

Subcutaneous Wound Irrigation with Betadine Versus Normal Saline in Preventing Surgical Site Infections in Elective Surgeries: A Cross-Sectional Comparative Study

Abstract

Background Surgical site infection (SSI) describes an infectious complication of surgical wounds. Although SSI is thought to be preventable, it still represents a major cause of morbidity and substantial economic burden on the health system. Wound irrigation (WI) might reduce the level of bacterial contamination, but current data on its role in reducing or preventing SSI is conflicting.

Aim is to investigate the effectiveness of Betadine solution versus normal saline prior to wound closure for the reduction of SSI in patients undergoing ~~in~~ elective abdominal surgeries

Material and Methods: The hospital-based prospective comparative study was conducted in the Department of Obstetrics and Gynecology, Jawaharlal Nehru Medical College, Aligarh Muslim University of Aligarh after approval from Institutional Ethics Committee, Faculty of Medicine. Primary outcome was the rate of SSI while allergy, postoperative fever, obstetric hemorrhages, need for antibiotic therapy, repeat surgical interventions and duration of hospital stay were included in secondary outcome measures.

Results: Total of 200 women were included for analysis. The incidence of superficial and deep SSIs were lower in betadine group compared to normal saline group. Similarly, significant differences in postoperative fever, antibiotic therapy requirements, mean hospital stay ~~between~~ ~~in~~ the two groups.

Conclusion: The use of Betadine solution for subcutaneous surgical wound irrigation prior to skin closure is a feasible and inexpensive approach for preventing surgical site infections.

Introduction

Surgical site infections (SSIs) occur after an operative procedure and can range from superficial to deep wound infections. Global estimates of SSIs have ranged from 0.5% to 15%, whereas studies in India have consistently shown higher rates from 23% to 38% [6]. SSIs are a substantial cause of morbidity, prolonged hospitalization, hospital readmissions, and death and pose a considerable financial burden on healthcare systems [7-9]. Thus, prevention and minimization of SSIs improve patient outcomes and reduce resource consumption [9,10]. Intraoperative measures primarily focus on decontamination of the skin and intraoperative wound irrigation using soap and antiseptics ~~and~~ are a simple, efficient, and cost-effective measure to reduce SSIs [19]. The most frequently used antiseptic is povidone-iodine (PVI), commonly applied as irrigation or

Comment [H1]: Needs to be rewritten. How the sampling was done? How data was collected

Comment [H2]: Where are 1-5 references?

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Comment [H3]: Again where are 11-18 references

a spray. PVI is an iodophor in which iodine is complexed with the polymer povidone. The microbicidal activity of iodine involves inhibition of vital bacterial cellular mechanisms and structures ^[20]. Povidone-iodine irrigation is a simple and inexpensive solution with the potential to prevent surgical site infection. Multiple studies investigated the use of povidone-iodine and normal saline irrigation in multiple types of surgeries. However, despite the potential usefulness of topical antiseptics, current clinical practice is variable and largely dependent on surgeon's preference. Furthermore, the routine use of topical antibiotics and antiseptics has been associated with adverse effects such as tissue toxicity and interference with wound healing ^[22,23]. Although systematic reviews and meta-analyses on the benefits of PVI in reducing the incidence of SSIs have been published, there has been no definite conclusion on the effectiveness of PVI and normal saline in different surgical categories ^[24,25], and its use as a prophylactic irrigation solution against surgical site infection has been examined to a lesser degree. Thus, the present study was conducted to compare the efficacy and safety of subcutaneous wound irrigation with betadine versus normal saline in preventing postoperative surgical site wound infections in elective obstetrical and gynecological surgeries.

Comment [H4]: Reference?

Comment [H5]: Then why are you doing this study?

Comment [H6]: Where is reference 21?

Material and Methods

This hospital-based cross-sectional comparative study was conducted in the Department of Obstetrics and Gynecology, Jawaharlal Nehru Medical College, Aligarh Muslim University of Aligarh, during 2022-2025. The study protocol was approved by the Institutional Ethics Committee, Faculty of Medicine, AMU. 200 women meeting the inclusion criteria were enrolled and an informed written consent was obtained.

