




Postoperative surgical site infection after preoperative use of razor versus clipper for hair removal in inguinal hernia surgery: A quasi-randomized clinical trial

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Abstract

Trail Design: Quasi-randomized clinical trial.

Methods: *Participants:* This study includes adult patients (≥ 18 years) who gave written consent for preoperative site preparation using razors or clippers. Exclusions comprised individuals < 18 years, bilateral hernias, prior laparoscopic hernia repair, steroid/chemotherapy use, diagnosed chronic obstructive pulmonary disease, and incomplete medical documentation. *Intervention:* Patients who underwent hernia surgery during the initial week of the study underwent site preparation using a razor, while in subsequent weeks underwent site preparation using a clipper. This randomization was maintained throughout the study. Uniform site preparation was done by consistent staff. Postpreparation interviews, follow-up interviews of the patients, and unbiased evaluation of digital photographs were conducted by nonoperating surgeon panels. *Outcome:* Preoperative, patient response, degree of skin trauma, quality of hair removal, and association between site preparation-like parameters were compared and analyzed between two groups using Statistical Package for Social Sciences-25. *Blinding:* In this study, blinding was not done and the primary investigator was aware of the two groups.

Results: The total number of participants was 320. The mean age of the Razor group was 45.36 ± 14.68 years and that of Clipper was 44.42 ± 13.77 ($p < 0.98$). The incidence of surgical site infection (SSI) was 23 (14.4%) in the razor group and 8(5%) in the clipper group, ($p = 0.01$). Skin trauma was found more in the razor group as compared to the clipper group. Also, the analysis of the provided data revealed that 65% of participants who experienced sustained cuts developed SSI.

Trial registration: From Institutional Review Committee of the Nepalese Army Institute of Health Sciences registration number 869.

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Conclusion: In summary, the practice of preoperative hair removal on-site preparation using a razor is associated with the incidence of skin trauma but overall shave quality at the operative site was better in the razor group with an apparent increased risk of SSI. Based on these findings, it would be better for surgeons to decide on an operation for either razors or clippers for preoperative preparation.

KEYWORDS

clipper, hernia surgery, razor, surgical site infection

1 | INTRODUCTION

Surgical site infections (SSIs) pose a considerable burden of morbidity for patients in the aftermath of surgery. It stands as one of the leading contributors to postoperative complications and mortality. SSI represents one of the most frequently encountered postoperative complications, with reported incidence rates ranging from 2.1% to 7%.^{1,2} Preoperative depilation has been utilized to prevent SSIs and hair from getting in the way of the incision site.³ The Cochrane Systemic Review Commission conducted a recent (2006) meta-analysis that focused exclusively on preoperative hair removal and found that using clippers as opposed to razors significantly reduced the risk of SSIs.⁴ Hair is cut short because its existence of it can prevent the incision from being exposed and causing a wound, as well as from allowing for the suturing of the incision and the use of adhesive drapes and wound dressings.⁴ Hair removal from surgical areas can be done in several ways. The most popular and economical method of hair removal in the past has been using a disposable safety razor. This method entails gently moving a razor head with a sharp blade inside over the patient's skin to cut hair that is close to the skin's surface. Clippers function optimally by precision trimming hair near the skin surface, maintaining mere millimeters without direct skin contact. This approach effectively minimizes the potential for skin trauma during the process.⁵ Clippers employ finely serrated teeth to achieve a close hair trim in proximity to the patient's skin, resulting in a short residual length of approximately 1 mm. The clipper heads can be subjected to either disposal or disinfection protocols between patient usage, effectively mitigating the potential for cross-infection risks. Inguinal hernia surgery involves a skin incision over the inguinal area which is considered skin folds having higher levels of moisture and temperature, creating an environment favorable for the growth of microorganisms.⁶ Adequate skin preparation stands as a pivotal element in the prevention of SSIs during the execution of hernia surgery. The choice between these methods in inguinal surgery may depend on factors such as personal preference, the desired outcome, and patient factors.

This prospective cohort study endeavors to assess and contrast the effectiveness of utilizing clippers versus razors as a means of averting SSIs in the context of hernia surgical procedures.

