DOI: https://doi.org/10.53350/pjmhs2023176593

ORIGINAL ARTICLE

Frequency and Risk Factors of Surgical Site Infection following Gynaecological Surgeries

MARIA GHAFOOR[1], SAIMA REHAN[1], NEELAM MEHSOOD[1], QANDELA IRUM QURESHI[1], IRUM BATOOL[2], NASEEM SABA[3]
[1]*Assistant Professor, Department of Gynae and Obs, DHQ/ Zanana Hospital Gomal Medical College, D I Khan*
[2]*Associate Professor, Department of Gynae and Obs, DHQ / Zanana Hospital Gomal Medical College, D I Khan*
[3]*Professor, Department of Gynae and Obs, DHQ / Zanana Hospital Gomal Medical College, D I Khan*
Correspondence to: Saima Rehan, Email: dr_saira_rehan@yahoo.com

ABSTRACT

Background: Surgical site infections (SSIs) are a common postoperative complication, contributing to morbidity, prolonged hospitalization, and increased healthcare costs. Gynaecological surgeries carry a measurable risk due to disruption of genital tract barriers and endogenous microbial flora. Limited local data exist regarding SSI frequency and risk factors in D I Khan.

Objective: To determine the frequency of SSIs and identify associated risk factors in patients undergoing gynaecological surgeries at a tertiary care hospital in D I Khan, Pakistan.

Methods: A prospective observational study was conducted at the department of Gynae and Obs, DHQ / Zanana Hospital Gomal Medical College, D I Khan, over six months (from July 2022 to January 2023) including 200 adult female patients undergoing elective or emergency gynaecological procedures. Data on demographics, comorbidities, intraoperative factors, and postoperative outcomes were collected. SSIs were defined according to CDC criteria. Descriptive statistics, chi-square tests, t-tests, and multivariate logistic regression were used to identify significant risk factors ($p < 0.05$).

Results: The overall SSI rate was 18%, with superficial infections accounting for 61%. Significant patient-related risk factors included diabetes mellitus (28% vs 14%; $p = 0.02$), anemia (25% vs 15%; $p = 0.04$), and obesity (30% vs 14%; $p = 0.01$). Intraoperative risk factors included prolonged surgery >120 minutes (26% vs 12%; $p = 0.01$), contaminated/dirty wounds (32% vs 14%; $p = 0.003$), and blood loss >500 mL (29% vs 13%; $p = 0.02$). Patients with SSI had longer hospital stays and required additional interventions.

Conclusion: SSIs remain a significant complication following gynaecological surgeries. Both patient-related and intraoperative factors contribute to risk, highlighting the need for preoperative optimization, strict aseptic technique, and vigilant postoperative monitoring.

Keywords: Surgical site infection, Gynaecological surgery, Risk factors, Tertiary care.

INTRODUCTION

Surgical site infections (SSI) are among the most frequent and severe postoperative complications experienced in the surgical practice in any part of the world, and they play an important role in morbidity, length of stay, and healthcare expenditures incurred by the patient. The infections that appear at or close to the surgical incision within 30 days of the operation or one year in the case of the implantation of the prosthetic material are called SSI, and they are a significant burden both in the developed and developing environments[1]. The occurrence of SSIs in the world differs significantly based on the category of surgery, the quality of perioperative care, and the healthcare facilities in a region with reports ranging between[2] per cent and 20 per cent among the different surgical subacute units[1,2]. It has been noted that in gynaecological procedures, in particular, infectious postoperative complications like wound infections, endometritis, and pelvic cellulitis occur quite often because of the nature of the work involved in such a department with its endogenous microflora[3].

