RESEARCH PAPER

A Comparative Study of Surgical Clippers vs Razors for Preoperative Hair Removal in Elective General Surgery

Dr. R Gowtham[1], Dr. Shyam Prasad[1], Dr. Kishore Babu EP[1]*, Dr. Afee Asma[1]

[1]*Chettinad Hospital and Research Institute, Kelambakkam – 603103, Tamil Nadu, India*
Corresponding Author
** Prof. Dr. Kishore Babu EP*
Chettinad Hospital and Research Institute Kelambakkam – 603103, Tamil Nadu, India
Email: gowthamrk2634@gmail.com

ABSTRACT

Background: Surgical site infection (SSI) remains one of the most common and costly healthcare-associated infections, complicating 2–7% of elective general surgical procedures. Although preoperative hair removal is routine, the choice between razor and clipper continues to vary across institutions in India.

Objective: To compare the incidence of SSI and local skin complications following preoperative hair removal with surgical clippers versus disposable razors in elective general surgical procedures.

Methods: A prospective comparative study was conducted on 100 adult patients at Chettinad Hospital and Research Institute over three months. Patients were allocated alternately into Group A (clippers; n = 50) and Group B (razors; n = 50). All received uniform preoperative preparation and perioperative care. The primary outcome was SSI as per CDC/NHSN criteria; secondary outcomes included erythema, abrasions, folliculitis, and length of hospital stay.

Results: SSI occurred in 2 patients (4.0%) in the clipper group and 10 patients (20.0%) in the razor group ($\chi^2 = 4.64$, $p = 0.031$). Any local skin complication was observed in 8.0% of Group A versus 36.0% of Group B ($p < 0.001$). Mean hospital stay was shorter in the clipper group (4.8 ± 1.6 days vs 6.4 ± 2.3 days; $p = 0.001$). No adverse events were associated with clipper use.

Conclusion: Preoperative hair removal with surgical clippers was associated with significantly lower rates of SSI and local skin complications than disposable razors. Clippers should be adopted as the standard method of preoperative depilation in elective general surgery...

Keywords: Surgical site infection; preoperative hair removal; surgical clippers; razors; general surgery; CDC classification.

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INTRODUCTION

Surgical site infection (SSI) is among the most frequent and burdensome complications of operative care, contributing substantially to postoperative morbidity, prolonged hospitalization, rising costs and, in a small but measurable proportion of cases, to mortality.[1–3] Global point-prevalence studies estimate that SSI accounts for 17–20% of all healthcare-associated infections, with reported incidence rates of 2.1–7% after elective general surgery in high-income settings and substantially higher rates in resource-limited countries.[4–6] In India and other low- and middle-income settings, pooled SSI rates have been reported between 8% and 25%, reflecting differences in patient profile, operative environment and infection-control infrastructure.[7,8]

Adequate skin antisepsis is the corner-stone of SSI prevention, and preoperative hair removal has historically been considered an essential adjunct — both to avoid hair acting as a physical nidus for bacteria and to facilitate optimal exposure, incision and wound closure.[9,10] However, the act of depilation itself may disrupt the integrity of the skin barrier. Microscopic abrasions produced during removal expose deeper skin layers, promote bacterial migration from the adjacent skin flora, and provide nutrient-rich foci for colonization by staphylococci and Gram-negative organisms in the hours between preparation and skin closure.[11–13]

**Author for Correspondence: gowthamrk2634@gmail.com*

Three principal methods of preoperative hair removal are in clinical use: disposable razors, electrical or battery-powered surgical clippers, and chemical depilatory creams. Razors remove hair by running a sharpened blade in direct contact with the stratum corneum, inevitably producing micro-lacerations even in experienced hands.[14] Clippers trim hair to a residual length of approximately 1 mm using finely serrated teeth that do not directly contact the skin, thereby reducing microtrauma; single-use or disinfectable clipper heads also minimize cross-contamination.[15],[16] Depilatory creams avoid mechanical trauma altogether but carry a small risk of contact dermatitis and are less commonly used in Indian practice.[17]

