Review Article

SURGICAL SITE INFECTIONS IN GYNAECOLOGICAL SURGERIES

ABSTRACT

Surgical contaminations are one of the utmost familiar medical management related contamination within the economically developing nations. Gynecologic tactics constitute a completely distinctive venture within which the infectious pathogen arising out of pores and the underlying skin or the vagina and endo-cervix can also relocate up to the area of surgery and may bring about vaginal cuff cellulitis, cellulitis of the pelvis, and abscesses of the pelvis. Numerous organisms along with operation threat elements were recognized as dangers that grow infectious sequelae after pelvic surgical treatment. The full-size use of antibiotic prophylaxis has decreased however now no longer removed severe postoperative infections; the common anticipated SSIs price being three–15% after c-section. Those costs are multiplied by the existence of various threat elements like surgical infection, which is compounded by untimely rupture of membranes, obstructed labour, chorioamnionitis, large obesity, extended duration of surgery, emergency surgeries, and immunodeficiency, all of that are not uncommon within aid-deficient nations. Other factors linked to physician ability, such as poor operation skills, insufficient hemostasis, and the presence of a useless region, lead to increased injury contamination. Working at the pinnacle, such as those medical conditions that occur during pregnancy and malnutrition, also contribute significantly to the problem.

SSIs as the most common motive concerning hospital-acquired contamination in obstetrics, although the present contemporary era, remains as chief residence fitness hassle within growing nations. We may even evaluate the definitions, microbiology, pathogenesis, diagnosis, and control of pelvic SSIs after gynecologic surgical procedures.

KEYWORDS: Surgical site infection, hysterectomy, cellulitis, gynaecological surgeries, management, risk factors.

INTRODUCTION

The Centers for Disease Control and Prevention (CDC) described a SSI as a contamination going on within 30 days of an operation at three sites: superficial on the incision, deep on the incision, or in different organs or areas unfolded in the course of an operation [1].

The Centers for Disease Control and Prevention have devised a plan of certain surveillance standards. Purulent discharge was recognised as an SSI (category 1), a culture that has been aseptically harvested and is positive (category 2), absence of a negative culture and at least one indication of inflammation with incision having opened (category 3), or an illness as determined by a physician (category 4). Category 4 SSI according to the CDC, takes careful notes to distinguish between situations where antibiotics were used to treat definite cellulites and (ii) additional situations that might meet the 2010 SSI category 4 criterion(For example, the wound was opened, the culture was negative, and cellulites were found) [2]. Gram-positive cocci, primarily staphylococci, bulk of these illnesses, but Gram -ve species are also common. A lot of variables influence the likelihood of acquiring an SSI, incorporating elements of the operating process itself, like the classification of wounds, Pre-existing medical issues, as well as patient-related factors [3].

Surgical-site infections (SSIs) are a common source of patient morbidity and increased healthcare expenses. SSIs are frequently the consequence of a multitude of factors associated that may or may not be controllable in gynecologic surgery, particularly hysterectomy [4]. Frailty has been connected to advancing age and has been demonstrated to increase postoperative complications and mortality following gynecologic surgery. Given that uterine corpus cancer is a common reason for hysterectomy, with an age-standardized rate of 12.9 per 100 000 women in rich nations, the additional burden on communities could be significant [5].

We discovered five key difficulties while assessing that an SSI comes with a hefty price tag. To begin with, differing definitions of SSI have an impact on who is diagnosed with one. Second, because an SSI can manifest after a patient is discharged from the hospital, procedures for SSI confirmation after release will have an impact on the rate of SSI identification. Following-up concerns for surgery patients in low-income settings can be exacerbated by large out-of-pocket transportation expenses for accessing healthcare [6].

Medicinal prophylaxis and washing the skin with antiseptic solutions have been used in surgical practice to avoid SSIs. BMI has been linked to SSI risk in non-gynecological studies [7]. Determining by the surgical procedures which are performed, the probability of SSI increases by every extra

operative hour. According to studies, careful surgical procedures are crucial in preventing surgical site infections [8].

INCIDENCE:

Global estimates of SSI range from 0.5 to 15%, while studies in India regularly reveal higher rates, ranging from 23 to 38 percent [9].In comparison to Western Europe's comparatively high-income countries (HIC), the incidence of SSIs is substantially higher in Low- and Middle-Income Countries (LMIC), where the patient bears the majority of the hospitalisation costs. In the LMIC scenario, the probability of getting an SSI significantly raises the total risk of financial catastrophe—a circumstance in which healthcare costs for this occurrence exceed 10% of yearly household expenditure [6].