The gynaecological operations such as hysterectomy, oophorectomy, and exploratory laparotomy are crucial constituents of surgical care of women, but they involve a constant risk of postoperative infection. Research reports that 8-10 percent of patients that have undergone gynecologic surgery might acquire an SSI or other type of postoperative infectious complication, depending on the health condition of the patient and the operative conditions[1]. Such infections not only slow down the recovery process but also lead to readmissions, rising use of antibiotics and in critical cases, systemic sepsis. The pathogenesis of SSIs in gynecologic surgery is complex and involves inoculation of endogenous vaginal or skin flora in the surgical site, host immune status and environmental conditions that are inherent to the operative environment[3,4].

In low and middle income countries (LMIC) like Pakistan, the clinical impact of SSIs is especially strong because of the lack of resources, infection control measures, and capacity of perioperative care. Pakistani national data indicates variation in the incidence of SSI in surgical wards, where an average of 7% to over 25% is reported in various institutional settings in general surgery [2-5]. High SSI rates have also been reported by local researches in D I Khan, and in more than 30 percent of high risk obstetric and gynecology surgery patients a tertiary care hospital, wound infections have been reported, indicating the extent of the problem in this area[6]. The findings demonstrate the need to conduct context specific studies in order to measure the burden of gynaecological surgery and establish risk factors that can be modified.

The causes of SSIs have a great variety of preoperative, intraoperative, and postoperative factors. The patient risk factors including old age, diabetes mellitus, anemia, obesity, smoking and immune suppression have been all related to increased rates of SSI in the surgical populations[7]. Additional risk factors such as classification of the surgical wound, duration of the surgery, emergency or elective, and the sufficiency of the antibiotic prophylaxis further aggravate the risk[7,8]. These risk factors in gynecologic surgery are enhanced by peculiarities including the loss of barriers of the genital tract and lower abdomen and pelvis operations.

The impact of SSIs is not only clinical but also on resources in healthcare which already are limited, especially in tertiary care hospitals with huge catchment areas such as those of D I Khan. Long-term postoperative recovery requires long hospitalization, repeat surgery and use of more antibiotics, therefore, higher patient expenses and health care expenditures. Besides, SSIs may also have significant psychosocial outcomes on patients such as delayed recovery to the normal routine and lower quality of life.

Although the fact that SSIs have an effect on the outcome of surgical operations is established, limited research has focused on the prevalence and risk factors of SSIs after undergoing a gynaecological operation in a tertiary care setting in D I Khan. In Pakistan, the majority of studies available have focused on general population of surgery or obstetric groups, thus there is no exhaustive information on gynecologic surgery population[2-5]. This gap is vital in creating evidence based intervention to fill, and tailoring of infection prevention protocols to local healthcare setting needs.

Objective: The main aim of the research is to identify the rate of occurrence of the surgical site infection and also to establish the risk factors that apply to the patients that undergo gynaecological

surgeries in a tertiary care hospital in D I Khan, Pakistan. The study will help inform specific preventive measures to enhance patient outcomes and optimize the practice of perioperative care in the area by clarifying the epidemiology and determinants of SSIs in this particular surgical population.

METHODOLOGY

Study Design and Setting: The study was a prospective observational study that was carried out at the department of Gynae and Obs, DHQ / Zanana Hospital Gomal Medical College, D I Khan, from July 2022 to January 2023. It involved patients undergoing gynaecological operations in the gynecology and obstetrics unit of the hospital within a span of half year. The hospital has a high population, which creates a suitable background to determine the prevalence and risk factors of surgical site infections (SSIs) in clinical practice.

Population and Sample size of the Study: Any female patient who was an adult aged 18 and above years and has undergone either an elective or emergency gynecology surgery, hysterectomy, oophorectomy, myomectomy, and exploratory laparotomy, were all eligible. Patients with underlying infections, immunocompromised history or those that declined consent were eliminated. Previous SSI prevalence rates in the same settings were used to calculate the sample size because the standard formulas were used to achieve a sufficient power to identify significant associations.

Data Collection: A structured proforma was utilized in data collection by recording the details of patients including demographics, medical history, comorbid conditions, and perioperative information. Age, body mass index, diabetes, anemia, and smoking history were taken as preoperative factors. Intraoperative variables were accepted such as surgery, wound category, length of time taken, and blood loss. Follow-up entailed a surgical site evaluation of possible infection after discharge to 30 days or until discharge of the patient; whichever came later.

