

ORIGINAL ARTICLE

Role of Normal Saline Irrigation Prior to Closure of Surgical Wound to Reduce Surgical Site Infection in Gynaecologic Oncologic Surgery

Monowara Begum¹, Sabiha Islam², Tanzila Halim³, Noor -E-Ferdous⁴, Sayeda Fatema Khatun⁵,
Khairun Nahar⁶, Mahmud-Un-Nabi⁷

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Correspondence to
Sabiha Islam

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ABSTRACT

Background: Surgical site infection (SSI) is a major cause of postoperative morbidity and increased healthcare burden in gynaecologic oncologic surgery. Patients with gynaecological malignancies face a higher SSI risk due to prolonged surgery, tissue dissection and immune compromise. Wound irrigation with saline before closure may reduce bacterial contamination and prevent SSI; however, evidence from low- and middle-income countries remains limited. **Objective:** This study evaluated the role of normal saline wound irrigation in reducing SSI among patients undergoing gynaecologic oncologic surgery. **Methods & Materials:** A comparative observational study was conducted at the Department of Gynecological Oncology, Bangladesh Medical University (BMU), Dhaka, from June 2024 to July 2025. The study included 100 patients: 50 receiving preoperative normal saline wound irrigation and 50 controls. Sociodemographic, clinical, operative and postoperative data were analyzed using SPSS version 25.0. **Results:** The groups were comparable in terms of baseline characteristics, surgery type and operative factors. The SSI rate within 30 days was lower in the irrigation group (10%) than in the control group (30%) ($p=0.012$). SSI at 10 days (8% vs. 26%, $p=0.018$) and 30 days (6% vs. 22%, $p=0.027$), wound discharge (6% vs. 20%, $p=0.034$), febrile illness (8% vs. 24%, $p=0.028$), additional antibiotics (6% vs. 22%, $p=0.027$) and hospital stay (4.8 ± 1.3 vs. 6.4 ± 1.9 days, $p=0.001$) were reduced with irrigation. **Conclusion:** Normal saline wound irrigation before closure significantly reduced SSI rates and complications in gynaecologic oncologic surgery, representing an effective preventive measure.

Keywords: Normal saline irrigation, surgical site infection, gynaecologic oncology, wound irrigation.

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1. Associate Professor, Department of Gynaecological Oncology, Bangladesh Medical University, Dhaka, Bangladesh (ORCID: 0009-0004-0710-9903)
2. Associate Professor, Department of Obstetrics & Gynaecology, Bangladesh Medical University, Dhaka, Bangladesh (ORCID: 0009-0000-1168-5867)
3. Associate Professor, Department of Obstetrics & Gynaecology, Bangladesh Medical University, Dhaka, Bangladesh (ORCID: 009-0008-7885-2656)
4. Associate Professor, Department of Gynaecological Oncology, Bangladesh Medical University, Dhaka, Bangladesh (ORCID: 0000-0003-1793-0792)
5. Associate Professor, Department of Gynaecological Oncology, Bangladesh Medical University, Dhaka, Bangladesh (ORCID: 0009-0000-2655-9409)
6. Associate Professor, Department of Gynaecological Oncology, Bangladesh Medical University, Dhaka, Bangladesh (ORCID: 0009-0002-5756-5910)
7. Assistant Professor, Department of Anaesthesia, Analgesia & Intensive Care Medicine, Bangladesh Medical University, Dhaka, Bangladesh (ORCID: 0009-0001-1531-8412)

INTRODUCTION

Surgical site infection (SSI) remains one of the most common and clinically significant complications following major abdominal surgery. Globally, SSI accounts for a substantial proportion of healthcare-associated infections, contributing to prolonged hospital admissions, increased antibiotic use, patient morbidity and escalating healthcare costs [1, 2]. The burden is disproportionately high in low- and middle-income countries, where resource constraints, high patient volumes and limited infection control infrastructure amplify the risk [3]. In Bangladesh, SSI has been documented in multiple surgical settings and the problem in gynaecological procedures remains a growing concern [4, 5].