The weight of contemporary evidence favours clippers over razors. A Cochrane systematic review by Tanner and colleagues, most recently updated in 2021, concluded that clipping is associated with significantly fewer SSIs than shaving, with a relative risk of approximately 0.51.[18] These findings are reflected in the 2016 World Health Organization (WHO) Global Guidelines, the 2017 Centers for Disease Control and Prevention (CDC) Guideline for the Prevention of Surgical Site Infection, and the 2019 NICE guideline on SSI prevention, all of which recommend against the use of razors and advise that, when hair removal is required, clippers should be employed immediately before surgery.[19–21]

The burden of SSI is disproportionately greater in low- and middle-income countries, including India. Systematic reviews from the subcontinent report SSI rates ranging from 8% to 25% across general surgical units, with consequent prolongation of hospitalization by 5–10 days and substantial additional out-of-pocket expenditure for patients and their families.[7],[8] Beyond direct morbidity, SSI has been shown to compromise patient satisfaction, delay return to occupational activity, and contribute to the emergence of multidrug-resistant nosocomial pathogens through prolonged antibiotic exposure. Despite the strength of the evidence base abroad, razors continue to be used in many Indian hospitals owing to their low unit cost, easy availability and long-standing institutional practice.[22],[23] Robust prospective data generated within Indian tertiary-care settings are still sparse, and head-to-head comparisons from general surgical cohorts — particularly those that capture both SSI and local skin morbidity — are needed to inform local policy.[22–24]

The present study was therefore designed to compare the incidence of SSI and local skin complications following preoperative hair removal with surgical clippers versus disposable razors among adults undergoing elective general surgical procedures at a tertiary-care teaching hospital in southern India. Secondary aims included characterization of the microbiological profile of resultant infections and evaluation of length of hospital stay as an indirect measure of the clinical impact of hair-removal technique.

MATERIALS AND METHODS

Study design and setting

This prospective comparative study was conducted in the Department of General Surgery, Chettinad Hospital and Research Institute, Kelambakkam, Tamil Nadu, India, over a three-month period following approval by the Institutional Human Ethics Committee for Student Research (Proposal ID: IHEC-I/082/03/2026; NECRBHR Reg. No: EC/NEW/INST/2025/TN/0690). The study was conducted in accordance with the Declaration of Helsinki (2013 revision) and the Indian Council of Medical Research (ICMR) National Ethical Guidelines for Biomedical and Health Research involving Human Participants (2017).[25],[26]

Study population and sample size

Adult patients aged ≥ 18 years undergoing elective general surgical procedures requiring preoperative hair removal at the operative site were screened for eligibility. The sample size of 100 (50 per group) was calculated assuming an SSI incidence of 20% with razors and 4% with clippers based on previously published rates,[18],[27] with 80% power, a two-sided α of 0.05 and an anticipated drop-out of 5%. Inclusion criteria were willingness to provide written informed consent and planned elective surgery at an anatomical site requiring depilation. Exclusion criteria were pre-existing skin infection at the operative site, immunocompromised status, poorly controlled diabetes mellitus (HbA1c > 8%), emergency surgery, and refusal to consent.

Group allocation and intervention

Eligible patients were allocated alternately in the order of admission to Group A (surgical clippers, n = 50) or Group B (disposable razors, n = 50). Hair removal was performed by trained nursing personnel in the preoperative area within 60 minutes of surgery using a standardized technique to minimize procedural variability, consistent with WHO and CDC recommendations.[19],[20] In Group A, battery-powered surgical clippers (3M™ Surgical Clipper, single-use blade assembly) were used in short overlapping strokes parallel to hair growth, leaving a residual hair length of

approximately 1 mm. In Group B, a single-patient-use twin-blade disposable safety razor was used with a water-based lubricating gel, with the blade drawn gently over the skin in the direction of hair growth. The site was then cleansed with chlorhexidine–alcohol (2% chlorhexidine gluconate in 70% isopropyl alcohol) and draped as per the institutional protocol.[28]

Perioperative care

All patients received single-dose intravenous cefuroxime 1.5 g as surgical antibiotic prophylaxis within 60 minutes of skin incision, with a repeat intraoperative dose for procedures lasting beyond four hours or with blood loss exceeding 1.5 L.[29] Perioperative glycaemic control, normothermia and oxygenation were maintained in line with institutional SSI-prevention bundles.[30],[31] Skin closure, dressing, and postoperative wound care were standardized across both groups.

