ISSN (Print) : 2348–263X
ISSN (Online) : 2348-2648
MVP Journal of Medical Sciences, *Vol 4(2), 186–192, July-December 2017* DOI: 10.18311/mvpjms/2017/v4i2/10463

Study of Surgical Site Infections following Gynaecological Surgeries in a Tertiary Care Hospital

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Abstract

Background: It was a prospective longitudinal study designed to study the incidence, risk factors and outcome of gynaecological surgeries in a tertiary care hospital. **Methods:** We included all the gynaecological surgeries performed in our unit. All the cases operated outside the hospital, cases with history of surgery in past 30 days, diagnosed cases of HIV and hepatitis B were excluded. We compared the cases with SSI with the age adjusted control group of non infected patients. **Results:** We found that the incidence of SSI was 10.35%. Amongst the various factors studied, we found that BMI, history of diabetes, per vaginal discharge, longer preoperative hospital stay, severe anaemia, ASA grade III, open abdominal approach, vertical incisions, class II surgeries were associated with SSI. Staphylococcus aureus is the commonest microbe isolated from surgical wounds. SSI cases have significantly longer hospital stay. **Conclusion:** SSI was significantly associated with BMI, diabetes, per vaginal discharge, pre-operative hospitalization, severe anaemia, ASA grade III, open abdominal route of surgery, class II surgery, vertical incisions were associated with surgical site infection.

Keywords: Deep Infections, Gynaecological Surgery, Surgical Site Infection, SSI

1. Introduction

Any surgical procedure carries risk of complications. Surgical Site Infections (SSI) remains a major challenge in clinical practice. These are one of the leading causes for patient mortality and morbidity. They have now emerged as the most common and most costly cause of health care associated infections[1]. SSIs are the indicators of quality of health care. Analysis of the reliable hospital data will help to determine the factors responsible for SSI and thereby will help in preventing them.

2. Material and Methodology

It was a prospective longitudinal study done between August 2014 to August 2016. All the cases undergoing gynaecological surgeries were included in our study after consent. Those patients who were operated outside our hospital, cases with history of surgery in past 30 days and the diagnosed cases of HIV and hepatitis B were excluded. Complete data regarding prepoperative, intraoperative and postoperative information was filled in the proforma and was analysed statistically. In two years we had operated 985 cases, out of which 102 cases suffered from SSI. We had analysed 102 cases with SSI and age adjusted 204 cases without SSI.

3. Results

The calculated incidence of SSI at our centre is 10.35%. The mean age of patients with SSI was 44.61 ± 10.45 years (range 21 to 76 years). After data analysis we found that obesity (BMI: 25-29.9 kg/m2) was significantly associated with SSI and was present in 21.6% of patients with SSI (Table - 1).

Table 1. Distribution of Surgical site infection (SSI) as per Body Mass Index (BMI)

BMI (Kg/m^2)	SSI	n (%)	No SSI	n (%)	Total
< 22.99 (Normal)	64	62.7%	96	47.1%	160
23 - 24.99 (Overweight)	16	15.7%	84	41.2%	100
25 - 29.9 (Obese)	22	21.6%	24	11.7%	46
Total	**102**	**100%**	**204**	**100%**	**306**
P = 0.01; significant					

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SSI was frequent in patients with diabetes as compared to those without SSI which was statistically significant (12.8% Vs 5%) (p = 0.014; significant) hypertension was equally distributed in both the groups (p = 0.645)).

Per vaginal discharge was significant complaint in 24 (23%) of the patients who had postoperative SSI and had statistically significant association with SSI (23% Vs 13%; p = 0.016).

In our study, 80% of the patients with SSI had history of previous surgery while 74% of the patients in control group had history of previous surgery. However, this data was not statistically significant.

41.1% of the patients with SSI had preoperative hospital stay of >3 days as compared to only 10% of the patients with SSI. This data was statistically significant (p value = 0.001).

Of patients with SSI, 12 (12%) had severe anemia (Hb < 8 gm/dL), 62 (60%) had moderate anemia (Hb = 8 to 11 gm/dL), 20 (19%) has mild anemia (Hb = 11 to 12 gm/dL) as per WHO guidelines 2014. Although the distribution of mild (19% Vs 20%; p = 0.92) and moderate (66% Vs 61%; p = 0.35) anaemia was similar; proportion of severe anaemia was significantly higher in patients with SSI (12% Vs 5%; p = 0.028).