Patients undergoing gynaecologic oncologic surgery represent a uniquely vulnerable group. They frequently present with advanced malignancies, nutritional deficiencies, immunosuppression secondary to the disease process and comorbid conditions such as diabetes mellitus and anaemia, all of which impair wound healing and elevate the risk of infection [6]. The procedures themselves — including total abdominal hysterectomy, radical hysterectomy, cytoreductive surgery and staging laparotomy — involve extensive tissue dissection, prolonged operative exposure and significant blood loss, creating conditions conducive to bacterial colonization and subsequent wound infection [7]. Studies from gynaecologic oncology units have reported SSI rates ranging

from 10% to over 30% following major abdominal surgery, with significant associated morbidity [8].

Among the various preventive strategies that have been explored, intraoperative wound irrigation prior to surgical closure has attracted considerable interest. The rationale is straightforward: mechanical lavage with normal saline dilutes bacterial load, removes devitalized tissue debris and reduces the inoculum at the wound site before final closure [9,10]. Normal saline, being isotonic and non-toxic to tissues, has been widely used for this purpose as it avoids the potential cytotoxic effects associated with antiseptic agents such as povidone-iodine [11]. A systematic review by Mueller et al. demonstrated that intraoperative wound irrigation significantly reduced SSI rates in abdominal surgery, with findings supporting the routine use of saline lavage [12]. Similarly, Norman et al., in a Cochrane review, concluded that intracavity lavage could reduce SSI, though the quality of evidence varied across studies [10].

Despite this growing body of evidence, the specific benefit of normal saline irrigation in gynaecologic oncologic surgery has not been adequately studied, particularly in South Asian clinical settings. Existing literature predominantly focuses on general abdominal, colorectal, or obstetric surgery, leaving a critical evidence gap for the gynaecologic oncology context [13]. Studies from resource-limited settings such as Bangladesh are particularly sparse, despite the high burden of gynaecological malignancies and postoperative infection risk in this population [14].

The economic and social consequences of SSI further justify the search for effective, low-cost preventive measures. Gelhorn et al. highlighted the substantial economic burden imposed by SSI, including costs related to extended hospital stay, re-admission, wound care and additional antimicrobial therapy [15]. In a resource-constrained setting like Bangladesh, any strategy that reduces postoperative infection rates without adding high cost would have meaningful public health implications. Normal saline wound irrigation, given its low cost and wide availability, represents precisely such an intervention [16,17].

Prior to this study, no dedicated investigation had examined the role of normal saline irrigation in reducing SSI specifically in gynaecologic oncologic procedures performed at a tertiary care center in Bangladesh. This study was therefore conducted to evaluate whether normal saline wound irrigation prior to surgical closure reduces SSI rates, wound-related complications and overall postoperative morbidity in patients undergoing gynaecologic oncologic surgery. The findings are intended to contribute to evidence-based surgical practice in this specialized and high-risk patient population.

OBJECTIVES

The objective of this study was to evaluate the role of normal saline wound irrigation prior to surgical closure in reducing surgical site infection (SSI) in patients undergoing gynaecologic oncologic surgery.

METHODS & MATERIALS

This was a comparative observational study conducted at the Department of Gynecological Oncology, Bangladesh Medical University (BMU), Dhaka, Bangladesh. The study period spanned from June 2024 to July 2025. The study was conducted in a comparative framework, evaluating patients who received normal saline wound irrigation prior to closure (case group) against those who did not (control group). A total of 100 patients were included in the study, with 50 participants assigned to each group. The study population

comprised women who had undergone major gynaecologic oncologic procedures, including total abdominal hysterectomy, radical hysterectomy, cytoreductive surgery and staging laparotomy for confirmed or suspected gynaecological malignancies.

Patient Selection

Inclusion Criteria:

- Women aged 18 years and above who underwent elective or semi-elective gynaecologic oncologic surgery at BMU during the study period.
- Patients who had a confirmed or suspected gynaecological malignancy, had undergone an abdominal surgical approach (midline vertical or Pfannenstiel incision) and had complete and retrievable medical records.
- All included patients had received standard perioperative antibiotic prophylaxis and had postoperative follow-up data available at both the 10th and 30th postoperative days.

Exclusion Criteria:

- Patients with pre-existing wound infection or active skin infection at the operative site at the time of surgery.
- Women with incomplete medical records or missing postoperative follow-up data.
- Patients who had undergone emergency surgery, laparoscopic procedures, or concurrent bowel or bladder surgery.
- Those receiving immunosuppressive therapy, systemic chemotherapy within four weeks before surgery, or concurrent radiotherapy.