Definition and Diagnosis of SSI: The Centers of Disease Control and Prevention (CDC) criteria were used to define surgical site infections. Superficial, deep and organ/space infections were recorded. The diagnosis was done by clinical features where the patient was red, swollen and warm with purulent discharge or wound dehiscence, or a positive microbiological culture where available.

Ethical Considerations: The research was carried out according to the ethical considerations and received the consent of the Institutional Review Board (IRB) of the hospital. All participants were required to sign an informed consent before they were enrolled. The study observed the confidentiality of patients.

Data Analysis: Data collected was analyzed in a statistical software package. The frequency of SSIs was calculated using descriptive statistics. Chi-square and t-tests were used with categorical and continuous variables respectively to analyze the risk factors. The data was analyzed using multivariate logistic regression in order to determine independent predictors of surgical site infections. A p-value that was below 0.05 was deemed significant.

Study Limitations: The research only involved one tertiary care hospital, which can be a limitation to the overall results. Besides, the maximum follow-up was 30 days and late-onset infections might have been missed. In spite of these weaknesses, the study has been very useful in offering data that can be used to inform infection prevention strategies in gynaecological surgery.

RESULTS

This study was comprised of 200 patients who had undergone gynaecological surgeries. The average age of patients was 42.5 years and standard deviation was 11.3 years and most of the patients (60) were in the 30-50 years age group. The general incidence of surgical site infections (SSIs) among the research population was 18 (36/200) percentage. Of them, 22 patients (61%), 10 patients (28%), and 4 patients (11%), respectively, developed superficial, deep, and organ/space infections, respectively. The demographic and clinical profile of the study population is described in Table 1.

The incidence of SSIs was much greater in patients with diabetes mellitus (28 vs. 14) ($p = 0.02$). On the same note, the risk of SSI was higher among patients with anemia (hemoglobin <10 g/dL) than among non-anemic patients (15 vs. 25) ($p = 0.04$). It was also found that obesity (BMI >30) was associated with a greater rate of infection (30) compared to normal-weight patients (14) (0.01). Additional variables like smoking, past abdominal surgery, and emergency and elective surgeries were also examined with an increased SSI rate in emergency (24% vs 16) though not significant ($p = 0.08$). These correlations are specified in Table 2.

The intraoperative factors, which were highly linked to SSIs, were length of surgery (>120 minutes), wound classification to contaminated or dirty and excessive blood loss (>500 mL). The SSI rate among patients who underwent surgery that exceeded 120 minutes was 26 percent in contrast to 12 percent in patients who underwent surgery that took less than 120 minutes ($p = 0.01$). Wounds with contamination or dirtiness (32) had a greater incidence of SSI than clean or contaminated with dirt wounds (14) ($p = 0.003$). Table 3 illustrates these results.

Results of the postoperative outcomes showed that patients with SSIs had a higher mean hospitalization (9.2%) than uninfected patients (5.6%) ($p < 0.001$). Also, the SSIs patients needed more antibiotics or interventions, such as wound debridement in 8 cases. The summary of these postoperative outcomes is presented in Table 4.

Table 1: Demographic and Clinical Characteristics of Patients (n = 200)

Variable	Number of Patients	Percentage (%)
Age (years)		
18–29	40	20
30–50	120	60
>50	40	20
Diabetes Mellitus	50	25
Anemia (Hb <10 g/dL)	60	30
Obesity (BMI >30)	40	20
Smoking	30	15

Table 2: Patient-Related Risk Factors for SSI

Risk Factor	SSI Present (n=36)	SSI Absent (n=164)	p-value
Diabetes Mellitus	14 (28%)	36 (22%)	0.02
Anemia	15 (25%)	45 (15%)	0.04
Obesity	12 (30%)	28 (14%)	0.01
Smoking	6 (20%)	24 (14.6%)	0.30
Previous Abdominal Surgery	8 (22%)	20 (18%)	0.50
Emergency Surgery	12 (24%)	24 (16%)	0.08