The surgical fitness was graded according to American association of Anaesthesiology. Patients with ASA grade III were significantly more in SSI group compared to control group (1% Vs 7.8%; p = 0.006).

In the study cohort, 20 patients (6 in SSI group while 14 in No SSI group) were operated on emergency basis whereas 286 surgeries were operated on elective basis. However the difference was not statistically significant (p value = 0.812).

From the patients with SSI, 96 (94%) had surgery through abdominal route, 4(4%) had laparoscopic surgeries whereas 2 (2%) had surgeries through vaginal route. The surgical procedures and their distribution in the cohort are as follows. Abdominal route of surgery was more commonly associated with SSI (p = 0.01) as compared to laparoscopic or vaginal route (Figure - 1).

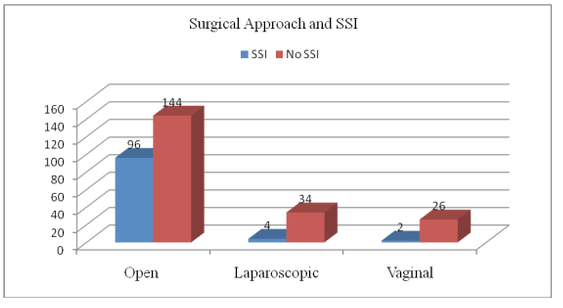

Figure 1. Surgical site approach and SSI.

In SSI group, 14 patients underwent class I surgeries and 88 patients underwent class II surgeries. When compared with non SSI group we found that class II surgeries were commonly associated with SSI (p value = 0.01)

Intra-operative blood transfusion was not required in any of the surgical procedure which had postoperative SSI. The mean duration of surgery was 113 ± 23 min which was comparable in both groups.

In our study, out of all abdominal surgeries with SSI, 79 patients were operated with transverse incision and 17 patients were operated with vertical incision. In control group, 122 patients were operated with transverse incision and 22 patients were operated with vertical incision. Vertical incision (43.6% Vs 39.3%) was more commonly associated with SSI (p = 0.01; significant)

On conservative management and secondary suturing after confirming healthy granulation tissue, delayed healing was noted in 66 (65%) patients in the study group. The mean total hospital stay in the patients with SSI was significantly longer than that of control group (16 ± 5 days for SSI Vs 7.3 ± 2.6 days for No SSI group; p = 0.01) so was the postoperative stay.

3.1 Characteristics of SSI

Of the 102 patients with SSI, 70 patients (68%) patients had superficial SSI while 32 patients (32%) had deep SSI according to CDC guidelines and no patients had organ space infections. In both the groups, SSI was detected on median postoperative day 5 with a range of day 3 to day 8. Seventy patients (62%) presented with increased surgical site pain whereas 34 (34%) patients presented with new onset postoperative fever.

3.2 Wound Characteristics

Changes of cellulitis were evident in 58(57%) patients; active discharge was present in 82 (80%) patients. Ten (10%) of them had altered bloody discharge at the onset of SSI whereas subcutaneous abscess was noted in 6 (6%) patients in this cohort under study. Foul smelling discharge was present in 10 (10%) patients following the onset of SSI.

Forty eight patients had wound disruption in the cohort under study, of whom 24 had partial wound breakdown whilst 24 had full length wound breakdown needing daily dressings which were done with povidon iodine and hydrogen peroxide as per departmental protocol. The healthy pink granulation tissue was found in 16 (33%) patients whereas it was unhealthy in rest of 32 (67%) patients. Of these 48 patients with wound breakdown, 14(29%) had their wound healed by secondary intention

whereas rest of 34 (71%) patients needed secondary suturing for wound management after daily dressings.

Pus cultures were sent in the study group on the onset of SSI. In the culture study, 38 (38%) patients had monobacterial growth in the wound isolate, 28 (27%) patients had multibacterial growth in the pus culture whereas 38 (35%) patients had no growth in the pus culture. There were 96 micro-organisms isolates from 64 positive wound cultures which was dissipated in the chart. Staphylococcus Aureus (55%) was the most common microorganism isolated from the surgical wounds followed by Klebsiella species (36%) which was the most common gram negative organism infecting surgical wounds.

