percentage
1-2	35	70%
3-4	12	24%
5-6	02	4%
Total	50	100%

Table III: Anaemic status of the population

Hb%	Number	Percentage
< 11 gm/dl	28	56
≥11 % gm/dl	22	44
Total	50	100

Table IV: Status of antenatal check up

ANC	Number	Percentage
Regular	17	34
Irregular	12	24
None	21	42
Total	50	100

Table V: Duration of labour pain in patients having infection (n=50)

Duration (hours)	Number	Percentage
0-12	05	10
13-24	14	28
24-48	18	36
49-72	05	10
>72	02	04
No labour pain	06	12

Table VI: Duration of rupture membrane

Time (hours)	Number	Percentage
<12	08	16
13-24	12	24
25-48	21	42
49-72	04	08
>72	02	04
Intact membrane	03	06

Table VII: Indication for Operation (n = 50)

Indication	Number	Percentage
Elective (n=2)		
Previous 1-1/0 1	01	02
Caesarean section for CPD		
Previous H/O 2 Caesarean section	01	02
Emergency (n=48)		
Obstructed labour	14	28
FROM with fetal distress	10	20
Antepartum eclampsia	05	10
Transverse lie with hand prolapse	01	02
Antepartum haemorrhage	03	06
Severe PET with labour pain	05	10
impending rupture/ Ruptured uterus	06	12
Bad obstetric history With	01	02
Breech with cord prolapse	02	04
Brow presentation with ruptured membrane	01	02
Total	50	100

Table VIII: Surgeon and infection

Types of Surgeon	No of Infection	Percentage of Infection
Consultant	01	2%
Registrar	05	10%
Assistant Registrar/ MO	44	88%

Table IX: Relationship between Duration of Operation and Infection Rate

Duration of operation	No. of cases	% of wound Infection
0-1	12	24
>1	38	76

Table X: Thickness of subcutaneous Fat (N=50)

Subcutaneous fat	Number	Percentage
≤2 cm	09	18
>2 cm	41	82

Table XI: Host Condition and Wound Infection (n= 50)

Findings	Number of patients	Percentage
Anaemia	28	56.0
Malnutrition	12	24.0
Diabetes	05	10.0
Obesity	03	06.0
Chronic asthma	02	04.0

Table XII: Post operative day of wound infection

Post operative day	Number	Percentage
3 rd days	03	06
4 th days	05	10
5 th days	25	50
6 th days	10	20
7 th days	06	14

Table XIII: Character of Wound Discharge (n= 50)

Characteristics of wound discharge	Number of patients	Percentage
Colour:		
Serosanguineous	34	68.0
Purulent	16	32.0
Smell:		
Foul smelling	17	34.0
No smell	33	66.00

Table XIV: Bacteriological Study of Wound Discharge (n= 50)

Organism isolated	Number of patients	Percentage
Escherichia coli	14	28.0
Staphylococcus	10	20.0
Pseudomonas	4	8.0
Klebsiella pneumoniae	2	4.0
Acinobacter	1	2.0
Proteus	1	2.0
No growth	18	36.0

Table XV: Postoperative Hospital Stay (n=50)

Hospital stay (days)	Number of patients	Percentage
7-10	8	16.0
11-20	25	50.0
21-30	14	28.0
31-40	3	6.0

Discussion

This prospective observational study investigated to find out the possible etiopathology of wound infection that developed in patients following operation for obstetrical causes (caesarean section and subtotal hysterectomy) and to take maximum possible measures to reduce the rate of wound infection.

In this study, the incidence of wound infection is 3.5 percent. Riou et al, in 1992 showed an incidence of wound infection of 0.2 to 6 percent 16 and Al- Fallouje and Mc Brien 1998 showed the peak incidence between sixth and eighth post operation day⁸. My study found that, the appearance of abdominal wound infection was highest on fifth post operative usually wound infection manifested on the fifth post operative day. In

case of superficial wound infection half of the abdominal wound infection started to appear on the postoperative day and majority of the deep wound infection occurred on the seventh operative day. Wound infection occurred on an average of 8 ± 2 days postoperatively.

In this study, the appearance of abdominal wound infection was highest at 5th postoperative day (50%), followed by 6th operative day (20%), 7th post operative day (15%). 3rd postoperative day (10%) and 4th post operative day (6%).

Haddad, Alexander and Prudden showed that largest number of wound dehiscence became clinically evident on the seventh postoperative day and on an average of 6.8 operative days, respectively.^{9,10} They suggested that early development of wound infection indicate the source of contamination was likely to be operation theatre. However in their series, late development of wound infection was associated with formation of hematoma, anemia, wound infection, hypoproteinaemia etc.

Various factors affect wound healing and then give rise to wound dehiscence. The actors that cause wound disruption have been studied extensively throughout the world. In his study post operative wound infection occurred with peak incidence at third decade of life (48%). Actually there was no direct relationship between age and wound infection. Probably as number of operated cases were more in this age group, so infection rate was also high. Aziz in 1997 in Bangladesh also made similar observation¹¹. The highest incident of post operative wound infection was in para 1-2 (70%).

An attempt has been made to identify factors or combination of factors that were responsible for increased incidence of abdominal wound infection. My study showed that there was direct relationship between the higher period of labour pain

highest percentage wound infection (36%), followed by 13-24 hours (28%) and 72 hours (4%). Time of ruptured membrane was 25-48 hours in 43 percent patients and 6 percent had intact membrane.

