Open Access

ORIGINAL ARTICLE

Postoperative wound infection after elective abdominal gynecological procedures: Incidence, risk factors, and treatment outcomes

Sehrish Razzaq[1], Nadia Zahid[1], Gulfreen Waheed[1], Robina Kauser[1]

Department of Gynecology & Obstetrics, Avicenna Medical College, Lahore, Pakistan[1]

ABSTRACT

Background: Postoperative wound infections are a significant complication of elective abdominal gynecological surgery, contributing to prolonged hospital stay, increased costs, and additional interventions.

Objectives: To determine the incidence of postoperative wound infections, identify associated risk factors, and evaluate treatment outcomes among women undergoing elective abdominal gynecological procedures.

Methods: This prospective observational study was conducted at Avicenna Medical College Hospital in Lahore from April to November 2025. Of 138 consecutively enrolled women, 23 were lost to follow-up, leaving 115 for final analysis. Risk factors were recorded, and all patients were followed for 30 days. Fisher's exact test and relative risk (RR) with 95% confidence intervals (CI) were calculated for statistical analysis.

Results: Cumulative incidence of postoperative wound infection was 12.17% (14/115), with 92.86% of cases detected after hospital discharge. Significant risk factors were duration of surgery >120 minutes (RR 4.26, p=0.013), intraoperative blood loss >500 ml (RR 4.05, p=0.018), and antibiotic administration <60 minutes before incision (RR 4.66, p=0.011). Antibiotic prophylaxis significantly reduced the risk of infection (RR 0.29, 95% CI 0.12–0.73, p=0.012). Elevated BMI, anemia, and diabetes showed increased risk but did not reach statistical significance. Infected patients had a longer hospital stay (4.4 days vs 2.0 days), corresponding to an excess of 2.4 days. Of 14 infected patients, 9 (64.3%) were managed conservatively, while 5 (35.7%) required surgical re-intervention. 50% required readmission for management.

Conclusion: Postoperative wound infection occurred in 12% of women, with 92.86% detected after discharge. Duration of surgery, blood loss, and delayed antibiotic administration were significant risk factors, whereas prophylaxis was protective. Most infections responded to conservative management, though 50% required readmission and 35.7% required re-intervention, underscoring the need for structured post-discharge surveillance.

Key Words: Surgical Wound Infection, Gynecologic Surgical Procedures, Antibiotic Prophylaxis, Risk Factors, Postoperative Complications

DOI: https://doi.org/10.53685/jshmdc.v7i1.451

Corresponding Author:
Sehrish Razzaq
Postgraduate Resident
Department of Gynecology & Obstetrics, Avicenna Medical College, Lahore, Pakistan.
drtahirmaqbool12@gmail.com
Received: 03.02.26, 1st Revision: 18.05.26, 2nd Revision: 09.06.26, Accepted: 15.06.26

How to cite this article: Razzaq S, Zahid N, Waheed G, Kauser R. Postoperative wound infection after elective abdominal gynecological procedures: Incidence, risk factors, and treatment outcomes. J Shalamar Med Dent Coll. 2026;7(1): 13-18. doi: https://doi.org/10.53685/jshmdc.v7i1.451

INTRODUCTION

One of the most frequent and severe complications that may occur after gynecologic surgery is wound infections. Despite advanced surgical procedures, sterilization, and perioperative care, we still observe a considerable number of these infections.[1] Infection rates in gynecologic surgeries have historically been approximately 8-10 percent, which is a considerable portion of the postoperative complications experienced by patients.[2] Not only do these infections decrease recovery, but they also result in increased length of stay, increased health care expenses, and an increased risk of having follow-up procedures such as drainage or additional surgeries.[3] The National Research Council Wound Classification system normally classifies elective gynecologic surgeries as