Subjective assessment was documented on follow up for 98 patients after excluding 4 patients who lost to follow up. The subjective assessment revealed 12 (12%) of the 98 patients complained of painful scars whereas 4 (4%) had scar hypertrophy. On graded subjective assessment about scar perception, 42 patients (43%) patients were quite happy about the scars but 10% (10 patients) were unhappy about the scar appearance; whereas rest of 46 patients (47%) had equivocal response.

4. Discussion

The incidence of SSI was found to be 10.35%, of which 68% had superficial SSI whereas 32% had deep SSI. Incidence of SSI after gynaecological surgery was reported as 1.6% to14.5% in literature[2–7] whereas in some studies with obstetrics and gynaecological surgeries, the incidence of SSI was found to be 4% to 15%[8–11].

Worldwide studies show increased rates of SSI and wound related complication in patients with higher BMI[3,12–15]coronary artery bypass graft, hip replacement, knee replacement, or large-bowel surgery. Among these patients, the risk of surgical site infection ranged from 0.65% for knee replacement to 11.04% for large-bowel surgery. Overall, 127 512 (79.8% especially >40kg/m^2[2,16,17]. This risk of SSI had shown to increase linearly with increase in BMI after a nadir of 30kg/m^2[18,19].

In our study 21.6% patients with SSI had BMI more than or equal to 25kg/m^2 and was significant as compared to the non infected group. Similar results were obtained in a study done by Vidyadhar Bangal et al on SSI following gynaecological surgeries[20].

Diabetes mellitus is a known risk factor for surgical site infections proven in multiple studies[3,4,14,18,21–24]. Diabetes was present in 12.7% of the cases with SSI in our study. Diabetes mellitus had statistically significant association with deep SSI in multiple studies[4,25,26]. However few studies denied such association[27].

Hypertension was a medical co-morbid condition in 15.7% of SSI cases, but no association was found with SSI. In few studies hypertension was associated with increased risk of SSI[28–30] which we could not assess.

In our study, we found that per vaginal discharge (23% Vs 13%) was significantly associated with SSI. Bangal et al., observed in their study that chronic pelvic inflammatory disease was associated with burst abdomen[21].

4.1 Previous Surgery

Previous surgery is shown to be risk factor for surgical site infection[21,28]. Even in our study, 80% of the patients with SSI had history of previous surgery in past. However, no statistical difference could be identified. Similar results were shown in a study by van Ramshorst et al[31]urological.

4.2 Preoperative Hospitalization

Longer preoperative hospitalization is a risk factor for SSI[32,33] but some studies contradicted such results[34]. In our study, we observed that 58.8% of the infected patients were operated with less than 3 days hospitalization and 41.2% of the infected patients had more than or equal to 3 days hospitalization prior to surgery. Preoperative hospitalization was significantly associated with SSI in our study.

4.3 Preoperative Investigation

We found severe anaemia (haemoglobin<8 gm/dl) to be the most common risk factor for SSI in the patients undergoing gynaecological surgery and was present in 11.8% of the cases with SSI and in 4.9% of the cases without SSI. This association is universally proven in literature[3,21,35,36]. Although the association of anaemia and SSI is proven, most of the studies considered anaemia as haematocrit less than 36%[3,36]. As we know, haematocrit is three times of haemoglobin we consider that these studies have considered anaemia as haemoglobin less than 12 g/dl[37].

4.4 Preoperative Fitness

7.8% patients with SSI were operated under ASA grade III. None of the patients were operated under ASA grade IV and grade V. Patients with ASA grade > II have been shown to have high risk for SSI[36], moreover those with ASA grade III and IV had more deep SSI[3,14,15]. Our data was consistent with these studies showing association of ASA grade >II with SSI.

4.4 Intraoperative Factors

Operating in emergency settings is a known risk factor for surgical site infection[33,38]; although contradicting results were found in few studies[39].