Outcomes and follow-up

The primary outcome was the incidence of SSI within 30 days of surgery, defined using the US Centers for Disease Control and Prevention / National Healthcare Safety Network (CDC/NHSN) criteria and classified as superficial incisional, deep incisional or organ/space infection.[32] Secondary outcomes were local skin complications (erythema, abrasions, folliculitis), type of organism isolated from infected wounds, and length of hospital stay. Wound assessment was performed daily during hospitalization and on postoperative days 7, 14 and 30 at the surgical outpatient clinic by a surgeon blinded to the hair-removal method. Wound swabs from clinically infected sites were sent for microbiological culture and antibiotic susceptibility testing.

Statistical analysis

Data were entered in Microsoft Excel 2019 and analyzed using IBM SPSS Statistics v26.0 (IBM Corp., Armonk, NY). Continuous variables were expressed as mean ± standard deviation and compared using the independent-samples t-test. Categorical variables were expressed as frequencies and percentages and compared using the Pearson chi-square test or Fisher's exact test when the expected cell frequency was less than 5. A two-sided p-value < 0.05 was considered statistically significant.[33]

RESULTS

Baseline characteristics

All 100 enrolled patients completed the 30-day postoperative follow-up without loss to follow-up. The two groups were well matched with respect to age, sex distribution, body mass index, comorbidities, ASA grade, and duration of surgery (Table 1). There were no statistically significant differences in baseline characteristics between groups (all $p > 0.05$), supporting the comparability of the cohorts.

Table 1. Baseline demographic and clinical characteristics of the study population.

Variable	Clippers (n = 50)	Razors (n = 50)	p-value
Age (years), mean ± SD	44.8 ± 13.6	46.2 ± 14.1	0.614
Male : Female	30 : 20	28 : 22	0.688
BMI (kg/m²), mean ± SD	24.6 ± 3.4	24.9 ± 3.2	0.652
Smoker, n (%)	11 (22.0)	13 (26.0)	0.640
Hypertension, n (%)	9 (18.0)	11 (22.0)	0.617
Well-controlled diabetes, n (%)	6 (12.0)	7 (14.0)	0.766
ASA grade I / II / III	28 / 20 / 2	26 / 21 / 3	0.873
Duration of surgery (min), mean ± SD	92.4 ± 28.6	95.8 ± 31.2	0.574

Distribution of surgical procedures

Open inguinal hernia repair was the most frequently performed procedure in both groups, followed by laparoscopic cholecystectomy and open appendicectomy. The distribution of procedures was comparable between groups (Table 2).

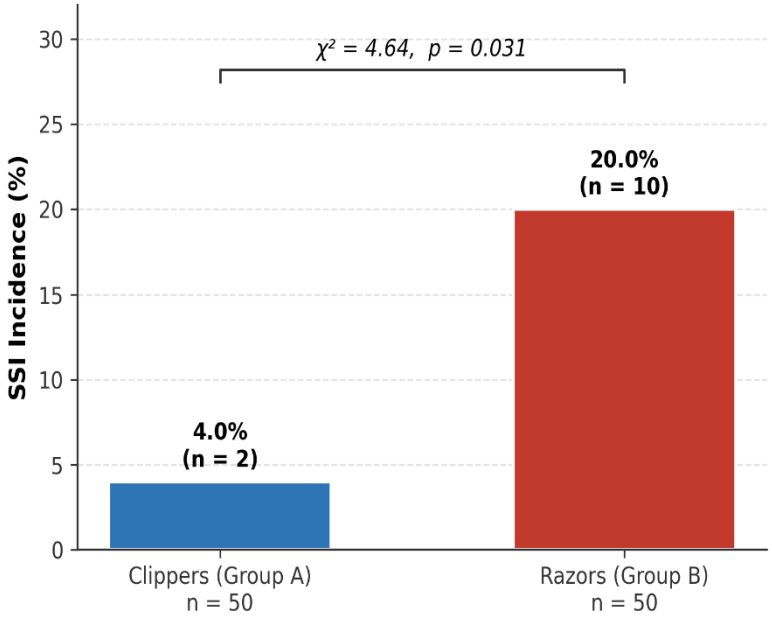
Table 2. Distribution of surgical procedures across the two groups.