Comment [H7]: How come? It's still 2024

Women were equally divided into two different groups.

- **Group A (study group)** → subcutaneous wound irrigation with 50ml 10% aqueous povidine iodine solution (betadine) before skin closure.
- **Group B (study group)** → subcutaneous wound irrigation with 100ml normal saline before skin closure.

After detailed history and examination, information such as surgical indication, age, parity, body mass index (BMI), preoperative hemoglobin (Hb%) value, diabetes, history of smoking, length

of hospitalization and the wound infection status of the women during hospitalization were recorded.

Inclusion Criteria

- Women accepting to participate in the study.
- Elective obstetrical and gynecological surgeries.
- Patients with postoperative purulent discharge
- Antibiotic therapy
- Daily dressing of wound

Comment [H8]: This is obvious, no need to mention in inclusion criteria

Comment [H9]: What is meant by these points? Please elaborate

Exclusion Criteria

- Allergy to iodine
- History of ~~immuno~~immune suppressive drugs.
- Diabetes mellitus.
- Anemia.
- Rupture of membrane
- Septicaemic cases
- Patients with subcutaneous hematoma, seroma, dehiscence, and ?

Comment [H10]: How have you excluded this point?

Comment [H11]: Why have you excluded these cases? No explanation provided

Comment [H12]: And What?

Methodology

All elective surgeries were performed on the women in accordance with the standardized surgical procedure. After elective surgery visceral and parietal peritoneum and the anterior abdominal wall fascia was closed. In Group A subcutaneous wound irrigation was done with 50ml 10% aqueous povidine iodine solution (betadine) before skin closure and in Group B (study group) subcutaneous wound irrigation was done with 100ml normal saline before skin closure. With the help of a sterile sponge, the subcutaneous space was thoroughly irrigated with saline and cleaned. At the end of the surgery, the wound surface was wiped with a betadine antiseptic solution and sterile dressing was applied. After wash, incisions were closed with standard suturing techniques. Postoperatively, wound dressings were changed after 72 hrs. The women were hospitalized for 7 to 10 days depending upon the nature of surgery and was given antibiotic and postoperative standard care according to our hospital protocol. Dressings of

Comment [H13]: How can one close visceral peritoneum? It is adhered to the viscera.

Comment [H14]: Which fascia? Do the author want to say rectus sheath?

Comment [H15]: Sponge is not used for irrigation, please correct

Comment [H16]: The skin was closed and dressing applied. Now what is being washed again?

Comment [H17]: The hospital protocol should be explained

the patients **were** opened on 3rd postoperative day and wounds **were** examined for subcutaneous hematoma, seroma, dehiscence, and skin hyperemia, postoperative purulent discharge and any side effects of the **study drug** was also recorded. Women **were** allowed to take a bath after discharge and **were** called for stitch removal on 7- 10 days postoperatively.

The primary study outcome measures included **ds**—incidence of wound infection (wound cellulitis, wound abscess, post-operative fever, pus discharge from wound, wound dehiscence) while allergy ,wound healing time ,postoperative fever, obstetric Hemorrhages ,wound healing, time need**ed** for antibiotic therapy, other surgical interventions and duration of hospital stay were included in secondary outcome measures.

conclusion

Comment [H18]: Why? These were the exclusion criteria. These patients are not included in the study.

Comment [H19]: Which drug?

Comment [H20]: There were admitted for 7 to 10 days?

Comment [H21]: ?

Results

In the present study, total of 200 women were evaluated. The study involved two groups Betadine (Group A) and a Normal Saline (Group B) each consisting of 100 women. The demographic profile was same among two groups .

