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Short-term incidence and risk factors of surgical site infection following trauma orthopaedic surgery in Northern Ghana

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Abstract

Trauma and orthopaedic surgery (TOS) can result in surgical site infections (SSIs), and the repercussions include prolonged and increased cost of treatment. This study investigated the incidence and risk factors of SSI following TOS. A prospective cohort study was conducted at the Tamale Teaching Hospital from September 2023 to May 2024. Data on demographics, comorbidities, preoperative, intra-operative and postoperative parameters were collected from patients, medical records and the operation report. SSI was defined following the Centers for Disease Control and Prevention criteria. The incidence of SSI during the study period was determined, and univariate and multivariate logistic regression analyses were used to identify the independent risk factors of SSI. A total of 210 patients were enrolled of which 6.7% (14) developed SSIs, including 1.0% (2) deep and 5.7% (12) superficial SSIs. The incidence of open fractures and closed fractures in this study was 3.3% (7) and 2.9% (6), respectively. According to multivariate regression analysis, blood transfusion before surgery ($p = 0.034$; OR = 3.53; 1.10–11.33) was identified as an independent risk factor of SSI following TOS. However, there was a significant association between the type of dressing used on the surgical site after surgery ($p = 0.035$; OR = 4.08; 1.10–15.08) and SSI. The study reported the overall incidence rate of SSI after TOS to be 6.7% (67 per 1000 surgical operations). Blood transfusion before surgery was an independent risk factor of SSI following TOS. Local and global measures that limit the rates of SSI after TOS should be adopted especially in managing high-risk patients such as those who require pre-operative blood transfusion.

KEYWORDS

orthopaedics, incidence, risk factors, surgery, surgical site infection, trauma

Key Messages

- The study established that the incidence of surgical site infections after trauma and orthopaedic surgery in Northern Ghana was 6.7% (14/210), of which 1.0% (2/210) were deep and 5.7% (12/210) superficial infections.
- Blood transfusion before surgery was identified as an independent risk factor for surgical site infections after trauma and orthopaedic surgery.

1 | INTRODUCTION

Surgical site infections (SSIs) are defined as those that develop at or close to a surgical incision within 30 days of the operation, or up to 1 year if an implant was used.[1] Orthopaedic infection result is costly to both the patient and the healthcare system, often requiring prolonged treatment and potentially resulting in poor functional outcomes. The Centers for Disease Control and Prevention (CDC) classifies SSIs into three groups.[2] These include superficial SSIs that are limited to the skin and subcutaneous tissue, deep incisional SSIs involving the fascia and muscle layers and organ or space SSIs connected to the human organs and body spaces. With incidence rates ranging from 0.4 to 30.9 per 100 patients undergoing surgery and a pooled incidence rate of 11.8 per 100 patients undergoing surgery, SSI continues to be one of the most common healthcare-acquired infections in low and middle-income countries.[3]

Of all hospital-acquired and healthcare-related infection, SSIs rank third in frequency.[4] These infections result in worse quality of life, increased readmissions, longer hospital stays and more expensive hospital care.[4] Furthermore, infections directly linked to open surgical wounds have up to 77% of mortality,[5] and 1%–3% of patients undergoing orthopaedic surgery are reported to suffer from infection[6] due to a number of causes including surgical techniques, drainage and implantation instruments.[7]

Depending on the related morbidity, different patients may have different risk factors for SSIs. These variables include both intrinsic (patient-related) and extrinsic (procedure-related) aspects. Intrinsic variables include age, obesity, smoking and immunosuppressive medical conditions,[8,9] whilst extrinsic factors include the kind of surgery done, how long it takes and the hospital setting.[10] This study aimed to investigate the incidence and risk factors of SSI following trauma and orthopaedic surgery (TOS) in northern Ghana.

2 | METHODOLOGY

2.1 | Ethical consideration

This study received approval from the institutional review board of the University for Development Studies (UDS/IRB/127/23). Site permission was granted by the Tamale Teaching Hospital (TTH) and the Department of Surgery (TTH/R&B/SR/283). Patients' participation was strictly voluntary, and patients granted written informed consent.