Data Collection Procedure

Data were collected retrospectively through a structured review of patient medical records maintained in the Department of Obstetrics and Gynecology at Bangladesh Medical University. A standardized data extraction form was designed and used by the research team to ensure consistency and accuracy throughout the process. The form captured sociodemographic information including patient age, body mass index (BMI) and parity, as well as relevant comorbidities such as diabetes mellitus, hypertension and anaemia. Operative details including the type of surgery, incision type, duration of operation, estimated blood loss, use of wound drains and whether normal saline wound irrigation was performed prior to closure, were also recorded.

Postoperative outcome data were extracted from clinical progress notes, nursing records, wound assessment charts and discharge summaries. SSI was defined in accordance with the criteria established by the Centers for Disease Control and Prevention (CDC) and infection was assessed at the 10th and 30th postoperative days. Outcome variables included overall SSI, superficial and deep SSI, wound dehiscence, wound discharge, post-operative febrile illness, duration of hospital stay, re-admission within 30 days and requirement for additional antibiotic therapy. Data were entered and verified by two independent team members to minimize transcription errors. Patient confidentiality was strictly maintained throughout the data collection process; all information was anonymized before analysis and identifying data were accessible only to authorized members of the research team.

Statistical Analysis

Data were analyzed using SPSS version 25.0. Categorical variables were presented as frequencies and percentages and compared using the chi-square test. Continuous variables were expressed as mean ± standard deviation and compared using the independent samples t-test. A p-value of less than 0.05 was considered statistically significant for all analyses.

RESULTS

Table I presents the sociodemographic and clinical characteristics of the study participants. The distribution of age groups was comparable between the two groups, with the majority of patients aged >50 years (42% in the case group,

40% in the control group). Mean age was 38.4 ± 7.6 years in the case group and 39.1 ± 8.2 years in the control group (p=0.631). BMI distribution was nearly identical, with overweight patients (BMI 25–29.9 kg/m²) constituting the largest subgroup in both groups. Multiparous women predominated in both arms. The prevalence of comorbidities including diabetes mellitus, hypertension and anaemia was similar across groups. All patients in both groups received antibiotic prophylaxis. No statistically significant differences were observed across any baseline variable, confirming adequate group comparability.

Table I: Sociodemographic and Clinical Characteristics of the Study Participants (n=100)

Variable	Case Group (n=50)		Control Group (n=50)		p-value	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)		
Age (years)	≤30	12	24	13	0.942	
	31-40	6	12	5		
	41-50	11	22	12		
	>50	21	42	20		
	Mean age ± SD	38.4 ± 7.6		39.1 ± 8.2		0.631
BMI (kg/m ²)	<25 (Normal)	14	28	13	0.978	
	25-29.9 (Overweight)	22	44	23		
	≥30 (Obese)	14	28	14		
Parity	Nulliparous	11	22	10	0.814	
	Multiparous	39	78	40		
Comorbidities	Diabetes Mellitus	9	18	11	0.624	
	Hypertension	8	16	9		
	Anaemia (Hb <11 g/dL)	7	14	8		
Antibiotic Prophylaxis	Given	50	100	50	100	—

Table II describes the operative characteristics of both groups. The distribution of surgical procedures was comparable between the two groups, with total abdominal hysterectomy being the most common surgery (44% and 46% respectively), followed by radical hysterectomy, cytoreductive surgery and staging laparotomy. The majority of patients in both groups underwent midline vertical incision (76% vs 74%). Mean

operative duration was 98.2 ± 18.4 minutes in the case group and 99.6 ± 17.9 minutes in the control group (p=0.682). Estimated blood loss was predominantly less than 300 mL in both groups. Wound drain placement rates were also comparable (86% vs 90%). None of the operative parameters demonstrated statistically significant differences, confirming that the two groups were operatively well-matched.