Table 1- Distribution According to Surgical Procedures

Surgical Procedure	Group A (n=100)	Group B (n=100)	p-value
Laparotomy	22 (22.0%)	18 (18.0%)	p=0.767 Non-significant
Cystectomy	11 (11.0%)	12 (12.0%)	
Myomectomy	15 (15.0%)	14 (14.0%)	
Total	25 (25.0%)	26 (26.0%)	
Abdominal Hysterectomy			
Caesarean Section	27 (27.0%)	30 (30.0%)	

Out of 200 surgical procedures, the most common surgical procedure was caesarean **section** followed **section** followed by TAH, laparotomy, myomectomy and cystectomy. The differences

Comment [H22]: Laparotomy for what?

Comment [H23]: Does it mean ovarian cystectomy?

in surgical procedure distribution across the **three groups** was not statistically significant ($p=0.53$)

Comment [H24]: ?? there are only 2 groups

Table 2- Distribution of **women cases according to presence or absence of Surgical site Infection (SSI)**

Comment [H25]: This table is not required. This can be mentioned just in a single sentence

SSI	Group A (n=100)	Group B (n=100)	p-value
SSI - Yes	7 (7%)	20 (20%)	0.02 Significant
SSI - No	93 (93%)	80 (80%)	

The incidence of surgical site infection (SSIs) varies significantly among the two groups. Group B shows a significantly higher occurrence (20%) of SSI **wound** compared to the Betadine group (7%). **The differences was statistically significant.**

Comment [H26]: Repeated sentence

Table 3- Distribution of **women cases according to **Type of Discharge** and Hospital Stay**

Comment [H27]: Should it not be SSI?

Type of Discharge	Group A (n=100)	Group B (n=100)	Total (n=200)	p-value
No Discharge or no pus	85	58	143	$X^2=8.53,$ $p=0.014,$ <i>Significant</i>
Mild Discharge or Pus Present	5	14	19	
Discharge or Pus Culture Growth Present	0	10	10	
Hospital Stay ≤ 5 days	85	62	147	

Comment [H28]: What is meant by this point?

Comment [H29]: The author mentioned hospital stay of patients from 7 to 10 days

6 to 10 days	10	28	38	0.0001 Significant
>10 days	5	10	15	
Mean ± SD	9.54 ± 4.06	15.60 ± 6.6	13.54 ± 7.0	

There is a significant association between the type of discharge and the group type (p=0.014) and the differences in the mean hospital stay across the groups was statistically significant (p-value = 0.0001)

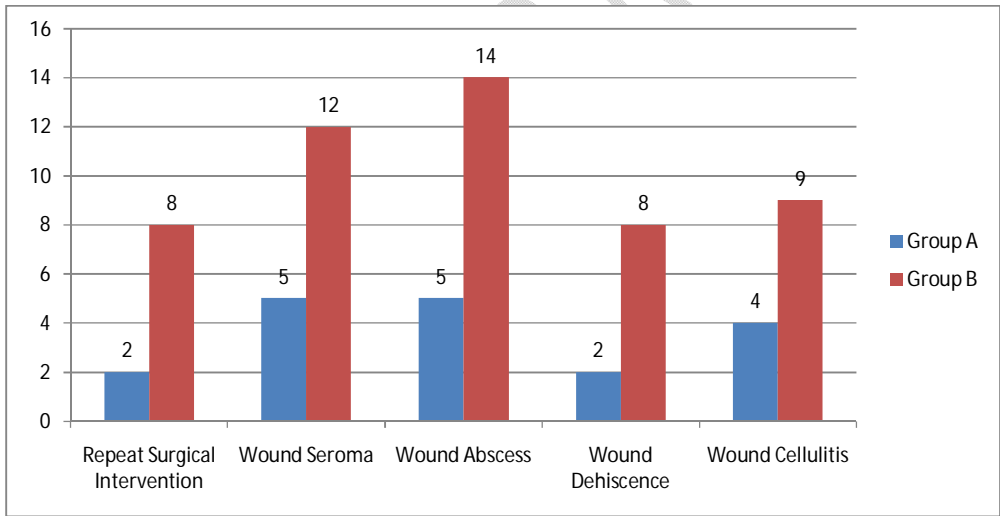


Figure 1: Association of Post Operative Infection Among Groups

The differences in the need for surgical intervention and other complications of SSI across the groups were statistically significant (p-value =0.0001)

Comment [H30]: Repeat surgical interventions????? It has no relation with the use of N/S or PVI. Why it has been even mentioned. And why it is more in group B?