clean-contaminated. reflecting the inherent risk of bacterial contamination from the genital tract due to exposure to vaginal flora.[4] Due to this fact, even with the strict aseptic practices, there is a high chance that postoperative wound infection might develop.[5] There are several determinants that affect the risk of postoperative infection. Risk can be increased in age, nutritional status, obesity, diabetes, smoking, and a compromised immune system, among other conditions, in patients. Moreover, the nature of the surgery performed, its duration, blood loss, and the surgeon's experience may affect the risk of infection. It has been shown to mitigate this risk when perioperative care guidelines are followed, especially through the appropriate use of prophylactic antibiotics. The tendency to shorten hospital stays further complicates the matter. Several infections may manifest days after abdominal gynecological surgery, even after the patient has already returned home. Therefore, by looking solely at inpatient records, we could grossly be underestimating the number of postoperative infections. This needs to be known: when and how these infections present, to accurately report, ensure quality, and develop appropriate follow-up strategies, particularly for patients who may not be able to return for subsequent appointments or have limited access to surgical care.[6]

Although postoperative wound infections are well reported, there is limited prospective data from Pakistan on elective abdominal gynecological surgeries, particularly capturing infections after hospital discharge. The study aimed to determine the incidence of postoperative wound infections, identify associated risk factors, and evaluate treatment outcomes among women undergoing elective abdominal gynecological procedures. The secondary objective was to assess the association between perioperative risk factors and postoperative wound infection.

METHODS

This prospective observational study was conducted in the Department of Gynecology & Obstetrics, Avicenna Medical College Hospital, Lahore, Pakistan, after obtaining ethical approval from the Institutional Review Board (IRB/Avic/ Obs & Gynae/2024/115) in 2024, prior to study commencement. The study was conducted from 1st April 2025 to 30th November 2025. A total of 138 women who met the inclusion criteria and underwent elective abdominal gynecological procedures during the study period were enrolled after written informed consent. Of these, 23 patients failed to follow up during the 30-day postoperative period due to an inability to attend scheduled outpatient visits, primarily because of distance and financial constraints. The final analysis was therefore conducted on 115 patients who completed the full follow-up period.

Women over the age of 18 years who underwent abdominal gynecological procedures including abdominal hysterectomy, subtotal hysterectomy, myomectomy, ovarian cystectomy, salpingo-oophorectomy, and exploratory laparotomy during the study period were considered for inclusion. Patients undergoing non-abdominal or minor gynecological procedures such as dilatation and curettage (D&C), hysteroscopy, cervical biopsy, and polypectomy were excluded. Additionally, individuals with pre-existing active infections, those who are immunocompromised, or those on long-term immunosuppressive therapy were excluded from the study. All patients received standardized perioperative care. Antibiotic prophylaxis (within 60 minutes before surgical incision), consisting of a single preoperative dose of cefazolin (Ancef) or cefuroxime (Zinacef) as per institutional protocol, was administered to 89 of 115 patients who completed follow-up .[11]

Twenty-six patients did not receive prophylactic antibiotics due to documented cephalosporin allergy. Postoperative wound infections were defined as any incidence of cellulitis, abscess, wound dehiscence, or seroma requiring drainage within 30 days of surgeon intervention.[7] All patients remained admitted in the hospital according to standard postoperative protocol and were examined daily for signs of wound infection, such as cellulitis, abscess, and wound dehiscence requiring intervention. After hospital discharge, patients were followed for 30 days postoperatively through scheduled outpatient visits and records from referring physicians.

All 115 patients who completed follow-up were assessed over the same 30-day period. Demographic data, surgical history, and postoperative patient outcomes were documented systematically. BMI was categorized according to the WHO classification as normal weight, overweight, or obese for analysis.

Ethical Approval

Ethical approval was obtained from the Institutional Review Board of Avicenna Medical College Hospital, Lahore (IRB/Avic/Obs&Gynae/2024/115), prior to study commencement in April 2025.

Statistical Analysis

GraphPad Prism 8 software was used for statistical analysis. Fisher's exact test was applied to assess the association between categorical perioperative risk factors and postoperative wound infection. Relative risk (RR) with 95% confidence intervals (CIs) was used to quantify the association between each risk factor and postoperative wound infection. A p-value of <0.05 was considered statistically significant.