In our study, only 5.9% (Vs 4% in control group) patients with SSI underwent surgical intervention for emergency indication. However, rest 96% patients (Vs 4%) had undergone elective surgeries. This data was not clinically significant.

4.5 Surgical Approach

SSI rate was higher in open surgeries compared to laparoscopic and vaginal approaches which was consistent with our study findings[3,14,18,30,40,41].

4.6 Duration of Surgery

Longer duration of surgery was found to be associated with increased risk for surgery owing to desiccation of wound and prolonged exposure of micro-organisms in the surgical wound[42–44].

It is observed that surgery lasting for more than 120 minutes is associated with surgical site infection in various studies[18,39,45,46]. In our study, the mean duration of surgery in the cohort of patients with SSI was 113±23min, which was not significant.

4.7 Class of Surgery

In our study, we found that SSI was more common in clean contaminated surgeries than clean surgeries. Our findings were consistent with the studies done on SSI amongst surgery and gynaecology cases[34,39].

4.8 Type of Incision

Vertical incisions were found to be associated with increased risk of SSI in our study as compared to transverse incisions (43.6% Vs 39.3%). Our results were in accordance with the study done by Bangal et al[21].

4.9 Postoperative Factors

4.9.1 Presentation of SSI and Wound Characteristics

In our study, SSI was diagnosed at a median postoperative day 5 with a range of 3 to 8 which was noted similarly by Madeira et al while studying SSI in patients undergoing gynaecological surgeries[4]. However in patients with Caesarean sections SSI manifested at average on postoperative day 9 today 10[9,47].

Wound discharge (82%) was the most common presenting complaints followed by excessive surgical site pain (64%) and postoperative fever (34%).

Purulent discharge, localised pain, local redness, discolouration and swelling were common characteristics of the surgical site infections which correlated with our findings[4,32].

4.9.2 Microbiology of SSI

Culture positivity of the SSI from gynaecological surgeries was as high as 55% to 84%[15,47] with 52% being polymicrobial[48]. However, we had 65% positive cultures consisting of relatively less multibacterial growths (28%).

In our study, staphylococcus aureus was found to be the most common micro-organism isolated from the wound cultures. It was most commonly reported organism isolated from patients with SSI in literature[4,21,47,49–52].

4.10 Hospital Stay

Longer perioperative hospital stay was shown to be associated with increased risk of SSI[53]. In our study population, the hospital stay was significantly higher for patients with SSI which was 16 days and these results were consistent with other studies[25,40]. This could be the effect of SSI rather than causal relation[34,50]and study the bacteriology and the factors associated with SSI in the study setting.\n\nSETTINGS AND DESIGN: Prospective study in the surgical wards of an apex medical teaching hospital in Goa.\n\nMATERIALS AND METHODS: Clinico-bacterilogical follow-up of 114 post-operative cases to the development of SSI, as per the CDC criteria (1991.

4.11 Follow-up

The postoperative scar was evaluated by subjective assessment about the scar perception. Only 10% patients were unhappy about the appearance; 4 for scar hypertrophy while 12% for painful scar and 10% for appearance of scar which was larger. However rest of the responses were happy (43%) and equivocal (47%).

5. Conclusion

Rate of SSI in our unit is 10.35%. Out of these 102 patients, 68% of the cases were of superficial infection and 32% of the cases were of deep surgical site infection. None of them had organ space infection.

Amongst the various factors considered, we found that BMI, diabetes, per vaginal discharge, pre-operative

hospitalization, severe anaemia, ASA grade III, open abdominal route of surgery, class II surgery, vertical incisions were associated with surgical site infection.

We can reduce the rate of SSI by proper preoperative work up. We should correct patient's anaemia, control their blood sugar levels, treat any infective focus like per vaginal discharge. Laparoscopic or vaginal route should be preferred rather than open abdominal approach. Transverse incisions should be preferred over vertical incisions wherever possible.

Wound discharge was the most common complaint of SSI.

Staphylococcus aureus was the commonest microbe isolated from wound culture followed by Klebsiella species.

Total hospital stay was significantly longer in patients with SSI. This result can be causative factor or the result of SSI. So, we should be vigilant to decrease as well as identify SSI as early as possible so as to decrease the economical burden on patients which occurs because of the prolonged hospital stay.

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