2 | METHODS

2.1 | Ethical consideration

The study was conducted in accordance with medical ethics, following approval from the Institutional Review Committee of the Nepalese Army Institute of Health Sciences with registration number 869. The manuscript is in line with CONSORT guidelines.⁷

2.2 | Informed consent

The study received approval from the institutional review committee before the study. Confidentiality of all patient information was maintained, and no information revealing the patient's identity was disclosed in the article (File S1).

2.3 | Trail design

This is a prospective, quasi-randomized clinical trial conducted to determine the incidence of SSI in patients who underwent preoperative hair removal using a razor or clipper for hernia surgery.

In this study, we have taken the patient aged 18 years and older who provided informed as well as written consent for their participation, and the preparation of hernia repair sites was carried out using either a razor or a clipper. Similarly, we had a team of well-trained staff for the preparation of the parts. Parts were prepared using either a razor or a clipper (an electronic device).

Following the preparation of the parts the photographic documentation was taken from the site and to prevent bias the photographs were shown to the nonoperating surgeon to grade on the injury and quality of shaving during the operative site preparation. The site preparation was graded as Table 1.⁸

On the regular follow-up, the surgeon in the surgical outpatient department (OPD) assessed the surgical site for the signs and symptoms of SSI.

TABLE 1 Grading of site preparation.

Grade	Skin trauma	Quality of hair removal within the surgical field
Grade 1	No evidence of skin trauma	No hair in the surgical field
Grade 2	Mild-moderate evidence of skin trauma	Occasional hair in the surgical field.
Grade 3	Significant evidence of skin trauma	Significant hair in the surgical field

2.4 | Participants

We conducted a randomized analysis of 320 patients who fit the inclusion criteria, ensuring appropriate consent was taken and the privacy of the patient was maintained. Patients who were above 18 years of age underwent hernia surgery, underwent preoperative preparation using either a clipper or a razor, and those patients who gave informed as well as written consent were included in the study. While, the study excluded patients below the age of 18 years, individuals with bilateral hernias, those who had previously undergone laparoscopic hernia repair, patients undergoing steroid and chemotherapy treatments, individuals diagnosed with chronic obstructive pulmonary disease, and those with incomplete medical records.

The study took place at Shree Birendra Hospital Nepal, a tertiary-level care center from January 2020 to December 2022. Approximately around 25–30 hernia repairs are being conducted monthly in the study hospital. Among them, most of them undergo open hernioplasty while few of them undergo laparoscopic repair surgery.

2.5 | Interventions

The patient was divided into two distinct groups based on the weeks of their surgical interventions. Specifically, patients who underwent hernia surgery during the initial week of the study and underwent site preparation using a razor were categorized as the razor group, while those who operated during the subsequent week and had undergone site preparation using a clipper were placed in the clipper group. This systematic alternation of weeks was maintained throughout the process of group allocation. Patients who were planned for hernia surgery (In both groups) received a prophylactic single dose of intravenous (IV) antibiotics (INJ CEFTRIAXONE 1 g IV) within 60 min before the initial incision. To maintain uniformity same skilled staff was employed for all the cases for the preparation of hernia repair sites across all patients. Then after completing the standardized preparation by either clipper or razor photographic documentation was undertaken. Subsequently, the participating patient was interviewed immediately after shaving or clipping for the data collection as part of subsequent study procedures.

Following this according to standard protocol patient received the general anesthesia. After the surgical procedure, the patient was transferred to the postoperative ward, where they received standardized and consistent quality care. Throughout their hospital stay, patients were constantly evaluated by the surgical team to monitor their recovery and any signs of SSI. Following discharge, the patient underwent regular follow-up assessment along with a follow-up questionnaire by the surgical team in the surgery OPD to ensure there were no signs of SSI.

The taken Photographs then were shown to the nonoperating surgeon to grade on the injury and quality of shaving during the operative site preparation.

2.6 | Outcome measure

This study focused on two main sets of results. Primary outcomes included (i) demographic and preoperative characteristics of patients undergoing inguinal hernia surgery. (ii) Occurrence of SSIs within 1 month following inguinal hernia surgery.

Secondary outcomes included (i) patient preferences regarding hair removal methods, specifically the choice between the use of a razor or a clipper, (ii) the degree of skin trauma caused by the hair removal process, (iii) the quality of shaving within the surgical area. (iv) Comparison between both hair removal methods in terms of patients' preference, their potential to cause trauma, quality of shaving and postoperative SSIs.

2.7 | Sample size

The selection of patients who underwent parts preparation using either a razor or a clipper was conducted through a systematic alternation randomized process. The subject was chosen from January 2020 to December 2022.