RESULTS

Data of 115 women who completed the 30-day follow-up period were analyzed. Participants had a mean age of 31 ± 11.3 years (range 18–45) and a mean BMI of 27.31 ± 4.5 kg/m². According to the WHO BMI categories, 30 participants (26.1%) were of normal weight, 55 (47.8%) were overweight, and 30 (26.1%) were classified as obese. The cumulative incidence of postoperative wound infection was 14/115 (12.17%), with 92.86% of cases (13/14) detected after hospital discharge (Table 1b).

Notably, 13 of the 14 infected (92.86%) were diagnosed after hospital discharge, either during scheduled outpatient follow-up or by the referring consultant. The mean time to infection onset was 7 ± 2.5 days (range 4–12 days). The incidence of postoperative wound infection varied across surgical procedures, with exploratory laparotomy showing the highest rate (28.6%) (Table-1a). However, comparison of infection rates across surgery types showed no statistically significant association between procedure type and postoperative wound infection (p = 0.783). Of the 115 patients, 89 received antibiotic prophylaxis, and 26 did not. Patients who received prophylaxis developed postoperative wound infection less frequently than those who did not (7.9% vs 26.9%). Administration of antibiotic prophylaxis was associated with a 71% reduction in infection risk (p=0.012) (Table 2). The mean hospital stay was 4.4 days among patients who developed postoperative wound infection compared with 2.0 days among those without infection, representing an average increase of 2.4 days. Of the 14 infected patients, 7 (50%) required readmission, and 5 (35.7%) underwent surgical reintervention, including wound drainage, debridement, or resuturing. Fisher's exact test identified three procedure-related factors significantly associated with postoperative wound infection: duration of surgery >120 minutes (p=0.013), intraoperative blood loss >500 ml (p=0.018), and delayed antibiotic administration <60 minutes before incision (p=0.011) (Table 3). Notably, none of the patients who received antibiotic prophylaxis 60 minutes before incision developed postoperative wound infection.

Table 1a: Infection rate by type of surgery

Surgery Type		Post-op Infection	Infection Rate
	(n)	(n)	(%)
Abdominal hysterectomy	45	6	13.3
Subtotal hysterectomy	18	2	11.1
Myomectomy	22	2	9.1
Ovarian cystectomy	15	1	6.7
Salpingo-oophorectomy	8	1	12.5
Exploratory laparotomy	7	2	28.6
Total	115	14	12.17

Table 1b: Incidence of postoperative wound infection

Morbidity	(n)	(%)
Total patients	115	100
Patients with wound infection	14	12.17
Infections detected during inpatient stay	1	7.14
Infections detected after hospital discharge	13	92.85

Five of the 14 patients with postoperative wound infections required active re-treatment, including surgical re-intervention and escalation of antimicrobial therapy. The remaining 9 of 14 (64.28%), were successfully managed conservatively though 50% required readmission and 35.7% required re-intervention. Conservative management focused on optimization of systemic risk factors, including strict glycemic control in diabetic patients, correction and maintenance of hemoglobin levels in anemic patients, and counseling for weight management to achieve an appropriate body mass index (BMI). These measures led to satisfactory wound healing without the need for additional surgical procedures in most infected cases.

Table 2: Wound infection risk associated with antibiotic prophylaxis							
Prophylactic Antibiotic	**Wound Infection (n) %**	**No Wound Infection (n) %**	**(n)**	**Risk of Infection (%)**	**Relative Risk (RR)**	**95% CI**	**P value**
Given	7 (7.9%)	82 (92.1%)	89	7.9%	0.29	0.12 – 0.73	0.012*
Not given	7 (26.9%)	19 (73.1%)	26	26.9%	—	—	—

*Fisher's exact test applied. Relative Risk and Confidence Interval were calculated. *p < 0.05 is considered statistically significant*