RISK FACTORS:

Risk elements may be divided into 2 categories :- host danger elements and surgical chance elements.

HOST RISK FACTORS

Obesity contributes significantly to Obgy SSIs, especially when sufferers have a body mass index that is greater than 30Kg/m2 and when the subcutaneous tissue is greater than 2cm DM has a multiplier effect on SSIs by contributing to hazard of wound contamination postoperatively, in particular in sufferers accompanied by perioperative blood sugar more than one hundred fifty milligrams per decilitres and glycosylated haemoglobin more than 6.5%. Patients with preexisting infection together with diabetes must be medically optimized before surgical operation. Anaemia before and records like cerebrovascular injuries have been additionally related to deep and organ area SSI. Existing different dangerous elements that include tobacco use, steroid use, undernutrition, and late adolescence. Past exposure to radiation before surgery additionally contributes/increases the threat to contamination. Bacterial vaginosis is related to a notably expanded danger of post-surgery contamination, mainly vaginal cuff cellulitis [1].

SURGICAL RISK FACTORS

Surgical infections may be similarly divided into preoperative, intraoperative and postoperative chance elements.

Preoperative danger elements encompass:-

Precautionary drugs lower the microbial inoculum burden affecting pores, skin and the surgical site made unfavourable for the growth of microorganisms.The medication of preference for precaution of disease ought to have a wide range, be low cost, and be smooth to operate. The drug cefazolin can be used as it fits in the above criteria.The administration of the medication should be done within one hour before the cut is made[1].

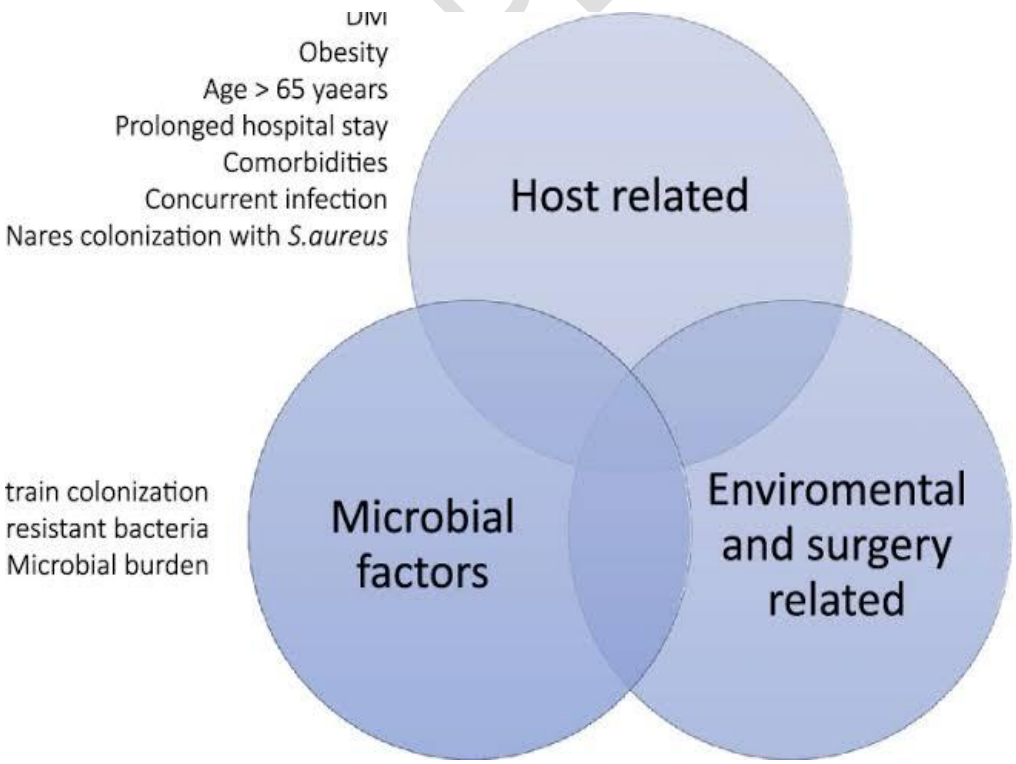

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Fig. 1. Preoperative danger elements encompass

Intraoperative danger elements:-

Quantitatively, it's been proven that the hazard for growing a contamination will increase markedly if the wound is infected with >a hundred and five microorganisms in keeping with gram of tissue[10].