2.8 | Randomization

Individuals undergoing inguinal hernia surgery in the first week underwent site preparation with a razor and those in subsequent weeks underwent site preparation with a clipper. This randomization was maintained throughout the course of the study.



FIGURE 1 Site preparation using razor.

2.9 | Blinding

In this study, blinding was not done and the primary investigator was aware of the two groups.

2.10 | Study tool

In this study, research Performa questionnaires were used during the preoperative phase and on the regular follow-up to evaluate the SSI. Also, during the study, photographic documentation was done to capture the site of the parts prepared (Figures 1 and 2). The study tool used in this study is available as File S2.

2.11 | Analytical strategy

The data were collected using the Performa and photographs then the data was organized and tabulated in EXCEL for further analysis. For data analysis, Statistical Package for Social Sciences version 25.0 was used. The quantitative variable was measured using mean and standard deviation and for the categorical data, the number and percentage of occurrence within each category were presented. The baseline score was analyzed using the Student's *t* test. To draw a conclusion and relationship between categorical variables Pearson's χ^2 test was used.

2.12 | Potential biases

Selection bias, patient bias, investigator bias, confounding bias, and sampling bias.



FIGURE 2 Site preparation using clipper.

3 | RESULTS

A total of 648 hernia surgeries were performed during the data collection period, 126 did not meet the inclusion criteria, 78 declined to participate, and 84 were excluded due to the unavailability of the same preparation staff and sample convenience. During allocation, 160 were on the razor group whereas the remaining 160 were on the clipper group. All 320 patients were followed up either on hospital visits or phone calls. The flow diagram is given in Figure 3. Details of other demographic and preoperative characteristics of the patients are listed in Table 2.

The mean age of the Razor group was 45.36 ± 14.68 years and that of Clipper was 44.42 ± 13.77 ($p < 0.98$) There were 144 males and 16 females in the Razor group, and 141 males and 19 females in the Clipper group. This difference in the proportion of males and females was statistically significant ($p = 0.01$). In the Razor group, 62.5% of participants reported smoking, while in the Clipper group, 76.9% reported smoking. ($p = 0.01$). The number of individuals diagnosed with Diabetes Mellitus in the Razor group was 63, while in the Clipper group, it was 80 ($p = 0.01$). The right-sided hernia was more common in both groups ($p = 0.03$). Patients responses to the first interview are shown in Table 3.

The results of the patient responses to the first interview regarding hair removal methods are in the Razor group ($n = 160$), 8 (5%) of participants reported that the method was painful, 18 (11.3%) experienced any sustained cuts, 15 (9.4%) felt itchiness after hair removal, and 17 (10.6%) observed redness on their skin. In the Clipper group ($n = 160$), 7 (4.4%) of participants found the method painful, 6 (3.8%) encountered any sustained cuts, 8 (5%) experienced itchiness after hair removal, and 12 (7.5%) observed redness on their skin. Patients' responses to follow-up interviews are shown in Table 4.