Table 3: Risk factors associated with postoperative wound infection					
Variables	**Infection (n=14)**	**No Infection (n=101)**	**Relative Risk (RR)**	**95% CI**	**P value**
Risk factors					
Age ≥ 40 years	9 (64.3%)	42 (41.6%)	2.53	0.80–7.99	0.115
BMI ≥ 25 kg/m²	12 (85.7%)	73 (72.3%)	2.30	0.49–10.85	0.353
Anemia (Hb <12 g/dL)	5 (35.7%)	18 (17.8%)	2.56	0.77–8.51	0.151
Diabetes mellitus	4 (28.6%)	20 (19.8%)	1.62	0.46–5.67	0.486
ASA-PS grade III–IV	6 (42.9%)	22 (21.8%)	2.69	0.85–8.49	0.118
Surgeon-related factors					
Estimated blood loss > 500 ml	8 (57.1%)	25 (24.8%)	4.05	1.28–12.83	0.018*
Drain placement	9 (64.3%)	38 (37.6%)	2.98	0.94–9.46	0.063
Open vs laparoscopic technique	12 (85.7%)	68 (67.3%)	2.91	0.62–13.69	0.205
Operating Room / Procedure-Related Factors					
Emergency procedure vs elective	5 (35.7%)	12 (11.9%)	4.12	1.18–14.34	0.026*
Wound class: clean vs contaminated	12 (85.7%)	70 (69.3%)	2.66	0.56–12.55	0.214
Duration of surgery > 120 min	9 (64.3%)	30 (29.7%)	4.26	1.31–13.84	0.013*
Antibiotic timing <60 min pre-incision	6 (42.9%)	14 (13.9%)	4.66	1.40–15.49	0.011*
Skin prep (povidone-Iodine vs chlorhexidine)	10 (71.4%)	50 (49.5%)	2.55	0.75–8.66	0.137

*ASA-PS= American Society of Anesthesiologists physical status grade, *p < 0.05 is considered statistically significant. Fisher's exact test applied. Relative Risk and Confidence Interval calculated*

DISCUSSION

The present study demonstrated a postoperative wound infection rate of 12.17% following elective abdominal gynecological surgeries.[8] The majority of infections were identified after hospital discharge. Infection rates were significantly decreased with antibiotic prophylaxis, whereas elevated BMI, anemia, and diabetes mellitus were associated with increased risk of postoperative wound infection but did not reach statistical significance. Moreover, hospital stay, readmission rates, and additional clinical or surgical care were also associated with postoperative wound infections.[9] The rate of infection found in the present study is nearly similar to the data already reported, which confirms that wound infection is a constant challenge in gynecologic practice. More than 90% of postoperative wound

infections were detected after hospital discharge, emphasizing the limitations of inpatient surveillance alone. Similar findings have been reported in a study, underscoring the importance of structured post-discharge follow-up and patient education for the early detection of postoperative complications.[1] The findings support the use of prophylactic antibiotics in gynecologic surgery. Antibiotic prophylaxis is firmly recommended for abdominal gynecological surgery

by major international guidelines, including those of the American College of Surgeons and the Infectious Diseases Society of America.[10,11] Our data indicate that the wound infection rate decreased from 26.9% to 7.9% among women who received antibiotic prophylaxis. This is fully consistent with the findings of large meta-analyses, which demonstrate that prophylactic antibiotics reduce the infection rate by 50-75 percent in clean-contaminated surgeries.[12,13] Prolonged surgery duration, intraoperative blood loss, and antibiotic administration <60 minutes before incision were associated with an increased risk of infection. Longer procedures and excessive blood loss may increase tissue exposure, bacterial contamination, tissue hypoperfusion, and operative complexity, thereby impairing wound healing.[4] Similarly, delayed antibiotic administration may reduce the antimicrobial concentration in tissue at the time of incision.[14] Although elevated BMI, anemia, and diabetes mellitus were associated with increased risk of postoperative wound infections, these associations did not reach

statistical significance in the present study. This may be related to the relatively small sample size, limited statistical power, and standardized perioperative care protocols that may have minimized the impact of certain patient-related risk factors.[4] In addition, most patients received standardized perioperative management, including glycemic control, antibiotic prophylaxis, optimization of hemoglobin levels, and postoperative wound care, which may have minimized the impact of these comorbid conditions on infection outcomes. Similar variables have been identified as important predictors of postoperative infection in previous studies.[15,16] Abnormal BMI may compromise wound healing by reducing vascularity and prolonging operative time.[17] Similarly, diabetes predisposes patients to infection due to impaired immune response and delayed tissue repair.[18,19] Exploratory laparotomy showed the highest wound infection rate (28.6%), although this association was not statistically significant, the higher rate may reflect the greater complexity of these procedures. However, the small number of patients in this subgroup (n=7) warrants cautious interpretation. Postoperative wound infection was associated with substantial clinical burden, including prolonged hospital stay, high readmission rates, and need for additional interventions. These findings highlight the importance of preventive perioperative strategies to reduce patient morbidity and healthcare utilization.[20]

