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Original Research Article

An original research paper on incidence and risk factors for surgical site infections following major abdominal surgeries in obstetrics and gynaecology

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ABSTRACT

Background: Surgical site infections associated with substantial morbidity and mortality, increase in hospital stay and enhanced cost of health care. Objective of present study is to analyse the incidence of surgical site infections after major abdominal obstetrics and gynaecologic surgeries and risk factors for development SSIs.
Methods: It is observational study carried out at Department of Obstetrics and Gynaecology, ESI-PGIMSR at a teaching public hospital Mumbai, Maharashtra, India. It is a tertiary care centre and a teaching hospital. Women who had undergone abdominal surgery for various Obstetrics and Gynaecology indications.
Results: 7.3% of operated subjects had SSI. And significant risk factors are anemia, obesity hypoprotenemia, prolonged pre-operative hospital stay, Diabetes mellitus.
Conclusions: Post-operative abdominal wound infection represents a substantial burden of disease both for the patients and the healthcare services in terms of the morbidity, mortality and economic costs.

Keywords: Abdominal hysterectomy, Body mass index, Surgical site infection

INTRODUCTION

Surgical Site Infection (SSI) is defined as infection occurring within 30 days after a surgical procedure and affecting either the incision or deep tissues at the operation site. These infections may be superficial or deep or involving an organ space.[1] There has been advance in SSI control practices which include improved operating room ventilation, sterilization methods, use of barriers, surgical technique and availability of antimicrobial prophylaxis. Despite, these SSIs remain common causes of morbidity and mortality among hospitalized patients.

The CDC's National Nosocomial Infections Surveillance (NNIS) system, established in 1970, monitors reported trends in nosocomial infections in U.S. acute-care hospitals. Based on NNIS system reports, SSIs are the third most frequently reported nosocomial infection, accounting for 14% to 16% of all nosocomial infections among hospitalized patients.[2] During 1986 to 1996, hospitals conducting SSI surveillance in the NNIS system reported 15,523 SSIs following 93,344 operations (CDC, unpublished data).

SSIs increase the rate of rehospitalization; the use of health care, diagnostic, and therapeutic resources; and hospital costs. The shorter the hospitalization time is for surgery, the lower the risk of infection.[3] Notably, the risk factors for the development of SSIs may be related to the patients and the surgical procedures themselves.

According to Mangram et al, the main risk factors related to patient characteristics are age, poor nutritional status,

diabetes mellitus, smoking, infectious focus at a distance, altered immune response, and long preoperative stays.[1]

The aim of our study was to analyse the incidence of SSIs and to identify associated risk factors in abdominal hysterectomy cases at a tertiary care hospital.

METHODS

A prospective study was carried out for a period of 18 months. This study was conducted on a total of 301 patients who underwent abdominal surgery in the Department of Obstetrics and Gynecology (OBGY) at a medical college attached to a tertiary care hospital.

During the study period, after obtaining informed consent to be a part of the study, data were collected as per a predesigned questionnaire for all the patients who underwent abdominal hysterectomy, myomectomy, explorative laparotomy, hysterotomy, salpingectomy in the OBGY department.

Risk factors, like patient characteristics (age, any co-morbidity, indications of surgery, ASA score etc) and procedure characteristics (prophylactic antibiotics, post-operative antibiotics, date of surgery, type of anesthesia, type of wound, duration of surgery in minutes, necessary pre op investigations) were analyzed to predict SSIs.

After surgery, the patients were monitored daily for any signs of SSIs as per the CDC (Centre for Disease Controland Prevention) definition. We usually discharge patients on day 3 or day 4 of surgery and call them on day 8 or day 10 of surgery. Patients were followed after discharge on OPD (Out Patient Department) basis twice or thrice weekly for up to 30 days to have a checkup for any signs of SSIs. Samples were collected from these patients and immediately transported to the Microbiology laboratory for culture.

Patients with SSI were identified as per the following criteria.[4]

- Infection occurring in the first post-operative week
- Involving skin and subcutaneous tissue at surgical site with any one of the following:
    a. Purulent discharge
    b. Organisms isolated from fluid/tissues of superficial incision
    c. At least one sign of inflammation (indurations, erythema, local rise of temperature, excess pain in the incision site.)
    d. Wound deliberately opened by the surgeon for drainage
    e. Surgeon declares that the wound is infected due to overt signs of inflammation and or discharge from suture line pointing towards SSI.