2.2 | Study area

This study was conducted at the TTH, located in Tamale in the Northern Region of Ghana, and serves as a referral hospital for the sector (Northern, Savana, North-East, Upper East and Upper West). The hospital also treats patients who have been referred from Togo, Burkina Faso and Mali (TTH Administration Directorate, 2015). The choice of this medical centre was made in response to the considerable number of orthopaedic patients it receives, the diverse patient population and the predicted growth in cases brought on by the expansion of motorized transportation in this region of Ghana.

2.3 | Study design, inclusion and exclusion criteria

A prospective cohort study was conducted at the TTH from September 2023 to May 2024. Selected participants comprised patients who had undergone surgery at the trauma and orthopaedics surgical ward. We excluded patients admitted to the orthopaedic surgical department but did not undergo any surgery and those who died after surgery. In addition, patients who had their wound infected before surgery (diagnosed by the surgeon and confirmed by culture-positive results) were excluded from this study. Also, patients with incomplete data of medical records by opting out within 6 months were excluded if SSI was not documented before the decision to opt-out.

2.4 | Data collection

The instruments for the data collection were in the form of a questionnaire to cover the demographic background of respondents and the risk factors associated with SSIs as informed by existing literature, and anecdotal observations.

The questionnaire was based on the objectives of the study; hence they were designed into themes. This study assessed the demographic characteristics, comorbidities, preoperative risk factors, intra-operative risk factors and postoperative risk factors of SSI following TOS. Follow-up was at 6 weeks, 3 months and 6 months for SSI. In addition, acute SSI requiring the patient to reattend the hospital at other timepoints was recorded. At each follow-up point assessment of wound healing was recorded.

2.5 | Sample collection for suspected SSI

Once the clinical diagnosis is confirmed by the surgeon following the CDC criteria for diagnosis of SSI, the suspected patients have their wounds cleaned with normal saline to reduce the skin flora before the samples are taken. The surgeon aseptically collects a wound swab, fluid or aspirate from each patient using a sterile cotton-tipped applicator or a syringe. After collection, all the samples are carefully labelled with patient details and transported in Stuart transport media within 1 h to the microbiology laboratory at the TTH for bacteria culture and sensitivity, and Ziehl Neelsen staining (for *Mycobacterium tuberculosis*) testing to be done.

2.6 | Definition of SSI classifications

The SSI was classified according to the CDC. The CDC classifies SSIs into three groups.[2] These include:

> Superficial incisional SSI: Infection occurs within 30 days after the operation and involves only the skin or subcutaneous tissue of the incision.
> Deep incisional SSI: Infection occurs within 30 days after the operation if no implant is left in place or within 1 year if an implant is in place and the infection appears to be related to the operation and involves deep soft tissues (e.g., fascial and muscle layers) of the incision.
> Organ/Space SSI: Infection occurs within 30 days after the operation if no implant is left in place or within 1 year if an implant is in place and the infection appears to be related to the operation; and the infection involves any part of the anatomy (e.g., organs or spaces), other than the incision, that was opened or manipulated during the operative procedure.

2.7 | Statistical analysis

For this investigation, the data was analysed using SPSS version 27. Frequencies, percentages and cross-tabulations were used to summarize the demographic variables. We utilized the Chi-square and Fisher's exact tests to see if there was an association between the dependent and independent variables. Furthermore, both binary and multiple logistic regression analyses were conducted to identify factors associated with SSI following TOS using variables with *p*-value of <0.05. Only variables significant for the binary logistic regression were included in the predictive analysis. Associations were deemed statistically significant at a *p*-value of <0.05 and a 95% confidence interval.