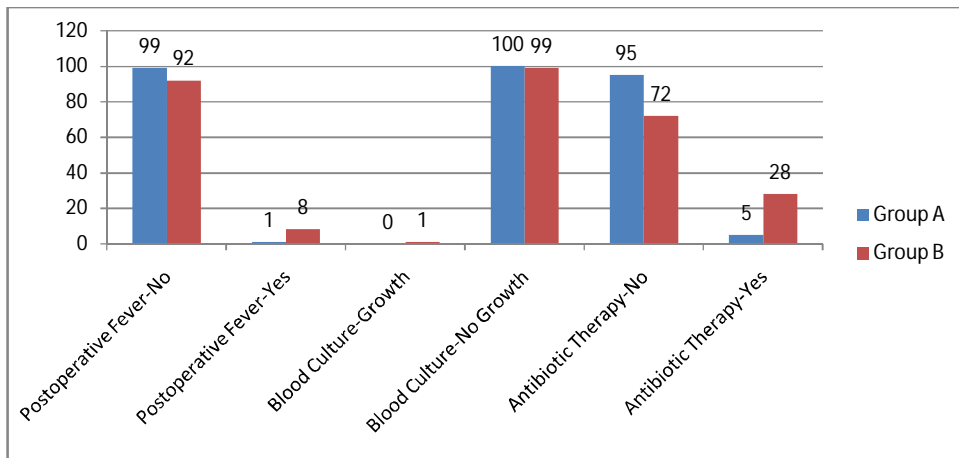


Fig 2: Association of various SSI across Groups

The incidence of postoperative fever varies significantly among the groups. The differences of association of various SSI were statistically significant among the two groups

Comment [H31]: These are not SSIs

Comment [H32]: Was antibiotic therapy totally not given to group A?

Discussion

Irrigation's aim is to clean wound ~~whereas well as minimising~~ minimizing trauma to wound bed and risk of introducing bacteria into wound bed. Protocol for systemic review and meta-analysis on impacts of saline irrigation before wound closure in reducing surgical place infection was published in 2018(1) The NS is used as an intravenous isotonic solution and for cleaning wounds. It is a mild but

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Comment [H33]: Why the font size and style keep on changing after every few lines?

Comment [H34]: Sentence makes no sense. What the author wants to say? Does the protocol for SR and meta-analysis on such topics is different?

Comment [H35]: Referencing style has also been changed suddenly.

effective disinfection agent and will not harm normal tissue, unlike many stronger antiseptics(2). It is available and less expensive in compared to PI.

Comment [H36]: New abbreviation introduced??

The WHO, CDC, and Infectious Diseases Society of America (IDSA) recommend irrigation of the incisional wound with an aqueous PVP-I solution before closure to prevent SSIs [3,4,5]. This is particularly recommended in clean and clean-contaminated wounds (ie, wounds showing no signs of infection that may or may not involve repairing or removing an internal organ) [3]. Few studies explored irrigation in abdominal operations while reporting contradictory results. Thus, the prospective randomized control research was conducted on 300 women planned for elective surgeries using subcutaneous wound irrigation with betadine (Grp A), normal saline (Grp B) and control (GrpC) prior to skin closure. Our results are supported by Andan et al (6) there was no statistically important variation among categories in terms of all baseline characteristics. Comparison of groups in terms of demographic characteristics demonstrated no differences in terms of years old, BMI, & gestational age ($P > 0.05$ for all) as found by Gül DK et al (7). Al-Ramahi et al. (17) reported NS irrigation did not reduce the SSI rate during gynaecological surgery (10.6% irrigation vs. 9.8% control). Gungorduk et al. (18) concluded NS irrigation was not associated with SSI rates for caesarean section (6.5% irrigation vs. 7.3% control, $p = 0.86$).

Comment [H37]: Third style of referencing introduced??

Comment [H38]: Irrigation with what?

Comment [H39]: Reference?

Comment [H40]: When and where?