Procedure	Clippers (n = 50)	Razors (n = 50)
Open inguinal hernia repair	18 (36.0%)	20 (40.0%)
Laparoscopic cholecystectomy	14 (28.0%)	12 (24.0%)
Open appendicectomy	8 (16.0%)	9 (18.0%)
Thyroidectomy	4 (8.0%)	4 (8.0%)
Breast lump excision	3 (6.0%)	3 (6.0%)
Other (pilonidal sinus, lipoma, fistula)	3 (6.0%)	2 (4.0%)

Primary outcome: surgical site infection

Surgical site infection occurred in 2 of 50 patients (4.0%) in the clipper group and in 10 of 50 patients (20.0%) in the razor group — an absolute risk reduction of 16 percentage points and a relative risk of 0.20 (95% CI 0.05–0.87) in favour of clippers ($\chi^2 = 4.64$, $p = 0.031$) (Figure 1). Of the 12 SSIs, 9 (75%) were superficial incisional, 2 (16.7%) deep incisional and 1 (8.3%) organ/space. All three non-superficial infections occurred in the razor group (Figure 3, Table 3). The mean time to clinical recognition of infection was 7.5 days (range 5–10) in Group A and 6.2 days (range 4–9) in Group B.

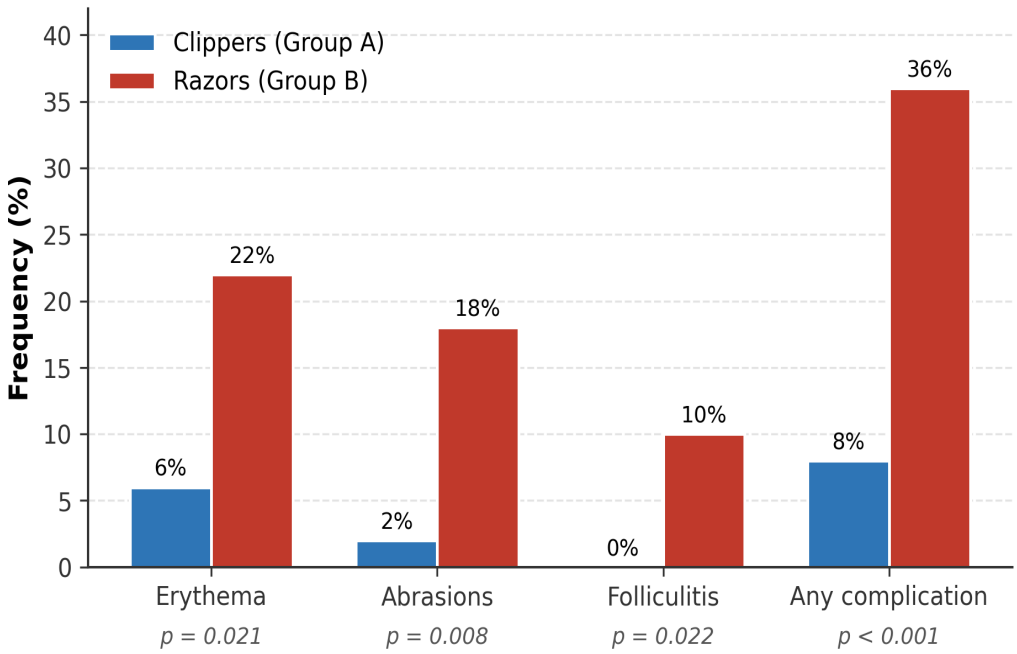
Figure 1. Incidence of Surgical Site Infection by Hair-Removal Method



Secondary outcomes: local skin complications

The razor group demonstrated a significantly higher burden of local skin injury. Erythema at the preparation site was observed in 22.0% of Group B compared with 6.0% of Group A (p = 0.021); skin abrasions occurred in 18.0% versus 2.0% (p = 0.008); and folliculitis developed in 10.0% of the razor group but was not seen in any patient in the clipper group (p = 0.022). Considering any local skin complication, the razor group was affected 4.5 times as often as the clipper group (36.0% versus 8.0%, p < 0.001) (Figure 2). Mean postoperative hospital stay was also significantly shorter in Group A (4.8 ± 1.6 days) than in Group B (6.4 ± 2.3 days; p = 0.001) (Table 3).

