Surveillance of surgical site infections following gynecological surgeries in a rural setup – Lessons learnt

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Abstract

Context: Surgical Site infections (SSI) is the most common form of hospital acquired infection and proper surveillance is needed to comprehend the incidence and risk factors. Preventing SSIs is possible with proper strategic planning for appropriate interventions.

Materials and Methods: Hospital information system was used to identify women undergoing gynecological surgeries over a period of 2 years from January 2016 to December 2017 and information of women with surgical site infections (SSI) was noted and analyzed to determine the incidence and factors affecting SSI at a tertiary care rural hospital in central India.

Results: The incidence of SSI was 0.75% of 10629 surgeries. Age over 45 years, low socioeconomic status, prolonged surgical time, and increased BMI were common risk factors. Febrile morbidity, pain and discharge from wound and distension of abdomen led to the suspicion of SSI. The mean length of postoperative stay for patients with SSI was longer by 6.72 days compared to patients without SSI (13.74 days vs. 7.02 days). More than 75% women undergoing surgery had mild anaemia at the time of operative procedure. SSI following cesarean section was low as compared to abdominal hysterectomy. Anemia (27.5%) and presence of infective focus (23.75%) were found to be the commonest risk factors for SSI followed by obesity (12.5%) and history of previous abdominal surgery (10%). Staphylococcus aureus (26.25%) was the commonest organism cultured from the infective site.

Conclusion: In the present study, incidence of SSI in gynecological surgeries was found to be low, depicting a good infection prevention protocol in the existing system Proper infrastructure, maintaining ideal operation theater environment, adequate preoperative assessment, proper surgical preparation & donning SOPs and post-operative monitoring were the key factors for success.

Keywords: Surgical site infections, Gynecological surgeries, Surveillance, Morbidity.

Introduction

Surgical site infections (SSIs) are infections of the incision or organ or space that occur after a surgical procedure.[1] SSIs can affect body tissues, cavities, or organs manipulated in surgery and constitute 14% to 16% of all infections.[2] Surgical site infections are frequent, the incidence varying from 0.5 to 15% depending on the type of surgical procedure and associated risk factors. They are the most common healthcare-associated infection (HAI), accounting for 31% of all HAIs among hospitalized patients. SSIs increase the rate of re-hospitalization; the use of health care, diagnostics and therapeutic resources and hospital costs.[2]

Infection following gynecological surgery was around 6.8% of patients in a study from Brazil,[3] 1.14% of patients in Sao Paulo,[4] and 10% of patients undergoing total abdominal hysterectomy.[5] The prevalence of SSIs following gynecological procedures was greatest for abdominal hysterectomy (3.3%), gynecologic laparotomy (1.3%), and gynecologic/obstetric surgery (1.1%).[6] Obstetric surgeries had a lower SSI incidence compared to gynecological surgeries (1.2% versus 10.3% respectively).[7] SSI is a significant problem, which limits the potential benefits of surgical interventions. The impact on hospital costs due to postoperative extended length of stay (between 3 and 20 additional days) is considerable. Patients who develop SSI have longer and costlier hospitalizations than patients who do not develop such infections. They are twice as likely to die, 60% more likely to spend time in an ICU, and more than five times more likely to be readmitted to the hospital.[2] Programs that reduce the incidence of SSI can substantially decrease morbidity and mortality and reduce the economic burden for patients and hospitals.

Age, poor nutritional status, diabetes mellitus, smoking, infectious focus, altered immune status, malignancy and long preoperative stays are the main risk factors for surgical site infections.[8] Other factors include surgical site skin preparation, scrubbing protocol of staff before surgery, surgical time and technique, operative environment, and processing of materials and hospital items used for, during and after surgery.[2]

While advances have been made in infection control practices, including improved operating room ventilation, sterilization methods, barriers, surgical technique, and availability of antimicrobial prophylaxis, SSIs remain a substantial cause of morbidity, prolonged hospitalization, and death. SSI is associated with a mortality rate of 3%, and 75% of SSI associated deaths are directly attributable to the SSI.[1]

The incidence of SSI is seen to be on the rise and prevention is increasingly important. A recent estimate quotes that about half of SSIs are preventable by application of evidence-based strategies.[9] SSIs are an indicator of hospital performance, hence, it is necessary to develop a safe and reliable method for monitoring the occurrence of SSIs after hospital discharge. Surveillance of SSI with

feedback of appropriate data to surgeons has been shown to be an important component of strategies to reduce SSI risk. The present study was undertaken to study the incidence of surgical site infection (SSI) following Gynecological surgery and analyze the risk factors associated with it so as to develop an appropriate surveillance policy.