3 | RESULTS

3.1 | Incidence, sociodemographic characteristics and patients' dependent factors of SSI after TOS

A total of 210 patients were recruited for this study. Out of these, 14 (6.7%) developed SSI (5.7% and 1.0% were within 30 days and 6 months, respectively). The study reported a maximum and minimum age of 86 and 0.67 years (8 months), respectively. The mean age of the study participants was 33.08 ± 19.23 (Mean ± SD). However, the predominant age groups were between 21–30 and 41–50 years (18.6% and 19.0%, respectively). Regarding gender, males were predominant (68.6%) and the majority of the study participants were married (55.7%). Education-wise, about a quarter had tertiary level education, whilst 19.0%, 12.9% and 11.4% had respectively primary, JHS and SHS levels of education. About a third of the study participants are unemployed (31.0%). A greater proportion of the study participants were Muslims (71.4%), 22.9% Christians and 5.7% Traditionalists. Comparatively, the study participants resided in the rural area (42.4%), 36.7% in the urban and 21.0% peri-urban area settlers, as depicted in Table 1.

Patient-related risk factors that predispose to SSI following TOS were examined. The results revealed that none of the factors was significantly associated with SSI following TOS (*p*-value >0.05) as shown in Table 1. The results however showed that a greater proportion of those who lived in the rural areas (64.3%) developed SSI as compared to the urban and peri-urban settlers. Furthermore, SSI was predominant in participants who did not have formal education (42.9%) compared to various levels of formal education. In addition, about 50.0% of the unemployed patients suffered from SSI as against the other occupational categories.

3.2 | Blood transfusion before surgery was a major preoperative factor associated with SSI after TOS

This study assessed the preoperative risk factors that predispose patients to SSI following TOS. However, the

TABLE 1 Sociodemographic and patients-related factors of surgical site infection after trauma and orthopaedic surgery.

Variables	Total	Surgical Site Infection Yes ($n = 14$)	No ($n = 196$)	*p*-value
Age categories (years)				
≤10	27 (12.9)	0 (0.0)	27 (13.8)	0.058
11–20	35 (16.7)	5 (35.7)	30 (15.3)	
21–30	39 (18.6)	4 (28.6)	35 (17.9)	
31–40	33 (15.7)	1 (7.1)	32 (16.3)	
41–50	40 (19.0)	0 (0.0)	40 (20.4)	
>50	36 (17.1)	4 (28.6)	32 (16.30)	
Gender				
Male	144 (68.6)	7 (50.0)	137 (69.9)	0.141
Female	66 (31.4)	7 (50.0)	59 (30.1)	
Marital status				
Married	117 (55.7)	8 (57.1)	109 (55.6)	0.817
Single	81 (38.6)	6 (42.9)	75 (38.3)	
Divorced	4 (1.9)	0 (0.0)	4 (2.0)	
Cohabitation	8 (3.8)	0 (0.0)	8 (4.1)	
Educational level				
No education	68 (32.4)	6 (42.9)	62 (31.6)	0.165
Primary	40 (19.0)	2 (14.3)	38 (19.4)	
Junior high school	27 (12.9)	3 (21.4)	24 (12.2)	
Senior high school	24 (11.4)	3 (21.4)	21 (10.7)	
Tertiary and above	51 (24.3)	0 (0.0)	51 (26.0)	
Occupation				
Government worker	29 (13.8)	0 (0.0)	29 (14.8)	0.346
Private worker	29 (13.8)	1 (7.1)	28 (14.3)	
Self-employed	37 (17.6)	3 (21.4)	34 (17.3)	
Student	50 (23.8)	3 (21.4)	47 (24.0)	
Unemployed	65 (31.0)	7 (50.0)	58 (29.6)	
Religious background				
Christians	48 (22.9)	2 (14.3)	46 (23.5)	0.413
Muslims	150 (71.4)	12 (85.7)	138 (70.4)	
Traditionalist	12 (5.7)	0 (0.0)	12 (6.1)	
Residential area				
Urban	77 (36.7)	3 (21.4)	74 (37.8)	0.227
Peri-urban	44 (21.0)	2 (14.3)	42 (21.4)	
Rural	89 (42.4)	9 (64.3)	80 (40.8)	
Diabetes mellitus				
Yes	3 (1.4)	0 (0.0)	3 (1.5)	0.641
No	207 (98.6)	14 (100.0)	193 (98.5)	
Hypertension				
Yes	22 (10.5)	2 (14.3)	20 (10.2)	0.646
No	188 (89.5)	12 (85.7)	176 (89.8)	