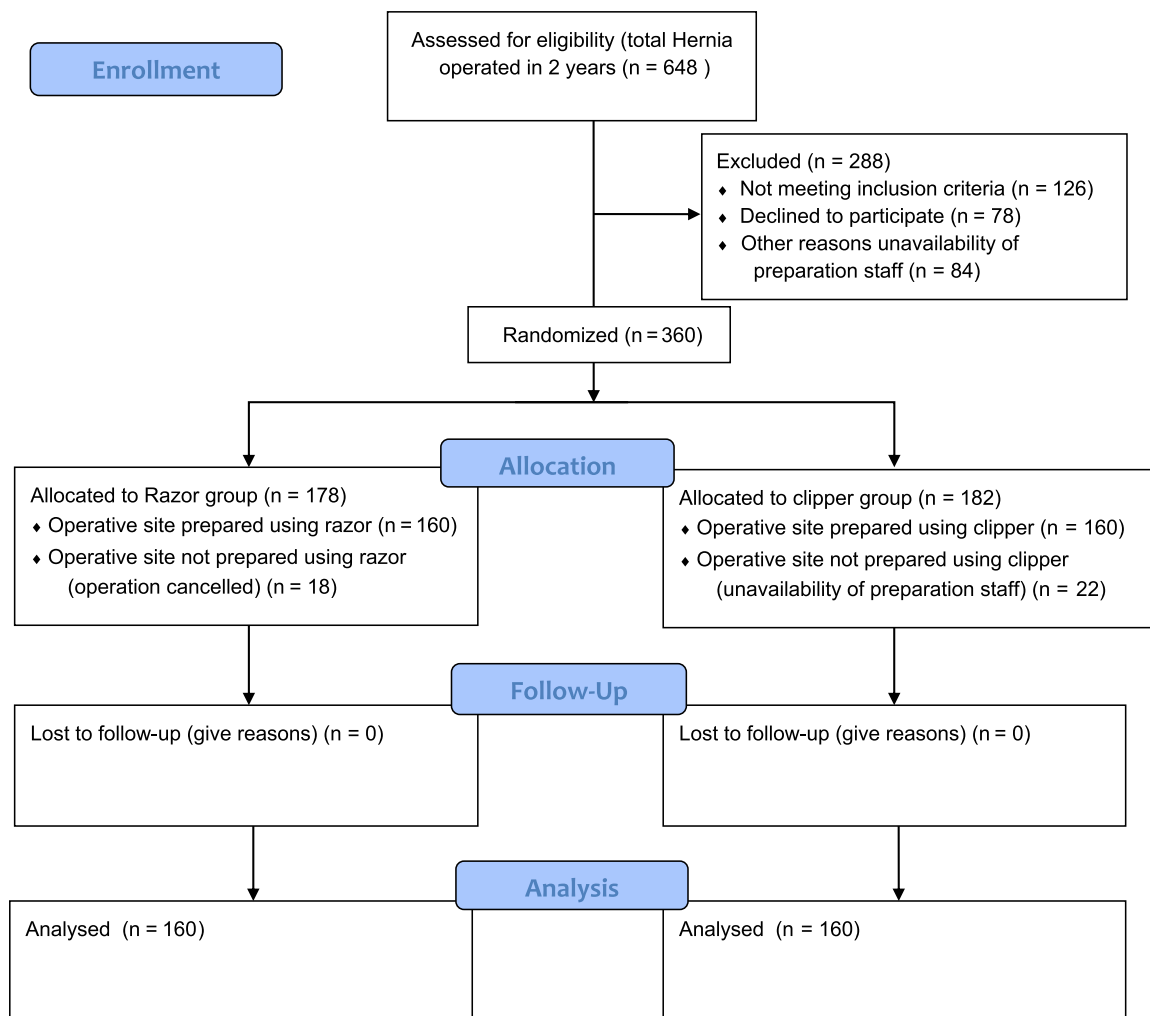


FIGURE 3 CONSORT 2010 flow diagram.

Regarding the skin around the shaved area, 44 (27.5%) of participants in the razor group and 21(13.1%) in the clipper group reported discoloration. Additionally, 40 (25%) in the Razor group and 44 (27.5%) in the clipper group reported experiencing problems with hair regrowth. The incidence of SSI is shown in Table 5.

The incidence of SSI was 23 (14.4%) in the razor group and 8(5%) in the clipper group, with a statistically significant difference ($p = 0.01$). The degree of skin trauma is shown in Table 6.

The analysis revealed that there was no statistically significant difference between the razor group and the clipper group regarding skin trauma ($p = 0.27$). In both groups, the majority of participants showed no evidence of skin trauma, while only a small percentage experienced mild to moderate or significant skin trauma which was found more in the Razor group as compared to the clipper group. The quality of hair removal within the surgical field is shown in Table 7.

There was no statistically significant difference in the quality of hair removal within the surgical field between the Razor group and the Clipper group ($p = 0.25$). The majority of participants in both groups had no hair in the surgical field, while a smaller percentage had occasional hair present in the surgical field was found more in the

clipper group as compared to the razor group. The results of Pearson χ^2 are shown in Table 8.

The Pearson χ^2 analysis revealed statistically significant associations between SSI and the following factors: any sustained cuts, hair removal felt itchy, skin appeared red after hair removal, and diabetes mellitus ($p < 0.05$). Additionally, there was a significant association between SSI and smoking ($p = 0.05$). However, there was no statistically significant association between SSI and any problems with hair regrowth ($p = 0.21$).