The prevalence of wound dehiscence was highest among patients who underwent emergency operation (96%) rather than elective operation 4%. Majority of emergency operations were due to obstructed labour (28%), followed by fetal distress (20%) ruptured uterus (12%) severe preeclampsia (10%) and antepartum haemorrhage (6%). Among the two elective caesarean sections, one patient had history of previous two caesarean section with APH and another patient had H/O previous one caesarean section with steroid therapy due to bronchial asthmas. The steroid therapy in usual dose is believed to have no clinical effect on wound healing but massive doses of steroid exert adverse effect. If steroids are given after the inflammatory phase of wound healing, there is little effect on healing. Riou et al in 1992 showed that preoperative steroid administration was a significant factor in wound disruption and 29 percent of their patients in the infection group were taking steroid.¹²

Type of incision, duration of operation blood loss during operation had direct relation. Types of incision, suture materials and methods of closure play an important role in post operative wound infection. My study found that midline vertical incisions were given to these cases of ruptured uterus and maximum of them developed wound infection.

Haddad et al in 1980 observed a higher incidence of wound infection in cases of vertical incision.⁹ Riou et al in 1992 found that 93 percent of the wound infection had Hine incision compared

with 63 percent in non dehiscence group.¹²

There is direct relationship between haemoglobin status and wound healing. A decrease level of hemoglobin contributes to wound infection by producing hypoxic effect at wound area. In this series patient's haemoglobin percentage ranged between 45-54%, among 54 percent patients, 55-64% among 38 percent, 65-75 % among 6 percent & 75-84% among 2 percent patients.

Riou et al in 1992 defined anemia as hemoglobin less than 10 gm/dl at the time of wound disruption in the infection group or early post operative period in the non infection group.¹² Anemia was found in 90 percent patients in the dehiscence group and only 16 present in control group.¹² Makela et al.¹⁰ In 1995 recorded anemia in 38 percent patients in infection group and 10 percent in the control group of patients. Patients considered to be malnourished prior to surgery were more common in the infection group (21%) than that of control group 41%. In my study malnutrition was found in 24% cases which contribute to infection by the defective synthesis of collagen. Register (10%) and consultant (2%). It was probably mishandling of tissue, inadequate and improper

My study also showed relationship between surgeon and infection. Infection rate was high when operation was done by medical officer or Assistant Registrar (88%) than that of register (10%) and consultant (2%). It was probably mishandling of tissue, inadequate and improper haemostasis.

Operation time also had some contribution to

wound infection. My study showed that wound infection rate was three times higher (76%) when operation time in more than one hour. Possible explanations are dosage of the bacterial contamination increases with time. Wounded tissues are damaged by drying and by exposure to air and retraction. Increased lint of suture material and electro-coagulation may reduce the local resistance of the wound. Longer procedures are more liable to be associated with blood loss and shock, by reducing general resistance of patients. Blood loss during operation showed relationship with wound infection by producing hypoxic effect at the wound healing process.

Obesity has no direct relationship with the development of wound infection.¹³ But is relationship between the thickness of subcutaneous fat at the incision site and infection. My study showed that when subcutaneous fat thickness was more than 2 cm then the infection rate was highest (82%).

Suture materials & wound infection also had some relation. Dexon, prolene, silk, vicryl were used in different cases. The conventional absorbable suture material provokes strong inflammatory reaction and prolonged the lag phase of wound healing. It is also synergistic with organisms in the promotion of wound infection.¹⁴

In this series bacteriological study of wound discharge showed negative culture in 36% cases which is probably due to use of antibiotics. The micro organisms and positive cultures were 64% cases. The organisms isolated were *Escherichia coli* (28%), *Staphylococcus* (20%) *Pseudomonas* (8%) *Klebsiella pneumoniae* (4%), *Acinobacter* (2%) and *Proteus* (2%).

Riou et al, in 1992 stated that *Staphylococcus aureus* was the most common organism responsible for wound

infection and polymicrobial infections were noted in a smaller number of patients¹⁵. Greenal in 1979 found *E. coli* as the commonest infecting organism. He also found *Salmonella typhi* in one of his case, which was not identified in any of this series¹⁶.

Aziz in 1997 in Dhaka Medical College Hospital reported that among 100 patients, 60 had positive wound culture and *Staphylococcus*, *Escherichia coli*, *Streptococci*, *Pseudomonas*, *Proteus* and bacteriocides were the common infecting organism¹¹. Matin in 1981 in Institute of Postgraduate Medicine and Research (Now BSMMU) noted the commonest infection organism; in his series as coliform (60%) followed by *Staphylococcus* (40%).¹⁷

Hospital stay of the patients varied from 7 to 40 days and average hospital stay was 5 days in non infected cases and 15 days in infected cases. Fifty percent of patients had to stay in hospital for 11-20 days and 6% of the patients for 31-40 days. Makela et al. in 1995 reported mean hospital stay was 25±5 days.¹⁸

Conclusion

The main determinants of wound infection are the microorganism, environmental factors and host defence mechanism. There is a continuous interaction between these three factors. Again infection rates are known to be higher in emergency surgery as compared to elective procedures. This is may be due to the fact that patients undergoing emergency surgical procedures have higher wound contamination, adverse host conditions and inadequate surgical technique. In this study it is clearly shown that there are many risk factors that increase the risk of wound infection. These can be grouped into (a) preoperative risk factors, such as anaemia, malnutrition, diabetes mellitus, decreased host defense for other

causes, prolonged labour, PROM for longer duration, shock, preeclampsia, intervention for delivery outside the hospital etc. (b) the peroperative risk factors, such as proper sterilization of OT complex, instruments, efficiency of surgeons, operation time and technique, use of suture materials etc. (c) post operative factors-, such as hygiene maintenance, antibiotic intake in improper dose and duration, post operative haemoglobin status etc.

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