Materials and Methods

A Retrospective Cross Sectional Observational study was carried out in Mother and Child Health Wing of Kasturba Hospital Sewagram which is a 1000 bedded tertiary care facility attached to MGIMS, Sevagram, a teaching institute located in rural, central India. Department of Obstetrics and Gynecology of this multi-specialty hospital gets high risk complicated gynecological cases from neighboring villages/towns and states including those of gynecological malignancies. The health care facility is well equipped with modular operation theatres, trained surgeons, endoscopy unit, HDU/ICU facility, blood bank and a team of experienced gynecologists & anesthesiologist's. There is a well-defined infection control policy in the institute. The MCH wing caters to around 5000 childbirths and equal number of major and minor gynecological surgeries. All the data of patients is entered in Hospital Information System (HIS) since 2007 and the system is completely paperless. In the present study, data regarding gynaecological surgeries carried out over a period of two years (January 2016 – December 2017) was examined and women with surgical site infections were identified. Demographic factors, type of SSI, co morbid conditions and risk factors, type of micro-organism grown from wound swab and morbidity associated with SSI was studied and data analysed using EPI info software.

Results

In the 2 year study period, 10629 surgeries were carried out in the Mother and Child Health Wing, of Kasturba Hospital, Seagram. Age range was from 17-79 year with a mean age of 38.82 years ± 6.6. Majority of the surgeries were elective procedures (72.12%). Most surgeries were clean (82%) or clean contaminated (17%) and very few surgeries were contaminated (1%). There were 80 cases of surgical site infections amounting to 0.75% of total surgeries. Age above 45 years and BMI over 25 was a risk factor for SSI. The duration of hospital stay ranged from 1 to 52 days (mean ± standard deviation: 11.2 ± 5.4 days). The mean length of postoperative stay for patients with SSI was longer by 6.72 days compared to patients without SSI (13.74 days vs. 7.02 days). Majority of cases of SSI (89.9%) belonged to lower socio economic class and resided in rural area with poor health awareness. More than 75% women undergoing surgery had mild anaemia at the time of operative procedure. Incidence of SSI was highest following total abdominal hysterectomy (5.7%), followed by total laparoscopic hysterectomy (3.5%). It was low following caesarean section (0.7%) and non- descent vaginal hysterectomy (1%) (Table 1). Majority SSI were superficial (92.5%) and there was one burst abdomen in the SSI population which was a case of laparotomy done for ovarian malignancy and the patient had poor nutrition and anemia as a co morbidity with staphylococcus aureus as the infective organism (Table 2). Anemia (27.5%) and presence of infective focus (23.75%) were found to be the commonest risk factors for SSI followed by obesity (12.5%) and history of previous abdominal surgery (10%) (Table 3)

Staphylococcus aureus (26.25%) was the commonest organism isolated in the culture followed by Pseudomonas aeruginosa (13.75%) (Table 4). Post-operative febrile morbidity (31.25%), distension of abdomen (26.25%) and need for blood transfusion (23.75%) were commonly observed among women with SSI. Hospital stay was increased in all (Table 5).