A longer surgical operation period, regardless of suitable redosing of antibiotics, has been diagnosed as an unbiased danger element for growing an SSI. Intraoperative blood transfusion additionally will increase the threat of SSI, in particular for organ area infections. Wound class is another operative hazard component.[11]

WOUND CLASSIFICATION AND INFECTION RISK	WOUND DESCRIPTION	RISK OF SURGICAL SITE INFECTION(%)
Clean	Uninfected operative wound without an irritation Does now no longer contain respiratory, alimentary, genital, or urinary tract	1.76
Clean-infected	Operative wound regarding the respiratory, alimentary, genital, or urinary tract	3.94
Contaminated Open, fresh,	Breaks in the sterility method	4.75

unintentional wound	Excessive leakage from the gastrointestinal tract Non-purulent infection along with necrotic tissue	
Dirty/infected Old	Contamination or punctured viscera from stressful wounds with preserved devitalized tissue	5.16

Table 1. Classification of wounds

[11]

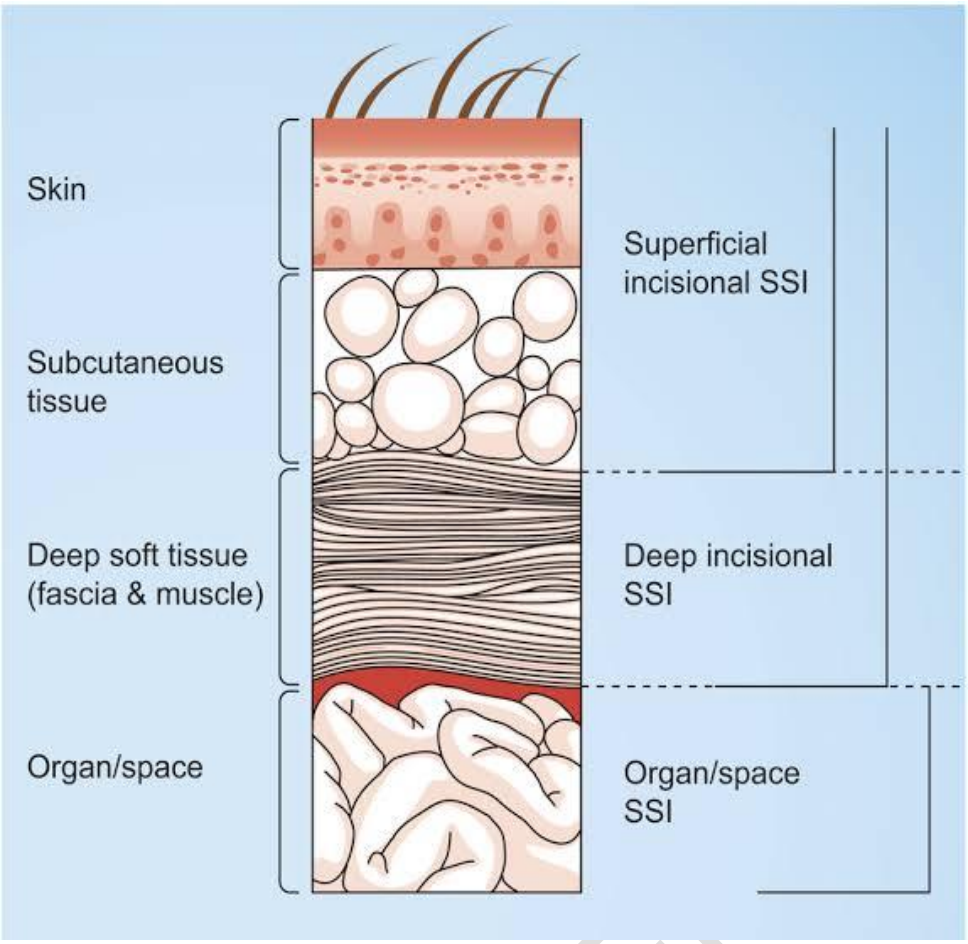
Postoperative danger elements consist of:-

Postoperative anemia, negative glucose levels and increased duration of postoperative period affect the progress of healing. Some postoperative practices must be taken into consideration like surgical dressings, vacuum-assisted wound closure [1].