Exclusion criteria

- Patients undergoing vaginal surgeries
- Cases operated outside our hospital
- Patients not giving consent to participate in the study

Variables studied

- Body mass index (BMI)
- Pre-operative Hemoglobin level
- Co-morbidities hypertension/diabetes mellitus/renal disease/bronchial asthma/Thyroid dysfunctions or any other
- Pre-surgery hospital stay i.e. interval between day of admission and day of surgery
- Duration of surgery (from incision to closure)
- Expertise and experience of operating surgeon
- Type of incision

Pre-operative antibiotics were usually administered half hour before surgery to all the patients. After surgery, the patients were monitored daily for any signs of SSIs as per the CDC (Centre for Disease Controland Prevention) definition4. Patients were followed after discharge on OPD (Out Patient Department) basis on a case to case basis as the need be for up to 30 days to have a checkup for any signs of SSIs. Samples were collected from these patients and immediately transported to the Microbiology laboratory for culture.

RESULTS

Surgeries performed on the women at Department of Obstetrics and Gynaecology, ESI-PGIMSR Obstetrics and Gynaecology indications. 22 cases (7.30%) of the study population of 301 patients) developed SSIs. The diagnosis of SSIs occurred between the 5th and 18th postoperative days.

Table 1: Incidence of SSIs in cases of abdominal surgeries.

Total cases of abdominal surgeries	301
SSIs among all cases	22
Total incidence	7.30

Table 2: Incidence of SSIs according to type of surgery.

Procedure	No. of cases	Infected cases	%
Abdominal hysterectomy	250	16	6.4
Exploratory laparotomy	32	05	15.62
Hysterotomy	05	0	0
Myomectomy	08	01	12.5
Salpingectomy	06	0	0

The most prevalent characteristics of the surgical wounds of women with SSIs (i.e., symptoms and signs of SSIs)

were draining purulent secretion, localized pain, in excess of that associated with incisions, redness, bruising, and swelling. The highest incidence of SSIs was observed among women aged 60 to 70 years of age (46.66%). The lowest incidence of SSIs was observed in women between 30 to 40 years of age (2.56%). Among women with SSIs risk factors were obesity (66.66%), anemia (23.68%), diabetes mellitus (19.35%) and hypoproteinemia (18.18%).

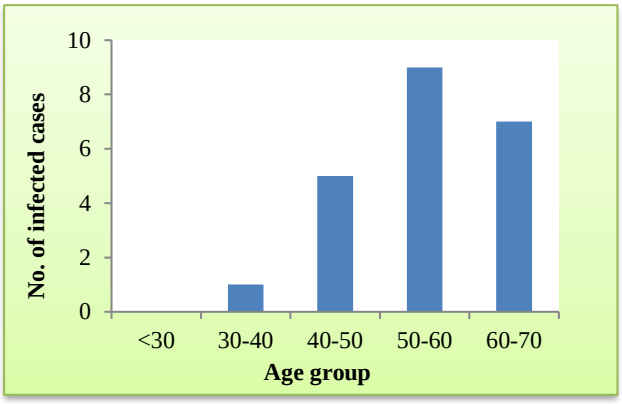

Figure 1: Incidence of SSSs in relation to age group.

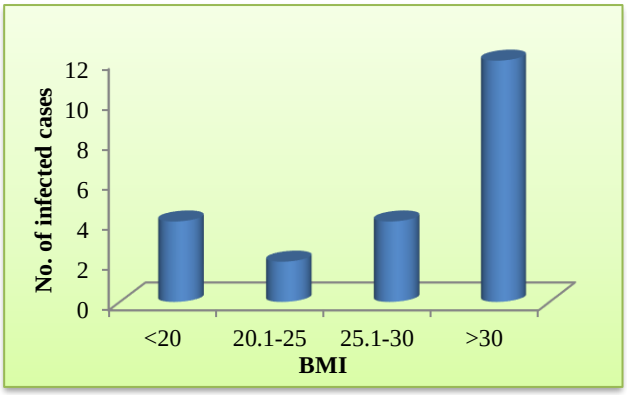

Figure 2: Incidence of SSIs in relation to BMI.

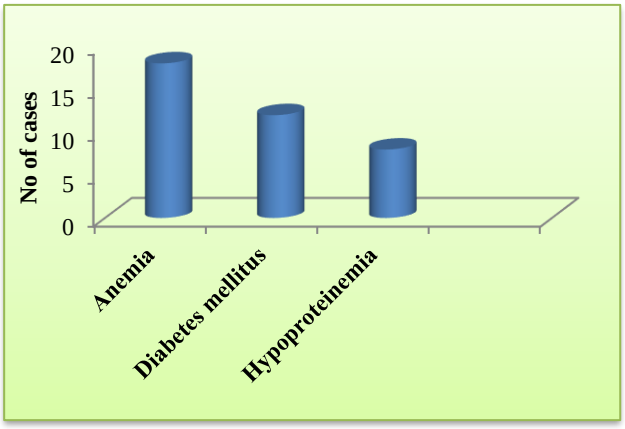

Figure 3: In incidence of SSIs in relation to high risk factors.