TABLE 1 (Continued)

Variables	Total	Surgical Site Yes ($n = 14$)	Infection No ($n = 196$)	p-value
Smoking				
Yes	2 (1.0)	0 (0.0)	2 (1.0)	0.704
No	208 (99.0)	14 (100.0)	194 (99.0)	
Alcohol used				
Yes	3 (1.4)	0 (0.0)	3 (1.5)	0.641
No	207 (98.6)	14 (100.0)	193 (98.5	
Asthmatic				
Yes	2 (1.0)	0 (0.0)	2 (1.0)	0.704
No	208 (99.0)	14 (100.0)	194 (99.0)	
Congestive cardiac failure				
Yes	1 (0.5)	0 (0.0)	1 (0.5)	0.789
No	209 (94.5)	14 (100.0)	195 (99.5)	
Cancer patient				
Yes	3 (1.4)	0 (0.0)	3 (1.5)	0.641
No	207 (98.6)	14 (100.0)	193 (98.5)	
ASA score				
ASA 1	179 (85.2)	12 (85.7)	167 (85.2)	0.958
ASA 2	27 (12.9)	2 (14.3)	25 (12.8)	
ASA 3	3 (1.4)	0 (0.0)	3 (1.5)	
ASA 4	1 (0.5)	0 (0.0)	1 (0.5)	

Abbreviation: ASA: American Society of Anesthesiologists physical status classification system.

only parameter that was linked to SSI was blood transfusion before surgery ($p = 0.038$) but not the type of blood transfused, as shown in Table 2. Proportion-wise, not washing the surgical site prior to surgery was associated with 78.6% of SSI, and savlon/alcohol skin preparation was mostly used by surgeons. The most common antibiotic given to patients prior to surgery was cefuroxime.

3.3 | The anatomical location of the surgery was a significant intra-operative factor associated with SSI after TOS

The current study assessed the intra-operative risk factors that predispose patients to SSI following trauma and orthopaedic surgery. The only parameter that was profoundly linked to SSI was the anatomical location (lower limb) of the surgery ($p = 0.003$), as shown in Table 3. Moreover, amongst the SSI cases, 92.9% had implants compared to those without implants, 7.1%. In addition, when the number of staff in the surgical room was >9, about 35.7% of such category developed SSI. Amongst patients whose surgery duration was >120 min, 15.7% of them had SSI, compared to 5.5% and 5.9% in the <60 and 60–120 min groups respectively but was not statistically significant.

3.4 | The type of dressing used on the surgical site and the type of blood group transfused post-surgery were significantly associated with post-operative SSI after TOS

The current study assessed the post-operative risk factors that predispose patients to SSI following TOS. The factors considered were whether there was blood transfusion after surgery, types of blood group transfused after surgery, types of dressing used on the surgical site and classification of the surgical wounds after surgery. However, the only factors that were profoundly linked to SSI were the type of dressing used on the surgical site ($p = 0.035$) and the type of blood group transfused after surgery ($p = 0.030$), as shown in Table 4.

TABLE 2 Preoperative factors associated with surgical site infection after trauma and orthopaedic surgery.