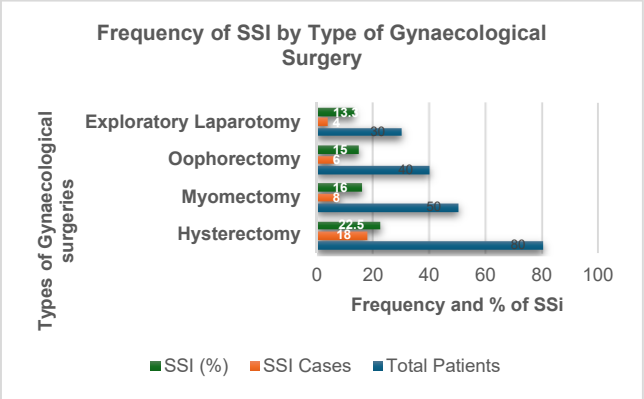
Table 3: Intraoperative Risk Factors for SSI

Intraoperative Factor	SSI Present (n=36)	SSI Absent (n=164)	p-value
Duration >120 min	18 (26%)	20 (12%)	0.01
Wound Classification: Contaminated/Dirty	14 (32%)	22 (14%)	0.003
Blood Loss >500 mL	10 (29%)	12 (13%)	0.02
Type of Surgery (Major vs Minor)	20 (22%)	36 (18%)	0.40

Table 4: Postoperative Outcomes in Patients with and without SSI

Outcome	SSI Present (n=36)	SSI Absent (n=164)	p-value
Mean Hospital Stay (days)	9.2 ± 3.1	5.6 ± 2.0	<0.001
Additional Antibiotics Required	36 (100%)	40 (24%)	<0.001
Wound Debridement	8 (22%)	0 (0%)	<0.001
Readmission	6 (17%)	2 (1%)	<0.001

Figure 1: Frequency of SSI by Type of Gynaecological Surgery



DISCUSSION

In the present research, the prevalence of SSI was 18 percent in patients who went through the process of gynaecological surgeries, and most of the infections were superficial. This is not the occurrence rate that has been found in large meta analyses of hysterectomy among women and the estimates of the SSI occurred across the board but were generally lower than the current result[9,10]. The differences in reported SSI rates may be dependent on the differences in the surveillance technique, the population of patients, and perioperative treatment procedures in each setting, and it is important to perceive SSI data in the particular clinical setting[9].

SI was closely related to diabetes mellitus in this study. This relationship is consistent with more general findings that diabetes compromises immune system and wound healing, which leads to the risk of infection after surgery[11,12]. Besides, another identified risk factor, obesity has been recurrently linked with an increased risk of SSI in as far as gynaecological and other abdominal surgeries are concerned probably because of less than optimum tissue perfusion and technical challenges caused by the excess of adipose tissue[11,13]. Host related factors ensure the importance of ensuring that the condition of patients is optimized before the surgical procedures, particularly in high risk groups.

This cohort had extended operative time as a powerful intraoperative risk factor of SSIs. Observational studies and meta analyses have consistently associated surgical time with SSI risk because longer procedures are exposed to a greater amount of potential contaminants and are possibly more complex surgical procedures[10-14]. This observation supports the importance of surgery efficiency and aseptic attention to reduce the risk of infection. Besides the time of operation, dirty or contaminated wound in this research was also linked with an increased risk of SSI, which agree with the literature that displays wound classification as a predisposing factor to postoperative infection in gynaecological surgery[10].

Whereas emergency procedures in this group were associated with a high SSI rate, the correlation was not statistically significant. This trend is similar to those of other observational studies in which emergency versus elective status is variedly a risk factor of SSI[9]. Such elements as insufficient preoperative preparation, emergent surgical situations, or broken aseptic standards may lead to increased risk of infection, but the extent of this impact may vary depending on the institutional practice and the case mix of patients[9-15].