Table II: Comparison of Operative Characteristics between Case and Control Groups (n=100)

Variable	Case Group (n=50)		Control Group (n=50)		p-value
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
Type of Surgery	Total Abdominal Hysterectomy	22	44	23	0.96
	Radical Hysterectomy	12	24	11	
	Cytoreductive Surgery	9	18	10	
	Staging Laparotomy	7	14	6	
Incision Type	Midline Vertical	38	76	37	0.832
	Pfannenstiel	12	24	13	
Duration of Surgery (min)	≤90	18	36	17	0.976
	91-120	20	40	21	
	>120	12	24	12	
	Mean ± SD (min)	98.2 ± 18.4		99.6 ± 17.9	
Estimated Blood Loss (mL)	<300	29	58	27	0.891
	300-600	15	30	16	
	>600	6	12	7	
Wound Drain Placement	Yes	43	86	45	0.749
	No	7	14	5	

Table III shows the distribution of surgical site infection outcomes between the two groups. The overall SSI rate within 30 days was markedly lower in the case group (10%) compared to the control group (30%). At the 10th postoperative day, SSI was observed in 8% of case group patients versus 26% in the control group. At the 30th postoperative day, SSI rates were 6% and 22% in the case and control groups, respectively. Superficial SSI occurred in 6% of

case group patients compared to 18% in controls, while deep SSI was seen in 4% and 12%, respectively. Wound dehiscence was noted in 0% of case group patients versus 6% in the control group. Wound discharge was present in 6% of the case group and 20% of controls. Post-operative febrile illness occurred in 8% and 24% of the case and control groups, respectively.

Table III: Distribution of Surgical Site Infection (SSI) Outcomes by Group (n=100)

SSI Outcome	Case Group (n=50)		Control Group (n=50)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
SSI at 10th Post-Operative Day	4	8	13	26
SSI at 30th Post-Operative Day	3	6	11	22
Overall SSI (within 30 days)	5	10	15	30
Superficial SSI	3	6	9	18
Deep SSI	2	4	6	12
Wound Dehiscence	0	0	3	6
Wound Discharge (Serous/Purulent)	3	6	10	20
Post-operative Febrile Illness (>38°C)	4	8	12	24

Table IV presents the comparative post-operative outcomes between the two groups with statistical analysis. Overall SSI within 30 days was significantly lower in the case group (10% vs 30%, p=0.012). SSI at the 10th postoperative day (8% vs 26%, p=0.018) and at the 30th postoperative day (6% vs 22%, p=0.027) were both significantly reduced in the case group. Wound discharge (6% vs 20%, p=0.034), febrile illness (8% vs 24%, p=0.028) and requirement for additional antibiotic

therapy (6% vs 22%, p=0.027) were all significantly lower in the irrigation group. Mean hospital stay was significantly shorter in the case group (4.8 ± 1.3 days vs 6.4 ± 1.9 days, p=0.001). Wound dehiscence (0% vs 6%, p=0.123) and re-admission within 30 days (4% vs 14%, p=0.076) showed numerically lower rates in the case group but did not reach statistical significance.

Table IV: Comparison of Post-operative Outcomes between Case and Control Groups (n=100)

Parameter	Case Group (n=50)		Control Group (n=50)		p-value
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
Overall SSI (30 days)	5	10	15	30	0.012
SSI at 10th POD	4	8	13	26	0.018
SSI at 30th POD	3	6	11	22	0.027
Wound Discharge	3	6	10	20	0.034
Febrile Illness	4	8	12	24	0.028
Wound Dehiscence	0	0	3	6	0.123
Hospital Stay (days) Mean ± SD	4.8 ± 1.3		6.4 ± 1.9		0.001
Re-admission within 30 days	2	4	7	14	0.076
Additional Antibiotic Therapy Required	3	6	11	22	0.027

DISCUSSION

The present study evaluated the effect of normal saline wound irrigation prior to closure on SSI rates and postoperative outcomes in patients undergoing gynaecologic oncologic surgery. The key finding was a significant reduction in overall SSI, wound-related complications and hospital stay in patients who received wound irrigation, with overall SSI rates of 10% and 30% in the case and control groups, respectively (p=0.012). These findings are consistent with and supported by an expanding body of literature demonstrating the protective role of intraoperative wound irrigation.

Mueller et al. conducted a systematic review and meta-analysis examining intra-operative wound irrigation in abdominal surgery and found that irrigation significantly reduced SSI rates, with results consistently favouring irrigated wounds across multiple surgical settings [12]. Consistent with this, findings from Mueller et al. in the CHIR-Net randomized clinical trial further reinforced that saline irrigation at laparotomy is associated with clinically meaningful reductions in SSI [13]. The SSI rate observed in our control group (30%) aligns with published rates in gynaecologic oncologic surgery, which range from approximately 15% to 35% depending on patient and operative factors. Hagedorn et al. reported key risk factors for SSI in gynaecological oncology patients undergoing median laparotomy, identifying elevated BMI, diabetes and prolonged operative time as significant contributors [6]. In our cohort, both groups were comparable for these variables, suggesting that the observed difference in SSI rates is attributable to the irrigation intervention rather than confounding.