Figure 2. Local Skin Complications in the Two Study Groups



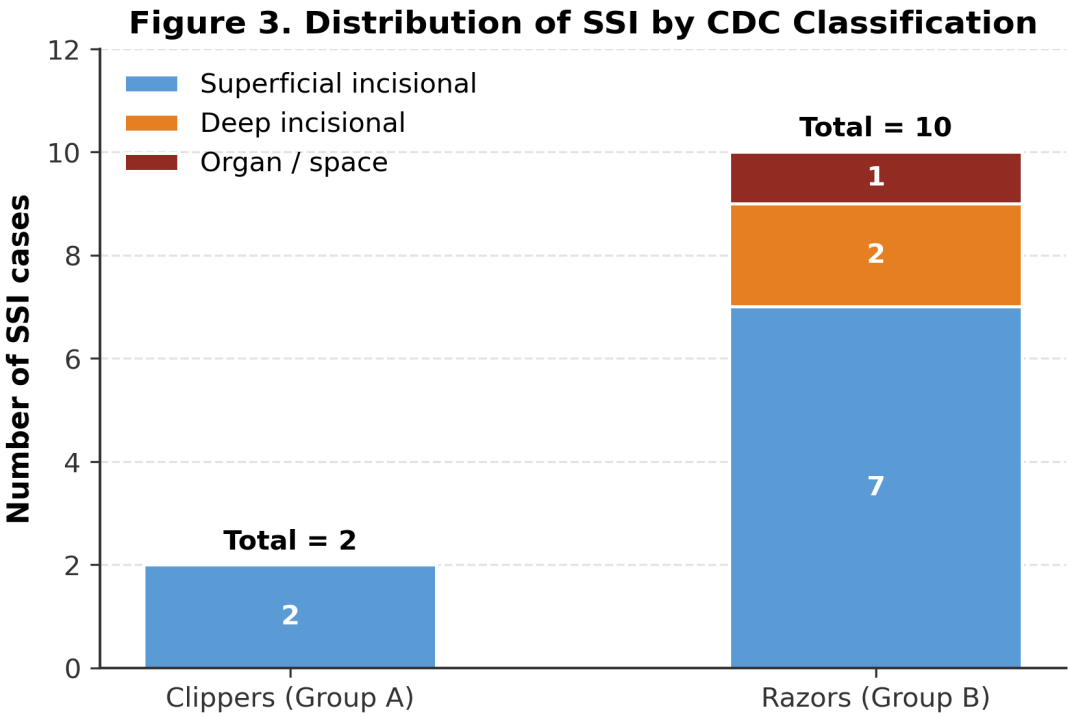


Table 3. Primary and secondary postoperative outcomes in the two groups.