Most postoperative wound infections in this study were managed conservatively through secondary intention healing, emphasizing the effectiveness of non-surgical approaches when systemic risk factors are adequately controlled. Optimization of glycemic status, correction of anemia, and maintenance of appropriate BMI appeared to support satisfactory wound healing and reduced the need for repeat surgical intervention. However, a subset of patients still required re-treatment, underscoring the clinical and resource burden associated with postoperative wound infections.

CONCLUSION

Postoperative wound infection occurred in 12% of women, with most cases detected after discharge. Prolonged surgery, greater blood loss, and delayed antibiotic administration increased infection risk, while prophylactic antibiotics were protective. Despite most infections responding to conservative treatment, frequent readmissions and re-interventions highlight the need for timely prophylaxis and structured post-discharge follow-up.

Limitations and future recommendations

This study has several limitations. The relatively small sample size and limited number of infection events may restrict the generalizability of the findings. Prophylactic antibiotic use was based on routine clinical practice rather than randomization, introducing potential selection bias. Only univariate analysis was performed due to the low number of infection events, and outcomes were limited to the first 30 postoperative days. Additionally, the single-center design may limit external validity. Future multicenter prospective studies with larger sample sizes are needed to evaluate effective strategies for preventing postoperative wound infections.

Acknowledgments

We gratefully acknowledge the Principal and Chairman of Avicenna Medical College, Lahore, for providing the hospital facilities necessary to conduct this study.

REFERENCES

1. Ekanem EE, Oniya O, Saleh H, Konje JC. Surgical site infection in obstetrics and gynaecology: prevention and management. Obstet Gynaecol. 2021; 23(2): 124–137. doi:10.1111/tog.12730
2. Hou Y, Collinsworth A, Hasa F, Griffin L. Incidence and impact of surgical site infections on length of stay and cost of care for patients undergoing open procedures. Surg Open Sci. 2023; 11: 1–18. doi:10.1016/j.sopen.2022.10.004
3. Farooq M, Mahmood MA, Razzaq S, Batool M, Tahir TH, Hanif S. Effects of enhanced recovery after surgery protocol on outcome of surgical patients. Pak Armed Forces Med J. 2024; 74(4): 926–930/pafmj.v74i. doi: 10.512534.9276
4. Seidelman JL, Mantyh CR, Anderson DJ. Surgical site infection prevention: a review. JAMA. 2023; 329(3): 244–252. doi:10.1001/jama.2022.24075
5. Rezaei AR, Zienkiewicz D. Surgical site infections: a comprehensive review. J Trauma Inj. 2025; 38(2): 71. doi: 10.20408/jti.2025.0019
6. Calegari IB, Peixoto CA, Furtado BEP, Raponi MBG, Felix MMS, Ferreira LA, et al. Post-discharge surveillance methods for infection of the surgical site: integrative review. Acta Paul Enferm. 2023; 36: eAPE019631. doi: 10.37689/acta-ape/2023AO019631
7. Taliento C, Scutiero G, Milano C, Grasso M, Nitti F, Brasile O, et al. Surgical site infections and sepsis in gynecological surgery. Int J Gynecol Obstet. 2026; 172(1): 92–103. doi:10.1002/ijgo.70356