The analysis of the provided data revealed that 65% of participants who experienced sustained cuts developed SSI, while 66.7% felt itchiness from hair removal was associated with SSI. Similarly, 66.7% found hair removal painful. Redness post hair removal tied to SSI was reported by 48.1%, and 24.6% had skin discoloration around the shaved area related to SSI. Problems with hair regrowth linked to the incidence of SSI were noted in 13.1% of cases. Participants with Diabetes Mellitus showed a 19.6% SSI rate, while smokers had a 9.9% SSI rate. Skin trauma ranged from 7.8% with no evidence of skin. trauma, 23.5% with mild-moderate skin trauma to 50% with significant trauma related

TABLE 2 Demographic and perioperative characteristics of the patients.

Characteristic	Participants, No. (%)		p Value
	Razor group (n = 160)	Clipper group (n = 160)	
Age, mean (SD), y	45.36 ± 14.68	44.42 ± 13.77	0.98
18–29	33 (20.6)	27 (16.9)	
30–44	41 (25.6)	47 (29.4)	
45–59	54 (33.8)	59 (36.9)	
60 and above	32 (20)	27 (16.8)	
Sex			0.01
Male	144 (90)	141 (88.1)	
Female	16 (10)	19 (11.9)	
Smoking	100 (62.5)	123 (76.9)	0.05
Diabetes mellitus	63 (39.4)	80 (50)	0.05
ASA status			0.05
ASA I	60 (37.5)	37(23.1)	
ASA II	100 (62.5)	123(76.9)	
Body mass index			0.03
<18.5	47 (29.4)	63 (39.3)	
18.5–24.9	51 (31.8)	56 (35)	
>25	62 (38.7)	41 (25.6)	
Side of hernia			0.03
Right side	129 (80.6)	113 (70.6)	
Left side	31 (19.4)	47 (29.3)	
Preoperative antibiotics	160 (100)	160 (100)	0.00

Note: Data are numbers (n) or, mean ± standard deviation values as indicated.

TABLE 3 Patients response to first interview.

Questions	Participants, No. (%)		p Value
	Razor group (n = 160)	Clipper group (n = 160)	
Method painful	8 (5)	7 (4.4)	0.23
Any sustained cuts	18 (11.3)	6 (3.8)	0.06
Hair removal felt itchy	15 (9.4)	8 (5)	0.09
Skin appeared Red after hair removal	17 (10.6)	12 (7.5)	0.42

Note: Data are numbers with (percentages).

to SSI. Quality of hair removal within the surgical field issues was reported by 17.2% indicating a significant association between the incidence of SSI and Quality of hair removal within the surgical field.

TABLE 4 Patients response to follow-up interview.

Questions	Participants, No. (%)		P-value
	Razor group (n = 160)	Clipper group (n = 160)	
Skin around the shaved area discolored	44 (27.5)	21 (13.1)	0.01
Any problems with hair regrowth	40 (25)	44 (27.5)	0.61

Note: Data are numbers with (percentage).

TABLE 5 Incidence of SSI.

Questions	Participants, No. (%)		p Value
	Razor group (n = 160)	Clipper group (n = 160)	
SSI	23 (14.4)	8 (5)	0.01

Note: Data are numbers with (percentage).

Abbreviation: SSI, surgical site infection.

TABLE 6 Degree of skin trauma.

Questions	Participants, No. (%)		p Value
	Razor group (n = 160)	Clipper group (n = 160)	
Skin trauma			0.05
No evidence of skin trauma	143 (89.4)	152 (95)	
Mild-moderate evidence of skin trauma	13 (8.1)	4 (2.5)	
Significant evidence of skin trauma	4 (2.5)	4 (2.5)	

Note: Data are numbers with (percentage).

4 | DISCUSSION

Historically, open repair techniques have been used for hernia repair. For about a decade, laparo-endoscopic methods have come to light, owing to faster recovery time, lower chronic pain risk, and cost-effectiveness⁹ That being said, a functional laparoscopy program requires significant investment and, as a result, remains unavailable for the majority of the world's population in low- and middle-income countries. In a resource-limited country like ours, use of open surgical techniques are still the most commonly used. In our institution, an average of 25 to 30 hernia repair occurs each month, most of them through open mesh repair techniques.

According to the Centers for Disease Control and Prevention (CDC), a SSI is an infection that occurs after surgery in the part of the body where the surgery took place.¹⁰ SSIs are divided into superficial

TABLE 7 Quality of hair removal within the surgical field.