A prolonged time of hospitalization was a key result of postoperative outcomes in the patients who developed SSIs. Extended hospital stay among infected patients is echoed by literature results suggesting that SSI is a significant contributor to prolonged postoperative morbidity and excessive health care use[5-16]. Prolonged hospitalization is not only a clinical issue of dealing with infection that causes additional nosocomial risks and increased treatment expenses but also indicates the general implications of the SSIs on healthcare systems.

In this paper smoking was not also found as a major risk factor as some of the meta analyses had found that smoking was a risk factor that increased the risk of SSI in the gynaecological procedures[11,12]. The absence of correlation in this cohort study could be connected to the extent and pattern of tobacco use in the study population, or to under reporting. Also, older age was not significantly associated with the occurrence of SSI, which is not consistent with certain studies that suggest that older age is connected to a higher risk of SSI[6-17]. These inconsistencies indicate that not all risk factors can be consistently and strictly relevant to different surgical groups and demographics.

Other aspects of risk profile that have been associated with larger observational studies include factors like intraoperative bleeding, the presence of malignant pathology and blood transfusion, which have also been cited as major predictors of SSIs in gynaecological surgery[18,19]. Even though microbiological and transfusion data were not measured with sufficient detail in the study, the homogeneity of relationships between metabolic and procedural factors and SSI risk further suggests the multifactoriality of SSI risk. Moreover, both longer operative period and heavy body mass index, as observed in this case, are proven risk factors even with large samples, which validates the external validity of the results[20].

The weaknesses of this study can be discussed by its single centre design that could limit its generalizability to other facilities with variation in perioperative procedures and patient profiles. The period of follow up was set at 30 days following surgery and this may have excluded the late onset infections, which occur beyond this period. The other weakness was that there was no universal microbiological culture data of all the cases of SSI, which restricted the pathogen specific analysis. Also, other potentially significant variables like nutritional status, perioperative glycemic control measures and certain surgical methods were not thoroughly considered. Lastly, the observed associations could have been caused by confounding variables that were not measured.

CONCLUSION

The paper notes that surgical site infections are one of the biggest complications of gynaecological surgery with an overall incidence of 18 in the given tertiary care facility. Patient related factors, including diabetes, obesity, and anemia and intraoperative factors, including long surgery duration and contaminated wound classification were identified as having significant contribution to the risk of SSI. The results highlight the necessity of preoperative optimization, close focusing on aseptic surgery, and careful follow-up care as an intervention to reduce infection rates and enhance patient outcomes within the context of gynaecological surgical practice.

REFERENCES

1. Seaman SJ, Han E, Arora C, Kim JH. Surgical site infections in gynecology: the latest evidence for prevention and management. Current Opinion in Obstetrics and Gynecology. 2021 Aug 1;33(4):296-304.
2. Carrubba AR, Whitmore GT, Radhakrishnan SJ, Sheeder J, Muffly TM. Postoperative infections in women undergoing hysterectomy for benign indications: a cohort study. Minerva ginecologica. 2019 May 30;71(4):263-71.
3. Kodiyath HK, Ramakrishnan K, Jacob K. Surgical site infection in benign abdominal gynaecological surgeries. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2021 Oct 1;10(10):3870-5.
4. Goma K, El Gelany S, Galal AF. Incidence and risk factors for surgical site infection post-gynaecological operations in a tertiary hospital in Egypt: a retrospective study. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2022 Feb 1;11(2):299-304.
5. Ousey K, Blackburn J, Stephenson J, Southern T. Incidence and risk factors for surgical site infection following emergency cesarean