8. Malik SS, Malik TA, Siddiqui N, Khan AU, Ahmad K, Sultan F, et al. PakSurg 1: determining the epidemiology and risk factors of surgical site infections in Pakistan a multicenter, prospective cohort study. BMJ Open. 2023; 13(7): e070831. doi: 10.1136/bmjopen-2022-070831
9. Khan OH, Zakaria AD, Hashim MN, Khan AH, AlQarni A, AlGethamy M, et al. The burden of surgical site infection at Hospital Universiti Sains Malaysia and related postoperative outcomes: a prospective surveillance study. Antibiotics (Basel). 2023; 12(2): 208. doi:10.3390/antibiotics12020208
10. Ban KA, Minei JP, Laronga C, Harbrecht BG, Jensen EH, Fry DE, et al. American College of Surgeons and Surgical Infection Society: surgical site infection guidelines, 2016 update. J Am Coll Surg. 2017; 224(1): 59–74. doi: 10.1016/j.jamcollsurg.2016.10.029
11. Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery. Am J Health Syst Pharm. 2013; 70(3): 195–283. doi: 10.2146/ajhp120568
12. Petousis S, Angelou P, Almperis A, Laganà AS, Titilas G, Margioula-Siarkou C et al. Prophylactic antibiotics before gynecologic surgery: a comprehensive review of guidelines. Journal of Personalized Medicine. 2024; 14(3): 327. doi: 10.3390/jpm14030327
13. Giouleka S, Tsakiridis I, Chalkia-Prapa EM, Katzi F, Liberis A, Michos G, et al. Antibiotic prophylaxis in obstetrics and gynecology: a comparative review of guidelines. Obstet Gynecol Surv. 2025; 80(3): 186–203. doi: 10.1097/OGX.0000000000001371
14. Bardia A, Treggiari MM, Michel G, Dai F, Tickoo M, Wai M, et al. Adherence to guidelines for the administration of intraoperative antibiotics in a nationwide US sample. JAMA NetwOpen.2021; 4(12): e2137296. doi:10.1001/jamanetwork open.2021.37296.
15. Rodríguez-Rodríguez N, Martínez-Jiménez I, García-Ojalvo A, Mendoza-Mari Y, Guillén-Nieto G, Armstrong DG, et al. Wound chronicity, impaired immunity, and infection in diabetic patients. MEDICC Rev. 2022; 24(1): 44–58. doi: 10.37757/MR2021.V23.N3.8.
16. Martin ET, Kaye KS, Knott C, Nguyen H, Santarossa M, Evans R, et al. Diabetes and risk of surgical site infection: a systematic review and meta-analysis. Infect Control Hosp Epidemiol. 2016; 37(1): 88–98. doi: 10.1017/ice.2015.249
17. Frykberg RG, Banks J. Challenges in the treatment of chronic wounds. Advances in wound care. 2015; 4(9): 560-582. doi: 10.1089/wound.2015.0635
18. Gul N, Khan H, Asif M, Faiz U, Ullah H, Jabeen S. Comparison of surgical site infection in diabetic vs non-diabetic patients operated electively in surgical unit of MTI Lady Reading Hospital Peshawar. Biol Clin Sci Res J. 2025; 6(1): 18–21. doi:10.54112/bcsrj.v6i1.1507.
19. Arshad S, Rasul A, Batool A, Zukhruf Z, Asad MT. Diabetes and risk of surgical site infection: a narrative review. J Health Rehabil Res.2024; 4(1): 567–572.doi:10.61919/jhrr.V4I1.500
20. Ghani MT, Rehman IU, Haider S, ur Rehman A, Zubair H. Microbiology and drug sensitivity of Surgical Site Infections in Pakistan: A Systematic Review. Annals of PIMS-Shaheed Zulfiqar Ali Bhutto Medical University. 2024; 20(1): 3-7. doi: 10.48036/apims.v20i1.953

AUTHORS' CONTRIBUTION:

SR: Data collection, manuscript drafting
NZ: Study supervision, study design, final approval of the manuscript
GW: Data analysis and interpretation, critical review
RK: Data analysis, study design, manuscript review and editing
All Authors agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

CONFLICT OF INTEREST:
All authors declared no conflict of interest.

GRANT SUPPORT AND FINANCIAL DISCLOSURE:
No specific grant was taken for this research from any funding agency in the public, commercial or not-for-profit sectors.

DATA SHARING STATEMENT:
The data are available from the corresponding author upon reasonable request.

This is an open-access article distributed under the terms of a Creative Commons Attribution-Noncommercial 4.0 International license.