Questions	Participants, No. (%)		p Value
	Razor group (n = 160)	Clipper group (n = 160)	
Quality of hair removal within the surgical field.			0.25
No hair in the surgical field	121 (75.6)	112 (70)	
Occasional hair in the surgical field	39 (24.4)	48 (30)	
Significant hair in the surgical field	0 (0)	0 (0)	

Note: Data are numbers with (percentage).

TABLE 8 Results of Pearson χ^2 .

Analysis	SSI in relation to different variables % (event/total)	Pearson χ^2	Asymptomatic significance
Incidence of SSI × any sustained cuts	65 (13/20)	1.94	0.00
Incidence of SSI × hair removal felt itchy	66.7 (16/24)	2.33	0.00
Incidence of SSI × method painful	66.7 (8/12)	1.16	0.00
Incidence of SSI × Skin appeared Red after hair removal	48.1 (13/27)	2.71	0.00
Incidence of SSI × skin around the shaved area discolored	24.6 (16/65)	6.30	0.04
Incidence of SSI × any problems with hair regrowth	13.1 (11/84)	1.51	0.21
Incidence of SSI × diabetes miletus	19.6 (28/143)	13.85	0.00
Incidence of SSI × smoking	9.9 (22/223)	9.40	0.05
Incidence of SSI × degree of skin trauma		0.78	0.00
Incidence of SSI × no evidence of Skin trauma	7.8 (23/295)		
Incidence of SSI × mild-moderate evidence of skin trauma	23.5 (4/17)		
Incidence of SSI × significant evidence of skin trauma	50 (4/8)		
Incidence of SSI × quality of hair removal within the surgical field.		7.79	0.05
Incidence of SSI × no hair in the surgical field	6.9 (16/233)		
Incidence of SSI × occasional hair in the surgical field	17.2 (15/87)		

Note: Data are numbers with (percentage).

Abbreviation: SSI, surgical site infection.

incisional, deep incisional, and organ SSIs based on the period following the surgery and the extent of infection.¹¹

The incidence of SSI ranges from 2% to 5% in in-patient surgeries. The financial burden of SSI is considerable; it ranks as the costliest of hospital-acquired infections.¹² SSIs may increase the duration of hospital stay, Emergency department visits, and chances of readmissions. Based on these data, it is not an overstatement to say that how well SSI is controlled is the conclusive factor in good postoperative results.

SSI depends on both patient-related modifiable and non-modifiable factors as well as treatment-related factors. Studies have found the modification of patient-related factors to be more effective in preventing SSIs compared to the treatment factors,¹³ but altering patient behaviors may pose a challenge. As healthcare professionals, priority should be given to improving preoperative and intraoperative

procedures to minimize the risks of SSIs. Changing from the usual practice to the use of hair removal is an extrinsic factor contributing to SSIs that can be easily modified.

Although numerous strategies are recommended by international organizations to decrease SSI, only some are supported by randomized trials. Avoiding razors for hair removal, anti-staphylococcal skin antiseptics for high-risk procedures, use of chlorhexidine gluconate and alcohol-based skin preparation, maintaining normothermia, perioperative glycemic control, and use of negative pressure wound therapy are some.¹⁴

Skin preparation before surgery is an important step to prevent SSIs. Most commonly, products containing iodophors or chlorhexidine gluconate are used as skin preparation agents.¹⁵ Some regions of the skin such as the groin, axilla, and toe web is higher in temperature and humidity and certain microorganisms thrive in such moist

conditions.¹⁶ Thus, careful skin preparation during inguinal hernia surgeries is a necessity.

Hair removal is necessary, whatever may be the surgical technique involved and skin preparation products used. Hairs are often areas of poor sanitation and also pose a problem during and after surgery. Stitching of wounds and application of dressings are a challenge with hairs present on the operative area.¹⁷

Our study aimed to find out if there existed any difference in hair removal by razors or clippers. Our study concluded that the incidence of SSI was 14.4% in the Shaver group and 5% in the Clipper group, with a statistically significant difference. ($p = 0.01$).