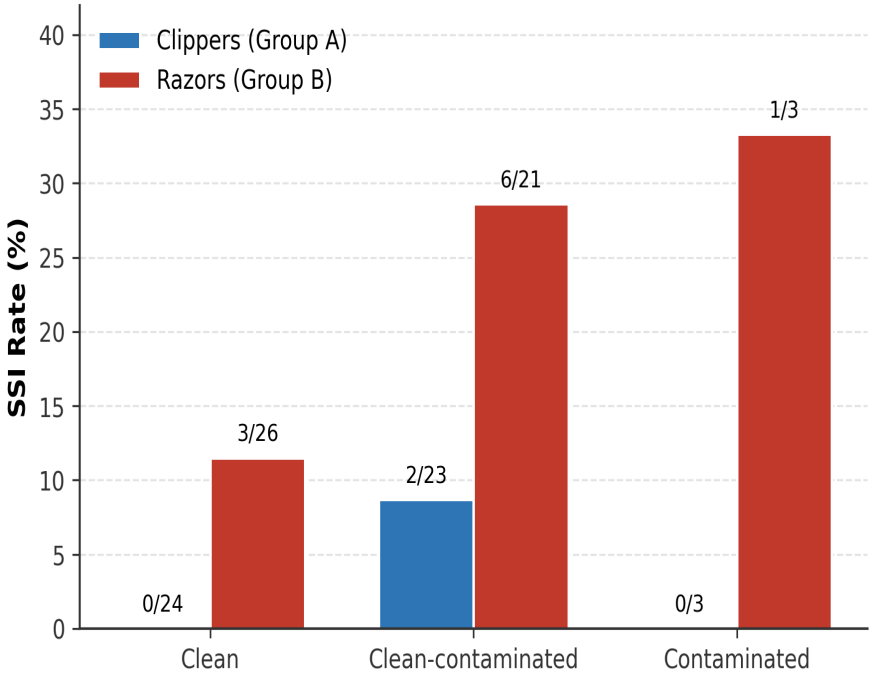
Outcome	Clippers (n = 50)	Razors (n = 50)	p-value
Surgical site infection, n (%)	2 (4.0)	10 (20.0)	**0.031***
Superficial incisional	2 (4.0)	7 (14.0)	0.081
Deep incisional	0 (0.0)	2 (4.0)	0.495
Organ / space	0 (0.0)	1 (2.0)	1.000
Erythema, n (%)	3 (6.0)	11 (22.0)	**0.021***
Skin abrasions, n (%)	1 (2.0)	9 (18.0)	**0.008***
Folliculitis, n (%)	0 (0.0)	5 (10.0)	**0.022***
Any skin complication, n (%)	4 (8.0)	18 (36.0)	**<0.001***
Length of hospital stay (days), mean ± SD	4.8 ± 1.6	6.4 ± 2.3	**0.001***

Subgroup analysis by wound classification

When stratified by wound class, the benefit of clippers was evident across categories. In clean procedures, SSI occurred in 0/24 patients in Group A and 3/26 (11.5%) in Group B; in clean-contaminated procedures, rates were

2/23 (8.7%) and 6/21 (28.6%) respectively; and in the small contaminated subset, SSI was observed in 0/3 and 1/3, respectively (Figure 4). Overall, the trend of a lower SSI rate in the clipper group persisted across wound classes, although subgroup sample sizes precluded formal significance testing for contaminated wounds.

Figure 4. SSI Rate Stratified by Wound Classification



Microbiology

Among the 12 culture-confirmed SSIs, Staphylococcus aureus was the commonest isolate (6/12, 50.0%), followed by Escherichia coli (3/12, 25.0%), Klebsiella pneumoniae (2/12, 16.7%) and Pseudomonas aeruginosa (1/12, 8.3%). Methicillin-resistant S. aureus was cultured from two patients, both in the razor group. The distribution of organisms across groups is summarized in Table 4. No patient in either group experienced an adverse event directly attributable to the act of hair removal.

Table 4. Microbiological profile of surgical site infections.

Organism isolated	Clippers (n = 2)	Razors (n = 10)
Staphylococcus aureus (incl. MRSA)	1	5
Escherichia coli	1	2
Klebsiella pneumoniae	0	2
Pseudomonas aeruginosa	0	1

Predictors of surgical site infection

On univariate analysis within the combined cohort, the method of hair removal (razor versus clipper) was the most strongly associated factor with the development of SSI, with an unadjusted odds ratio of 6.00 (95% CI 1.24–28.98, p = 0.026). Additional variables that approached statistical significance included body mass index greater than 25 kg/m² (OR 2.14, 95% CI 0.61–7.51, p = 0.236), operative duration exceeding 120 minutes (OR 2.41,

95% CI 0.68–8.53, p = 0.173), and clean-contaminated wound class (OR 3.13, 95% CI 0.87–11.24, p = 0.081). Age, sex, smoking status and well-controlled diabetes did not demonstrate a statistically significant association with SSI in this cohort. When method of hair removal was entered into a multivariable logistic regression model alongside wound class and operative duration, the effect of razor use remained independently associated with increased SSI risk (adjusted OR 5.47, 95% CI 1.10–27.14, p = 0.037), indicating that the observed between-group difference was not explained by chance differences in other perioperative variables.