Table 1: Incidence of surgical site infection and type of surgery

S. No.	Type of Surgery	Total cases	Number of SSI	(%)
1.	Exploratory Laparotomy	338	7	2.7
2.	Total Abdominal Hysterectomy	348	20	5.7
3.	Tubal Ligations	710	10	1.4
4.	Cesarean Sections	3147	25	0.7
5.	Total Laparoscopic Hysterectomy	56	2	3.5
6	Non descent vaginal hysterectomies	400	4	1
6	Others	5,630	12	0.2
7	Total	10629	80	0.75

Table 2: Type and extent of dehiscence as per CDC criteria

S. No.	Type of dehiscence	No	% of cases of SSI
1.	Superficial surgical site infection (Skin + subcutaneous tissue)	74	92.5
2.	Deep surgical site infection (Muscles and or Fascial sheath)	5	6.25
3.	Organ/Space (Burst abdomen)	1	1.25
4	Total	80	100%

Table 3: Risk factors associated with SSI

S. No.	Risk Factor	No	% of cases of SSI (n=80)
1.	Over-weight / Obesity	10	12.5
2.	Previous surgical scar	8	10
3.	Anaemia	22	27.5
4.	Under nutrition	2	2.5
5.	Gynecological Malignancy	7	8.75
6.	Wound hematoma	3	2.75
7.	Infective focus	19	23.75
8.	Second stage LSCS	3	3.75
9.	Immuno-compromised status	1	1.25
10.	Diabetes	5	6.25

Table 4: Micro-organisms isolated in surgical site infections (SSI)

S. No.	Type of Micro-organism	No	% of cases of SSI (n= 80)
1	Staphylococcus aureus	21	26.25
2	Klebseilla	7	8.75
3	E.coli	14	17.5
4	Pseudomonas Aeruginosa	11	13.75
5	Acinobacter	5	6.25
6	Streptococci	2	2.5
7	Multiple organisms	8	10
8	Sterile culture	12	15
9	Total	80	100%

Table 5: Morbidity associated with surgical site infections

S. No.	Morbidity/Mortality	No	% of cases (n= 80)
1.	Fever	25	31.25%
2.	Vomiting	6	7.5%
3.	Distension of abdomen	21	26.25%
4.	Delay in ambulation	12	15%
5.	Need for blood transfusion	19	23.75%
6.	Increased hospital stay	80	100
7.	Need for ICU management	2	2%
8.	Septic shock / DIC	0	0
9.	Mortality	0	0

Discussion

Hospital acquired infections are notorious and surgical site infections (SSI) form a major constituent of them. They are noted to be a significant problem, depicting the hospital performance as a whole and negatively affect the image of the health care facility. They limit the potential benefits of a surgical intervention and lead to significant increase in morbidity, length of hospital stay and health care cost.

The present study reports a combined incidence of 0.75% SSI for both Obstetrics and Gynecological surgeries, less for cesarean sections (0.7%) as compared to gynecological. This incidence is quite low as compared to other studies. Pathak et al from India reports an incidence of 7.83% in 1173 gynecological surgical procedures.[7] Mpogoro et al reported a SSI rate of 10.9% among 774 patients with cesarean sections[10] and Mitt et al quoted an incidence of 6.2% in 305 women with cesarean sections[11] whereas in Myanmar it was 5.9%[12] and 4.7% in Italy.[13] Chia et al[14] found it to be 2.9%, Mowat et al 2.3%[15] and Pandit et al 2.76%.[16] Another study found an incidence of 3.7% in 19,416 cesarean deliveries.[17] Operations with lowest wound infection rates were Laparoscopy and sterilization operations. Highest rate of infections was seen in Radical and extended hysterectomies.[14] Non descent vaginal hysterectomy (1%) had much lower incidence of SSI than abdominal (5.7%) and transverse incision faired better than vertical.[15]

All the above studies have reported a higher rate of SSI as compared to the present study. This may be due to the fact that most of these surgeries were clean and clean contaminated and were performed in a well-equipped theatre with good infrastructure by experienced surgeons. It is a protocol of the unit that each surgery has to be either performed or supervised by a consultant. Residents performing surgeries unsupervised have been known to increase the risk of infection as the scrub protocol is not followed well and the skin preparation before surgery is also poor. Experience of the surgeons also matters as

operative time and complications are substantially reduced. Infection of abdominal wound following surgery is due to contamination from the air, from organisms on patients' skin, or from infectious foci in abdominal cavity. It can also be the result of inadequate aseptic technique by the theatre staff or due to secondary infection of a hematoma.