Not many studies have been previously conducted to test the difference between using razors vs clippers in preventing SSIs. Tanner et. al concluded in their systematic review that fewer SSIs occur when shaving at the surgical site is not done compared to shaving. But, if hair removal has to be done, the use of clippers or depilatory creams results in fewer SSIs and other complications compared to shaving with razors.¹⁸

Another meta-analysis has a similar conclusion that preoperative hair removal should be avoided unless necessary and whenever needed, clipping is more effective in preventing SSIs compared to both shaving with a razor and using depilatory creams.¹⁹

Evidence of moderate certainty from seven studies involving 3723 participants suggests that the risk of SSI is probably higher while using a razor compared with the use of clippers (risk ratio: 1.64, 95% confidence interval: 1.16–2.33).¹⁸

Several other studies have similar conclusions that are consistent with the findings of our study, that is, use clippers rather than razors.^{20–22}

Furthermore, the practice of preoperative hair removal on-site preparation using a razor is associated with the incidence of skin trauma ($p = 0.05$) but overall shave quality at the operative site was better in the razor group. Other studies also have found clippers to be superior in preventing skin trauma. In three trials that assessed the potential risk of skin injury, it was found that the risk probability increased in people who underwent hair removal with a razor rather than clippers.¹⁸ Since razors have to come in contact with the patient's skin, they may sustain several cuts and abrasions in the skin favoring the growth of microorganisms. However, one study contradicted this, as razor was found to have lesser skin trauma and overall better quality of shave than clippers.⁸

On Pearson's χ^2 test analysis, our study revealed statistically significant associations between SSI and the following factors: any sustained cuts, smoking, and diabetes mellitus. hair removal feeling itchy, skin appearing red after hair removal, skin trauma, and quality of shaving.

Although many studies have not explored the association between smoking and SSIs, a review conducted found that smoking cessation before elective surgery has strong evidence for the reduction of the risk of SSIs.²³ The current CDC guidelines on preventing SSIs include glycemic control as a preventive measure for SSIs.¹⁰ A review by Seidelman et. al states preoperative glycemic control is an effective strategy to reduce the risk of SSIs.¹⁴ In our

study, individuals with diabetes mellitus recorded a higher incidence of SSIs ($p < 0.005$). Thus, our study lights upon the need for proper glycemic control before surgeries.

Although SSIs can have a heavy health and economic burden, their incidence can be reduced by the application of simple preoperative and intraoperative practices. Thus, changing the practice of using clippers instead of razors is a simple and cost-effective technique that can be employed by surgeons to prevent catastrophic outcomes of SSIs.

5 | CONCLUSION

Concluding, the procedure of preoperative hair removal as part of preoperative site preparation using a razor has been observed to have an associated increase in the occurrence of skin trauma. However, it is important to note that this method showed overall betterment in the shave quality of the operative site within the razor group, despite being associated with a rise in the potential risk of SSIs. By carefully considering the benefits of improved shave quality, degree of trauma, and patient satisfaction on-site preparation compared against the risk of SSIs, surgical practitioners can make decisions that align with the best interests of patient outcomes and safety during the preoperative phase.

6 | LIMITATIONS OF THE STUDY

1. Since it is a study conducted in a single tertiary care hospital, it is not representative of the entire data.
2. The time frame for this study is 3 years which does not represent the incidence of SSI as a whole.
3. Although its a quasi-randomized control trial, however as the blinding was not done, the risk of confounding factors also exists.
4. Duration of surgery is not measured in this study which may influence on the SSI rates.

AUTHOR CONTRIBUTIONS

Niranjan Thapa: Conceptualization; data curation; investigation; resources; software; writing—original draft; writing—review and editing. **Sunil Basukala:** Conceptualization; data curation; investigation; resources; supervision. **Shiva K. Regmi:** Conceptualization; data curation; investigation. **Oshan Shrestha:** Conceptualization; formal analysis; methodology; validation; visualization. **Sandip Paudel:** Conceptualization; validation; writing—review and editing. **Kabita Chaudhary:** Data curation; resources. **Bipin Metha:** Conceptualization; formal analysis; writing—review and editing. **Manoj K. C.:** Investigation; resources. **Suman Thapa:** Conceptualization; formal analysis; resources; supervision. **Sachhyatkar Bista:** Conceptualization; investigation; supervision.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Curated data that was analyzed is available from the corresponding author upon reasonable request.

ETHICS STATEMENT

Approval from the institutional review committee board was obtained before the study and all patients' details were kept confidential and no information revealing the patient's identity was disclosed in the article.

TRANSPARENCY STATEMENT

The lead author Shiva K. Regmi affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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