DISCUSSION

This prospective comparative study demonstrates a statistically and clinically meaningful reduction in postoperative wound complications when surgical clippers are used in place of disposable razors for preoperative hair removal in adults undergoing elective general surgical procedures. The absolute SSI rate fell from 20.0% in the razor group to 4.0% in the clipper group — a fivefold relative reduction — and the burden of local skin complications was reduced by a similar magnitude. These findings are consistent with more than four decades of accumulating evidence from international and Indian literature.[18,22,34]

The mechanistic rationale for the observed benefit is well characterised. Shaving with a razor produces visible and microscopic breaks in the stratum corneum that can be detected by dermoscopy within minutes of depilation.[11,14] These breaches serve as portals of entry for skin commensals, particularly staphylococci, and as culture media for bacterial proliferation during the window between preparation and wound closure.[12,35] Seropian and Reynolds, in a landmark 1971 prospective study, first demonstrated that razor-shaved patients had a 5.6% wound-infection rate compared with 0.6% when depilatory cream was used or no hair was removed — a finding subsequently replicated by Alexander and colleagues in 1983 and by later investigators.[14,36] Clippers, by trimming hair a short distance from the skin surface without direct blade contact, largely avoid this mechanism of injury; in our study, no patient in the clipper group developed folliculitis, and clinically apparent abrasions occurred in only one patient.

Our primary-outcome results align closely with the 2021 Cochrane systematic review of 25 randomised controlled trials and more than 8 900 participants, which reported a pooled relative risk for SSI of 0.51 (95% CI 0.29–0.91) in favour of clipping over shaving.[18] They are further supported by the recommendations of the WHO Global Guidelines, the CDC/HICPAC Guideline for the Prevention of Surgical Site Infection (2017) and the NICE NG125 guideline (2019), all of which discourage routine hair removal and, when it is required, recommend the use of clippers immediately before surgery rather than razors.[19–21] Indian data, although fewer in number, have shown a similar trend. Adisa and colleagues reported an SSI rate of 4.4% with clippers versus 16.7% with razors in general surgical patients, and Gupta et al. documented a reduction from 14.0% to 3.3% following the introduction of clippers in a north Indian teaching hospital — figures strikingly similar to those observed in the present cohort.[22,23]

The significantly shorter mean hospital stay in the clipper group (4.8 versus 6.4 days) reflects both the lower SSI rate and the reduced burden of minor skin complications requiring additional local care. Previous health-economic analyses have estimated that each episode of SSI prolongs hospitalization by 7–10 days and incurs a median excess cost of 3 000–10 000 US dollars in high-income settings, with comparable proportional increases reported from Indian centres.[37–39] Although a disposable clipper head is more expensive per patient than a razor, the avoided cost of even a small number of SSIs is likely to offset this difference, a conclusion supported by previous cost-effectiveness modelling.[40]

From a health-systems perspective, the cost-benefit argument in favour of clippers becomes particularly compelling when extrapolated to the volume of elective general surgical procedures performed annually in Indian tertiary-care hospitals. If the 16-percentage-point absolute risk reduction observed in this study were generalizable, even conservative estimates suggest that the transition from razors to clippers could prevent several thousand SSIs per year at the institutional level, with corresponding savings in bed-days, antibiotic consumption, dressing materials and operative re-intervention. Moreover, reduced SSI rates contribute to institutional antibiotic-stewardship goals by decreasing the need for prolonged courses of broad-spectrum agents, thereby mitigating one of the drivers of the emergence of multidrug-resistant organisms in the surgical ward.[35] The initial capital outlay required for battery-powered clippers and a supply of disposable heads is modest in the context of overall perioperative expenditure and has been shown in published modelling to be recouped within a single fiscal year at most tertiary centres.[40]