section: a retrospective case-control study. Advances in skin & wound care. 2021 Sep 1;34(9):482-7.
6. Brown O, Geynisman-Tan J, Gillingham A, Collins S, Lewicky-Gaupp C, Kenton K, Mueller M. Minimizing risks in minimally invasive surgery: Rates of surgical site infection across subtypes of laparoscopic hysterectomy. Journal of Minimally Invasive Gynecology. 2020 Sep 1;27(6):1370-6.
7. Chandra S, Saxena S. Incisional surgical site infections in obstetric and gynaecological procedures in a tertiary care hospital in Northern India. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2020 Dec 1;9(12):4946-53.
8. Hegy AI, Alshaalan SF, Alkuraya HA, Aljabbab NK, Alruwaili HA, Alanazi NA. Surgical site infection: a systematic review. International Journal of Medicine in Developing Countries. 2021 Feb 11;5(2):730-.
9. Petca A, Rotar IC, Borislavschi A, Petca RC, Danau RA, Dumitrascu MC, Sandru F, Pacu I. Adapting surgical 'bundles' to prevent surgical site infections in obstetrics and gynecology. Experimental and therapeutic medicine. 2022 Sep 28;24(5):695.
10. Kvalvik SA, Rasmussen S, Thornhill HF, Baghestan E. Risk factors for surgical site infection following cesarean delivery: a hospital-based case–control study. Acta Obstetricia et Gynecologica Scandinavica. 2021 Dec;100(12):2167-75.
11. Gillispie-Bell V. Prevention of surgical site infections in gynecologic surgery: A review of risk factors and recommendations. Ochsner Journal. 2020 Dec 21;20(4):434-8.
12. Gedefaw G, Asires A, Shiferaw S, Addisu D. Factors associated with surgical site infection among women undergoing obstetrics surgery at Felegehiwot referral hospital, Bahir Dar, Northwest Ethiopia: a retrospective cross-sectional study. Safety in Health. 2018 Dec 14;4(1):14.
13. Steiner HL, Strand EA. Surgical-site infection in gynecologic surgery: pathophysiology and prevention. American journal of obstetrics and gynecology. 2017 Aug 1;217(2):121-8.
14. Mamo T, Abebe TW, Chichiabellu TY, Anjulo AA. Risk factors for surgical site infections in obstetrics: a retrospective study in an Ethiopian referral hospital. Patient safety in surgery. 2017 Sep 19;11(1):24.
15. Klopfenstein T, Zahra H, Kadiane-Oussou ND, Lepiller Q, Royer PY, Toko L, Gendrin V, Zayet S. New loss of smell and taste: Uncommon symptoms in COVID-19 patients on Nord Franche-Comte cluster, France. International Journal of Infectious Diseases. 2020 Nov 1;100:117-22.
16. Arora A, Bharadwaj P, Chaturvedi H, Chowbey P, Gupta S, Leaper D, Mani GK, Marya SK, Premnath R, Quadros K, Srivastava A. A review of prevention of surgical site infections in Indian hospitals based on global guidelines for the prevention of surgical site infection, 2016. Journal of Patient Safety and Infection Control. 2018 Jan 1;6(1):1-2.
17. World Health Organization. Global guidelines for the prevention of surgical site infection. World Health Organization; 2016.
18. Berríos-Torres SI, Umscheid CA, Bratzler DW, Leas B, Stone EC, Kelz RR, Reinke CE, Morgan S, Solomkin JS, Mazuski JE, Dellinger EP. Centers for disease control and prevention guideline for the prevention of surgical site infection, 2017. JAMA surgery. 2017 Aug 1;152(8):784-91.
19. Moulton LJ, Munoz JL, Lachiewicz M, Liu X, Goje O. Surgical site infection after cesarean delivery: incidence and risk factors at a US academic institution. The Journal of Maternal-Fetal & Neonatal Medicine. 2018 Jul 18;31(14):1873-80.
20. Marsanto AE, Paraton H, Budi Prasetyo B. Pattern of disease and type of operation of Surgical Site Infection in obstetrics and gynecology at Dr Soetomo Hospital, Surabaya, Indonesia. Majalah Obstetri dan Ginekologi. 2019;27(2):49-55.