Table 2. Types of affected tissues

Category	Affected Tissue	Characteristics
Superficial	Superficial tissue, pores and skin, and subcutaneous tissue	One of the subsequent required: Purulent drainage Organism correctly acquired thru wound tradition Incision opened via way of means of physician, health care professional, or superior exercise practitioner and presence of ache, swelling, warmth, or redness Diagnosed as a superficial

		surgical contamination via way of means of a physician, health practitioner, or superior exercise practitioner
Deep	Deep tissue, fascia, or muscle	One of the subsequent required: Purulent drainage Spontaneous dehiscence or incision opened through a health care provider, organism accurately received through wound tradition, and presence of ache or fever Abscess diagnosed via way of means of examination, surgical treatment, or imaging
Organ area	Below the fascia and muscle	Either one of the subsequent required: Purulent drainage from a drain withinside the deep organ area Organism as it should be received thru wound way of life Abscess diagnosed via way of means of examination, surgical operation, or imaging
[11]		



[12]

Fig. 2. Tissue differentiation

ETIOLOGY AND PATHOGENESIS

The most common postoperative SSI is microbial infection of the operative region by indigenous flora of the vagina or skin. In gynaecology, SSIs are more commonly poly-microbial, also can include gram -ve bacteria, enterococcus, group of streptococcus B, and anaerobic organism [1]. Microbes create pathogenic and other toxic components that help them infiltrate, cause injury extending to, and continue to survive inside or upon the tissue of host[1].

Most common organisms encompass: Escherichia coli

Potential pathogenic bacteria can also emerge back from the epidermis or ascend from the vagina and endocervix extending to the operational regions, such as abdominal–incision and the vaginal cuff, making gynecologic methods a completely unique task. The domestic flora of vagina is a diverse and vital mix of virulent and nonvirulent bacteria that includes gram +ve and gram -ve facultative and obligate anaerobic bacteria .As a result of incisions affecting the vaginal and perineal regions, gynecological SSIs are more certainly poly-microbial, containing gram -ve bacilli, entero-

cocci, streptococci of group B, and the anaerobes. These bacteria can acquire an advantage if the balance of virulent to nonvirulent bacteria is disturbed.

It is possible to obtain entry to the pelvic tissue that is sterile, which can result in infection. Bacterial vaginosis (BV), especially vaginal cuff cellulitis, is a SSI risk factor that is well-known following pelvic surgery. BV is a complicated disease.An increase in the concentration of potentially harmful anaerobic bacteria in the vaginal flora, which has been found to be 1000–10000-fold higher than usual [1].

The infection occurs as follows:

Infection caused by a weakened human defence system in the absence of adequate antibiotic prophylaxis in virulent species of a large bacterial inoculum.

Microbes create a variety of poisonous and pathogenic substances which improves their capacity to infiltrate, cause injury to host tissue and live within or on it.

Blood, lymphatic and serous fluid, necrotic debris, and fibrillar hemostats might collect inside the lower pelvic region and vault of vagina, resulting in a simple fluid series in the event of an abscess in pelvis after surgery

This fluid series can become inflamed as a result of infection arising from skin, the vaginal entrance, or resections of the bowel, resulting to the development of an abscess in pelvis [1].

<u>CLINICAL FEATURES</u>:

1. Localised pain (which is often distinct from usual post-operative pain) is one of the most prevalent clinical characteristics.
2. Dehiscence of a wound
3. Persistent fever with no known cause.

4. The surgical site's recovery is delayed.
5. Discoloured tissue near the surgical site is possible.
6. The incision site has a bad odour.
7. When you touch the incision, it's quite hot [13].

Other features include:

1. Wound cellulitis, wound abscess, endometritis, pelvic cellulitis, and pelvic abscess are some of the diseases which can occur after surgery. Fever and higher-than-normal postoperative discomfort are common signs of infection. Septic pelvic vein thrombophlebitis or noninfectious causes of refractory fevers [1].
2. Patients have associated tachycardia and leucocytosis [1].
3. Cellulitis of the vaginal cuff and pelvic cellulitis are also common in these patients. Cellulitis occurs in 1.6 percent of individuals following hysterectomy, according to a research done by AeuMuro G. Lake. Fever, nonspecific abdominal discomfort, or a sense of pelvic fullness are common symptoms of cellulitis five to ten days following surgery. Anorexia may be one of the associated symptoms, although they seldom experience gastrointestinal or urinary problems. If no tumours or peritoneal symptoms are present, a physical assessment will reveal any pain in the area in probing and oedema [14].
4. Pelvic abscess is a severe complication that when there is a cellulitis or hematoma in the pelvis spreads within the soft tissue of the parametrial region. Pelvic abscess symptoms are similar to cellulitis in the pelvis, but with the inclusion of a substantial mass matching to the accumulation concerning contaminated fluid or ultrasonography, computed tomography (CT), or magnetic resonance imaging can all be used to see the fluid accumulation (MRI) [1].