Comment [H41]: It is mandatory for a research study to choose participants with similar base lines, so this is not how results are supported

Comment [H42]: And what about your study?

Comment [H43]: And your study?

Sindelar et al. showed that the effectiveness in decreasing the rate of infection of 10% povidone-iodine is more than normal saline [8].

Comment [H44]: Comparison with your study?

Aslan et al. (19) also revealed the limited effect of NS irrigation on SSI reduction for cesarean section (14.3% irrigation vs. 12.8% control). **Al-Ramahi, Gungorduk** and **Aslan** used 50, 100 and 200 ml of NS for incision irrigation, respectively, in their gynaecological and obstetric surgery patients. However, **Cervantes and Emile** used a large volume of NS (300 and 400 ml, respectively) for appendectomy patients. Therefore, high-volume NS irrigation in large incisions may function. With the increase in the volume of irrigation, the decline in bacterial load is supposed to be logarithmic. In the irrigation cohort, a reduction in the readmission rate suggested that irrigation not only decreased the SSI rates but also alleviated the severity of incision complications.

Comment [H45]: Why these sentences are added without comparison with the current study?

Comment [H46]: Makes no sense

A decrease in SSIs has been reported when diluted aqueous PVP-I is used for wound irrigation in a range of surgical settings, including craniotomy, cesarean delivery, breast surgery, and intraperitoneal irrigation during laparotomy and spinal surgery [72–79]. The efficacy of aqueous PVP-I in eradicating biofilms has been described in numerous in vitro studies [101–109] and has been extensively reviewed [110,111]. **Mueller et al** measured prophylactic intraoperative wound irrigation with saline, povidone-iodine, and antibiotic solutions and determined

Comment [H47]: No comparison with the current study?

that both povidone-iodine and antibiotic irrigation are effective in the decrease of surgical site infection. However, **De Jonge et al** found that only povidone-iodine but not antibiotic solutions are effective in the decrease of surgical site infection.⁴⁸ Studies have shown that PVP-I has very low cytotoxicity compared with other antiseptics when tested on skin and oromucosal cell lines [9]. As a strong oxidative agent, iodine can cause denaturation of enzymes by reacting with the amino, phenol, and sulfhydryl groups of their composite amino acids [126]. The resultant loss of enzymatic function may represent PVP-I's mechanism of action. Based on these findings, the authors recommended using PVP-I in impaired wound healing when healing is poorly progressing, strongly exudating, and excessive protease levels predominate [126]. Our results are contrary to the study of **Amstey et al** who evidenced that NS solution can have the same efficacy as PI in the prevention of postoperative infections after vaginal surgery.¹⁰ The reason could be they have used different surgical route. **Ashraf Hamday** concluded that irrigation of subcutaneous tissue with saline throughout caesarean section significantly reduced rates of seroma, hematoma, and superficial surgical place of infections **Andan et al**.⁵ SSI was found in 22 (1%) of 2220 studied cases. Infected studied cases included 9 (0.8%) in saline group and 13 (1.1%) in control group. There was no important variation in SSI among studied cases who received saline irrigation prior

to closing surgical wound incision and those who did not ($P > 0.05$). The disagreement may be due to the differences in sample size and inclusion criteria.

Ambe et al.8 found there was no variation in hospital stay length between two intervention arms. This systematic review found no benefit to routine irrigation of abdominal wounds with normal saline over no irrigation prior to wound closure in terms of avoiding or decreasing rate of SSI.

UNDER PEER REVIEW

Conclusion

There is decrease in the incidence of surgical site infections (SSI) in subcutaneous wound irrigation with Betadine compared to normal saline irrigation. The use of a Betadine for antiseptic for subcutaneous surgical wound irrigation prior to skin closure is a feasible and inexpensive approach for preventing surgical site infections.

Ethics approval

Ethics approval was not required as this manuscript is a narrative review article.

Comment [H48]: What??????? Is it a copy paste?

References

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Comment [H49]: 7 years old reference

Comment [H50]: 20 years old reference

Comment [H51]: 23 years old reference

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