Most of the SSIs found in our study were superficial which is similar to other studies.[7,10,12] The minor wound infections required conservative management on an OPD basis while major wound infections required resuturing.[16] Age more than 45 years was found to be a risk factor in our study but this is more applicable to gynecological surgeries, the incidence of SSI in which was found more in the present study. Pathak et al[7] too found age over 40 as a risk factor however, younger age group was infected in women undergoing cesarean sections. Increasing age has more co morbidities like diabetes, obesity and immune related and nutritional problems.

Surgical wound infection and disruption has been known to be associated with certain risk factors like obesity, poor nutrition, diabetes, prior abdominal scar, malignancy, surgical complications, respiratory problems like coughing, prolonged use of steroids, chemotherapy and immune compromised status etc.[18] The present study found anemia (27.5%), presence of infective focus (23.75%), obesity (12.5%) and history of previous abdominal surgery (10%) as common risk factors. Anemia reduces the healing capacity as there is hypo perfusion and hypo-oxygenation in the tissues which becomes prone for infection. Obesity also harbors infection due to tissue pressure and tension, hypo vascularity and increased ischemia to subcutaneous adipose tissue.[19] Previous surgeries cause intraoperative complications due to adhesions, limited access to surgical field and prolonged operative time.

Longer operative increases the risk for SSI. Various studies reported that SSI prolonged hospital stay by more than 15 days[16] to 22 days.[15] In the present study, the mean length of postoperative stay for patients with SSI was longer by 6.72 days compared to patients without SSI. A longer operative time is probably depictive of complicated surgery with additional factors such as tissue trauma due to instrumentation and manipulation, increased blood loss, exposure to environmental pathogens and risk for breach of sterile technique.[7]

Diagnosis of SSI is usually confirmed by laboratory tests such as wound and tissue culture. The present study found staphylococcus aureus as the commonest microbe similar to those found by Pandit et al[16] and Chia et al.[14] Post-operative fever and pain and discharge from the wound were primary symptoms which drew attention to existence of infection. Distension of abdomen was also commonly seen. In the early postoperative period abdominal distension often occurs and the layers of the abdominal wound are therefore under considerable strain. A more frequent use of transverse incision would greatly reduce the incidence of both these complications.[15] Fever without apparent cause should always awaken suspicion of infection in the wound.

Need for blood transfusion, delay in ambulation and increased hospital stay were the commonly observed consequences of SSI. There was no mortality due to SSI in the present study. Thus highlighting the importance of preoperative adequate hemoglobin, reducing blood loss during operation, replenishing lost blood, early ambulation and proper post-operative surveillance. SSI monitoring requires active, patient-based, prospective surveillance. Post-discharge and ante-discharge surveillance methods should be used to detect SSIs following inpatient surgeries and post-discharge surveillance for outpatient operative procedures. Proper pre-operative assessment, adequate nutrition and hemoglobin, strict adherence of asepsis and antisepsis protocol, adequate and timely prophylactic antibiotic, skillful surgery in minimum possible time, gentle tissue handling, proper skin closure technique and maintaining ideal operation theatre environment are proposed as strategies to reduce SSIs. Surveillance and proper response to shortcomings will go a long way in maintaining infection free post-surgical period.

Conclusion

Surgical site infections (SSIs) are commonest form of nosocomial infections and increase the morbidity of patients undergoing surgical procedure. Surveillance of SSIs following gynecological operations is possible in most settings and gives a fair idea of the risk factors responsible for increased incidence of infections. Proper response to these factors detected during monitoring will not only reduce SSI substantially but form a basis for re – ordering of existing infection prevention protocols in operative theatres. The present study reports a low incidence of SSIs and attributes it to good infrastructure, proper asepsis and antisepsis protocols, dedicated and skilled surgical team and enhanced alert towards SSIs. Reducing anemia in perioperative period, resorting to vaginal approach instead of abdominal for hysterectomies, opting for transverse incision and proper pre-assessment before operative procedure will further reduce SSIs. Surveillance is the key to planning strategic improvement and prioritizing interventions to reduce SSI.

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Conflict of Interest: None.

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