PREVENTION:

Best practices to lessen SSIs are divided into preoperative, intraoperative, and postoperative activities.

Preoperative Considerations

1. **Patient Showering**

At the very least one night before to surgical therapy, patients must bathe with soap or an antibiotic. Although preoperative washing has been proven to lower the risk of SSIs, a 2015 Cochrane study found no difference between showering with bar soap and chlorhexidine. However, after a thorough wash with chlorhexidine compared ,a partial wash, the results indicated a decrease in SSIs that is statistically significant. The data did, however, show a SSIs have decreased by a statistically significant amount as a result of a complete chlorhexidine wash versus a partial wash. It's worth noting that the washing method used in the Cochrane review wasn't standardised. The Journal of the American Medical Association published a research in which it was found that standardising the wash reduced SSIs by at least two showers and a one-minute wait before rinsing.The research does not give consensus on how to take a shower or what sort of cleaner to use, due to the differences in studies and the absence of convincing evidence [11].

2. **Hair Removal**

Patients ought to be informed to now no longer put off hair at domestic previous to surgical procedure. For surgical purposes, hair has to now no longer be eliminated until it'll intrude with the procedure. If hair wishes to be eliminated, clippers in preference to a razor must be used due to the fact razors can cause microtrauma to the pores and skin that may be a nidus of infection. Preoperative nurses need to be advised to make the hair decrease however now no longer to make the location bald, due to the fact making a place bald also can reason microtrauma to the pores and skin. Hair has to be eliminated within- the preoperative vicinity and now no longer the running room [11].

3. **Hand and forearm scrub**

It is no longer advised to do a 10-minute hand and forearm scrub. Scrubbing for 2 to 6 minutes reduces germs just as well as a 10-minute scrub without causing skin harm. With or without a sponge, use an antibacterial soap or an alcohol-based scrape, but not a brush. Alcohol-based scrubs are effective against most gram +ve and gram -ve bacteria, includes illnesses that are multidrug-resistant, and offer a rapid antimicrobial impact due to protein denaturation, but they do not produce a lasting antibacterial effect (approximately 1 to 3 hours of effect). Chlorhexidine gluconate causes disruption of cytoplasmic membranes, is extra powerful in opposition to gram +ve than gram –ve micro organism, and is extra powerful than alcohol-primarily based solutions. Chlorhexidine gluconate lasts at least 6 hours, although not being as effective as alcohol-based treatments. Iodophor/iodine washes inhibit protein synthesis and disrupt cell membranes, and are effective against both gram-positive and gram-negative bacteria. Scrubs containing alcohol and chlorhexidine have the best antibacterial action both immediately and long-term. . A prewash with a non antimicrobial cleaning soap and drying earlier than making use of the alcohol-primarily based scrub is recommended. Even with suitable washing, all pores and skin vegetation and micro organism might not be eliminated. Additionally, micro organism reaccumulate over time specifically crucial attention in the course of prolonged procedures—so double-gloving is recommended [11].

Intra-operative and immediate post-operative

1. **Normothermia**

Hypothermia can continue for up to 2 hours during or after an operation. It arises as a result of a failure in thermoregulation brought on by anaesthesia and exposure to a chilly environment in the operating room. Simple blankets or warming solutions used by regular microwaves can be utilised to avoid this, but caution must be exercised [10].

2. **Peri-operative oxygenation**

In patients having general anaesthesia with tracheal intubation, providing high FiO2 (80%) is highly helpful . Neutrophil oxidative killing is improved by increased oxygenation. A nasal cannula or a facemask can be used to provide oxygenation [10].

3. Glycemic control

The pressure of surgical operation causes dysregulation in glucose manufacturing and glucose utilization, thereby increasing the danger of SSI. Even in the absence of a history of diabetes, hyperglycemia is discovered in between 12% and 30% of patients having surgery. As a result, regardless of whether the patient has a history of diabetes, a fasting blood sugar check should be performed prior to surgery on all patients. It's disputed what the goal glucose level should be. To reduce the risk of SSI, the Society for Ambulatory Anesthesia, the American Diabetes Association, the Endocrine Society, and the Society of Thoracic Surgeons all suggest a glucose level of 180 mg/dL, whereas the CDC advises a glucose level of 200 mg/dL [10].