DISCUSSION

Rates of surgical site infection (SSI) reported from individual institutions have ranged from 0% to15%, depending on the indication for the operation, the site, the approach, and the use of instrumentation.[5] The overall wound infection rate obtained by our study was 7.30%. Bangal VB et al found that highest infection rate for laparotomies 11.4% followed by 10.94% for abdominal hysterectomies.[6] The infection rate was highest for laprotomy 15.62% (5/32), followed by myomectomy 12.5% (1/8), abdominal hysterectomy 6.4%(16/250). This could be explained by laparotomies were done for malignancy patients which were old age, immunocompromised, and prolonged pre-operative hospital stay and duration of operation.

Table 3: Incidence of SSIs in relation to pre op hospital stay.

No. of days	No. of cases	Infected cases	Incidence
1-5	275	15	5.45
5-10	24	6	25
11-15	2	1	50

The relationships between age and SSIs are frequently reported in the literature and are attributable to immune senescence during the physiological process of aging which increases the risk of infection. Studies confirm that women aged 50 years and over have a 3-fold higher risk of SSIs than younger women16-19. In this study, we found that infection rate was highest (46.66%) in extremes of age (51- 60 years). This was because increasing age is correlated with greater likelihood of certain chronic conditions, malnutrition and a fall in the body's immunological efficiency, causing more extensive SSI.[7] The rate of SSI was lowest (2.56%) in 30-40 years of age where the immunity is good. Barwolff et al (2006) found that maternal ages of <25 years and >45 years were significant risk factors for overall SSI in a multiple logistic regression analysis.[8] Johnson et al found increasing age a significant risk factor for overall SSIs.[9] In the present study, an increased BMI was seen to influence the outcome of surgery in terms of an increased rate of infection. One reason being a decrease in blood circulation in fat tissues is associated with increase in infection rate. Similar results were found in other studies.[10]

Table 4: Incidence in relation to duration of surgery.

Duration	No of cases	Infected cases	Percentage
<2 hrs	249	8	3.4
>2 hrs	52	14	26.92

In a retrospective study of risk factors in 15 cases of post-surgical wound infection by John et al in Messologi, COPD was noticed in 10 cases (66.66%), obesity in 6

cases (40%), malnutrition in 5 cases (33.33%), anaemia in 6 cases (40%), diabetes in 6 cases (40%), history of previous radiotherapy or chemotherapy in 6 cases (40%) and 3 cases (20%) were on steroids.[11] Waqar et al from Pakistan institute of medical sciences studied 117 cases from 1st January 2002-31st Dec 2002, out of which obesity was found in 13%, anaemia in 17% cases, undernutrition in 13% cases and Malignancies in 15% of cases.[12] In the present study the common risk factors found were obesity, anaemia 23.68% , undernutrition in 18.18%, diabetes in 19.35%.

Kowli et al found an infection rate of 17.4% when preoperative stay was 0-7 days, and an infection rate of 71.4% with a preoperative stay of more than 21days.[13] Anvikar et al demonstrated that preoperative hospital stay predisposed an individual to 1.76% risk of acquiring an infection. With an increase in preoperative stay, the risk increased proportionally.

A preoperative stay of one week increased the risk rate to 5%[14]. In the present study wound infections are highest when pre operative hospital stay is more than 5 days.

Devjani et al found 53.3% of patients with prolonged duration of surgery exceeding 45 minutes got infected.[15] Lilani et al found that infection rate of 1.47% for operations lasting for 45 minutes to 2 hr and infection rate of 38.46% for procedures lasting for more than 2 hrs.[16] In present we found infection rate of 26.92% for procedures lasting for more than 2 hrs and 3.4% for procedures lasting for less than 2 hrs.

CONCLUSION

Post-operative abdominal wound infection represents a substantial burden of disease both for the patients and the healthcare services in terms of the morbidity, mortality and economic costs. Although surgical wound infections cannot be completely eliminated, a reduction in the infection rate to a minimal level may have significant benefits. This may be achieved by meticulous surgical techniques, minimizing the duration of operation, proper sterilization, hygienic operation theatres and ward environments. Counselling patients in maintaining good personal hygiene and dietary advice towards improvement in general health is an exercise worth doing. Patients must understand that surgeons operate, sutures approximate, but ultimate healing is done by a well nourished body and positive mind set.

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