Norman et al., in a Cochrane systematic review on intracavity lavage and wound irrigation, concluded that irrigation can reduce the risk of SSI, though they highlighted the need for

high-quality randomized evidence [10]. Our findings support this conclusion and add specific data from a gynaecologic oncology cohort in Bangladesh. Barnes et al. similarly called for evidence-based standardization of wound irrigation practice, arguing that the inconsistency in clinical use of irrigation reflects an unmet need for guidance from well-designed studies in specific surgical subgroups [9]. The present study contributes to addressing this gap. Muller et al., in a recent meta-analysis published in BJS Open, evaluated antiseptic and saline wound irrigation after laparotomy and found that both approaches were effective in reducing SSI, with saline offering comparable outcomes to antiseptic solutions without additional tissue toxicity [18].

Regarding postoperative wound-specific outcomes, the case group showed significantly lower wound discharge (6% vs 20%, p=0.034) and wound dehiscence rates (2% vs 10%), though the latter did not reach statistical significance. Wong et al. reported on an SSI prevention initiative in a dedicated gynaecologic oncology unit and demonstrated that multimodal preventive strategies including wound irrigation contributed to sustained reductions in SSI [8]. The role of irrigation in minimizing microbial load at the wound surface before closure is well established mechanistically and our results corroborate this at the clinical level.

A particularly clinically important finding of this study was the significant reduction in mean hospital stay in the case group (4.8 ± 1.3 days vs 6.4 ± 1.9 days, p=0.001). Gelhorn et al. documented the substantial economic and clinical burden of SSI, including costs related to prolonged hospitalization and re-admission [15]. In the context of Bangladesh, where hospital capacity is limited and the cost of prolonged hospitalization falls directly on patients and their families, this finding has considerable public health relevance. Additional antibiotic

therapy was also significantly less frequently required in the case group (6% vs 22%, $p=0.027$), which carries implications for antibiotic stewardship in a setting already challenged by high rates of antimicrobial resistance.

Studies from the South Asian region have documented high SSI rates following obstetric and gynaecological procedures. Ahmed et al. reported SSI prevalence and risk factors in a Bangladeshi tertiary care center, highlighting that infectious complications following gynaecological surgery are a significant concern in this setting [15]. Nahar et al. described the epidemiological profile of persistent surgical site infections in Bangladesh, further emphasizing the infectious burden in this population [14]. Our study adds evidence directly relevant to gynaecologic oncologic practice in Bangladesh, a context in which such evidence has been largely absent.

The rate of post-operative febrile illness was also significantly reduced in the case group (8% vs 24%, $p=0.028$), an outcome closely related to wound infection and its systemic sequelae. Khan et al. reported that per-operative wound irrigation in contaminated wounds significantly reduced infection-related outcomes, including fever [16]. Normal saline irrigation is thought to achieve these benefits by mechanically reducing the bacterial inoculum below the critical threshold for infection, by diluting exotoxins and cellular debris and by promoting a cleaner wound environment before closure [9, 12]. Importantly, saline does not carry the tissue-damaging cytotoxic potential of antiseptic solutions, making it a preferred agent in settings where tissue viability is important, such as following radical dissection in oncologic surgery [11].

Pieper et al. described the theoretical and mechanistic basis for saline irrigation prior to wound closure in a systematic review protocol, noting that the evidence base at the time was heterogeneous and that dedicated high-quality studies in specific surgical subgroups were needed [19]. The present study, conducted in a well-defined population of gynaecologic oncology patients in Bangladesh, addresses exactly this gap. Ashraf and Awan reported the efficacy of normal saline irrigation in a Pakistani surgical setting, finding significantly fewer SSIs in irrigated wounds [17]. Our results are consistent with these findings and extend them to a gynaecologic oncology context in the South Asian region.

CONCLUSION

Normal saline wound irrigation prior to surgical closure significantly reduces SSI rates, wound-related complications and duration of hospital stay in patients undergoing gynaecologic oncologic surgery. The intervention also lowers the requirement for additional antibiotic therapy and postoperative febrile episodes. Given its simplicity, safety and minimal cost, normal saline wound irrigation should be considered a routine component of the surgical protocol in gynaecologic oncologic procedures.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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