Post-operative period

Wound care and dressings

The incisions are covered with a covering (dressing) that protects the wound from the outside environment until it becomes impervious to microbes. They also keep the wound dry as they absorb exudates. Dressings come in a wide range (like gauges or advanced dressings). When a surgical wound is closed in the operating room, it is impermeable for 48 hours following the incision [10].

The following drugs are used preoperatively in preventing SSIs :

Antimicrobial	**Recommended dose**
Ampicillin-sulbactam	3 g (ampicillin 2 g/sulbactam 1 g)
Aztreonam	2 g
Cefazolin	2 g, 3 g for pts weighing ≥120 kg
Cefuroxime	1.5 g
Cefoxitin	2 g
Cefotetan	2 g
Ciprofloxacin	400 mg

Antimicrobial	Recommended dose
Clindamycin	900 mg
Gentamicin	5 mg/kg based on dosing weight (single dose)
Levofloxacin	500 mg
Metronidazole	500 mg

TREATMENT:

Following the findings of AA Kamat's investigation, The basic wound contamination charge changed into 12.17% .Antibiotic prophylaxis considerably reduced contamination rates. Antibiotics prophylaxis has a position/role to control the rate at which a sufferer presents/comes down with SSIs down an abdominal gynaecological surgical procedure [15].

THERAPY FOR ANTIBIOTICS

Antibiotic treatment candidates for the following women can be recommended by myself:

1. Normal hemodynamics.

2. No signs or symptoms of sepsis or abscess rupture.

3. Acceptable response to antibiotics.

4. Pelvic abscess with a diameter of about eight centimetres.

Patients are started on antibiotics based on their symptoms, and one antibiotic intravenous regimen that has been well researched is a combination of clindamycin (900 mg for every eight hrs) or metronidazole (500 mg for every 12 hrs) plus penicillin (five million units for every six hrs) or ampicillin (2 g for every six hrs) and gentamicin (five mg/kg ideal weight for the body every 24 hrs). In

patients with renal impairment, azatreonam (2 g every eight hours) is used instead of gentamicin [16-18].

SURGICAL INTERVENTION:

Drainage of pelvic abscesses regularly can help to reduce the length of time spent in the hospital and improve reproductive results.

The following are some examples of failure criteria:

1. Patients who do not have a radiological abscess size reduction. A discount of more than 50% must be readily apparent.

2. Patients with a growing abscess.

3. Fevers that come on suddenly or that last for a long time.

4. Prolonged clinical worsening or increasing abdominal/pelvic pain after antimicrobal therapy.

5. Patients that fulfil sepsis criterion: Antibiotics must be administered to septic patients, and they must be sent to the operating room for urgent surgery.

6. Intraabdominal abscess ruptured or suspected. Sepsis and septic shock can occur when an abscess ruptures, which can be fatal. Ruptured abscesses must be treated right away to improve the result of those patients and surgical intervention is recommended. Antibiotics should be given to these patients, and they should be sent to the emergency room for immediate surgery [16-18].

In comparison to laparotomy, drainage can be done by laparoscopy, which offers a number of advantages. However, in hemodynamically stable patients with good outcomes, Drainage guided by CT or ultrasound, in conjunction with antibiotics, has emerged as the recommended method, independent of large abscesses. Transvaginal aspiration with ultrasound guidance can be used to empty pelvic cuff abscesses [1].

CONCLUSION

Surgical site infections are one of the most prevalent complications following gynaecological surgery. Mostly gram-negative bacteria such as group B streptococcus, enterococcus, and anaerobic organisms are responsible for the infection. It frequently causes morbidity in patients and raises healthcare costs. Some preparatory procedures, such as patient bathing, hair removal, and hand and forearm cleaning, may help to prevent these complications. Certain antibacterial medicines can be used prior to surgery. Some intra-operative and immediate post-operative interventions, including glycemic control, normothermia, and perioperative oxygenation, can be taken, and adequate wound care and dressing are necessary in the postoperative period. Medical and surgical treatments are available for the treatment of SSIs. Antibiotics such as clindamycin, penicillin, ampicillin, and gentamycin are used in medical treatment. Surgical interventions such as abscess drainage and USG guided transvaginal aspirations are possible**.**

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