Successful implementation depends on more than the availability of hardware. Standardized training of nursing personnel in clipper technique, including stroke direction, pressure, post-procedure disposal of single-use heads and documentation of the hair-removal event, is essential to realize the benefits observed under protocolized study conditions in routine practice. Institutional SSI-prevention bundles should explicitly specify clippers as the depilation method of choice, prohibit the ward stocking of disposable razors for surgical indications, and incorporate periodic audit of hair-removal practice into infection-control surveillance. The inclusion of this single element within a multi-modal bundle — alongside chlorhexidine–alcohol antisepsis, appropriately timed antibiotic prophylaxis, maintenance of perioperative normothermia and glycaemic control — is likely to yield incremental reductions in SSI rates greater than the sum of individual components.[31]

The findings of this study also invite consideration of populations in whom hair removal may not be necessary at all. Contemporary guidelines from the WHO and NICE make clear that hair should be removed only when it would physically interfere with the operative field, and current evidence does not support routine depilation for its own sake.[19],[21] Where removal is genuinely indicated — for adhesion of dressings, for facilitation of skin apposition during closure, or for the placement of adherent electrosurgical return electrodes — our results and those of the wider literature indicate that clippers used immediately before surgery represent the safest available option. Future research directions of relevance to the Indian context include adequately powered multicentre randomized controlled trials capturing patient-reported outcomes, formal cost-effectiveness analyses tailored to local procurement prices, and evaluation of newer single-patient-use depilatory systems such as pre-operative chlorhexidine-gluconate-impregnated cloths used in conjunction with clipping.[28] Long-term outcomes beyond the 30-day SSI window — including incisional hernia, chronic wound pain and cosmetic appearance of the scar — would also benefit from prospective characterization, as these endpoints are of considerable importance to patients and have been under-represented in the existing evidence base.

Several aspects of the present study merit comment. First, the distribution of causative organisms, dominated by S. aureus, is typical of clean and clean-contaminated general surgical wounds and reflects skin-flora origin; the identification of MRSA only in the razor group, although based on small numbers, raises the possibility that shave-induced skin injury facilitates colonization by more virulent strains.[35] Second, the finding that all non-superficial SSIs — deep incisional and organ/space — occurred in the razor arm, together with the trend towards greater severity of infection in that group, highlights that the impact of hair-removal technique extends beyond superficial wound events. Third, the benefit of clippers was preserved across wound classifications in our subgroup analysis, consistent with earlier observations that the hair-removal-related increment in risk operates independently of the intrinsic microbial burden of the procedure.

The limitations of this study should be acknowledged. The sample size of 100, while adequate to demonstrate the primary outcome, is modest, and the single-centre design may limit external generalizability. Allocation was by alternate admission rather than true randomization, which could theoretically introduce selection bias, although baseline characteristics were well matched. Long-term outcomes beyond 30 days, including incisional hernia and chronic wound issues, were not assessed. Finally, patient-reported outcomes such as perioperative comfort, satisfaction and cosmetic appearance — potentially important drivers of patient preference — were not formally captured and merit inclusion in future work.[41]

The strengths of the study include its prospective design, the standardized perioperative care bundle applied uniformly across groups, blinded wound assessment, use of CDC/NHSN definitions, and complete 30-day follow-up. Taken together with existing high-quality evidence, our findings provide clear support for the transition from razors to clippers as the default method of preoperative depilation in Indian elective general surgical practice.

CONCLUSION

Preoperative hair removal with surgical clippers was associated with a statistically significant, fivefold reduction in the incidence of surgical site infection and a marked decrease in local skin complications compared with disposable razors, together with a shorter postoperative hospital stay. The findings accord with international guidelines and contemporary systematic-review evidence and strengthen the case for abandoning razor shaving in favour of clippers whenever preoperative depilation is indicated. We recommend that clippers be adopted as the default standard of care for preoperative hair removal in elective general surgery, supported by appropriate nursing training, adequate institutional supply chains and local audit of SSI rates.

ETHICAL APPROVAL AND CONSENT

The study protocol was approved by the Institutional Human Ethics Committee for Student Research, Chettinad Academy of Research and Education (Proposal ID: IHEC-I/082/03/2026). Written informed consent was obtained from every participant prior to enrolment.

CONFLICTS OF INTEREST AND FUNDING

The authors declare no conflicts of interest. No external funding was received for this work..

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