Variables	Total	Surgical site Yes ($n = 14$)	Infection No ($n = 196$)	*p*-value
Was the surgical site washed with soap and water before surgery?				
Yes	52 (24.8)	3 (21.4)	49 (25.0)	0.765
No	158 (75.2)	11 (78.6)	147 (75.0)	
What solution was used for the skin preparation?				
70% Isopropyl alcohol	1 (0.5)	0 (0.0)	1 (0.5)	0.864
Chlorhexidine/alcohol	3 (1.4)	0 (0.0)	3 (1.5)	
Savlon/alcohol	206 (98.1)	14 (100.0)	192 (98.0)	
Was antibiotics given before surgery?				
Yes	209 (99.5)	14 (100.0)	195 (99.5)	0.789
No	1 (0.5)	0 (90.0)	1 (0.5)	
Types of antibiotics given before surgery				
Cefuroxime	202 (96.7)	13 (92.9)	189 (96.9)	0.497
Meropenem	1 (0.5)	0 (0.0)	1 (0.5)	
Ceftriaxone	4 (1.9)	1 (7.1)	3 (1.5)	
Clindamycin	2 (1.0)	0 (0.0)	2 (1.0)	
Blood transfusion before surgery?				
Yes	42 (20.0)	6 (42.9)	36 (18.4)	0.038
No	168 (80.0)	8 (57.1)	160 (81.6)	
Types of blood groups that was given before surgery				
Blood Group A	8 (19.0)	1 (16.7)	7 (19.4)	0.869
Blood Group B	10 (23.8)	1 (16.7)	9 (25.0)	
Blood Group AB	0 (0.0)	0 (0.0)	0 (0.0)	
Blood Group O	24 (57.1)	4 (66.7)	20 (55.6)	

3.5 | Blood transfusion before surgery was an independent risk factor of SSI after TOS

Univariate and multivariate binary logistic regression analyses were applied to identify independent risk factors that predispose patients to SSI following TOS. Blood transfusion before surgery (*p*-value = 0.035; OR = 3.33; 1.09–10.20), and type of dressing used on the surgical site (*p*-value = 0.027; OR = 4.28; 1.18–15.51) were the only factors that showed significant association with SSI after the univariate binary logistic regression analysis. Further, only those with significant association were used to run the multivariate logistic regression analysis. The results confirmed that blood transfusion before surgery (*p*-value = 0.034; OR = 3.53; 1.10–11.33) was observed as an independent risk factor (Table 5).

3.6 | Criteria used in the diagnosis of SSI after TOS

The study revealed that most of the participants who developed SSI experienced no signs and symptoms such as fever, swelling of the site, erythema and pain and tenderness (85.7%, 92.9%, 64.3% and 64.3%, respectively). All the study participants who developed SSI experienced serous discharge or pus from the site as a clinical sign (100.0%). Most of the participants did not experience the separation of tissues as a clinical sign of SSI. A total of two (14.3%) deep and 12 (85.7%) superficial SSIs were identified (Table 6).

4 | DISCUSSION

Surgical site aseptic precautions during surgery do not eliminate the risk of infection, which is a recognized complication in orthopaedics. In the present study, the incidence of SSI after TOS was 6.7% (67 per 1000 surgical operations), with 5.7% for superficial infection and 1.0% for deep infection. The incidence of SSI in the current study is higher than that reported by other authors from Saudi Arabia, Indonesia, India and Belgrade.[11–14] However, a higher incidence of SSI has been observed in other studies in Tanzania and Nigeria.[15,16] The differences in incidents could be due to differences in sample size, time

TABLE 3 Intra-operative factors associated with surgical site infection after trauma and orthopaedic surgery.

Variables	Total	Surgical site Yes ($n = 14$)	Infection No ($n = 196$)	p-value
Type of surgery				
Elective	195 (92.9)	13 (92.9)	182 (92.9)	1.000
Emergency	15 (7.1)	1 (7.1)	14 (7.1)	
Type of procedure				
Implant used	154 (73.3)	13 (92.9)	141 (71.9)	0.119
No implant used	56 (26.7)	1 (7.1)	55 (28.1)	
Types of implants used				
Endoprosthesis	3 (1.9)	0 (0.0)	3 (2.1)	0.461
I. M. Nailing	30 (19.5)	4 (30.8)	26 (18.4)	
Plate and screw	70 (45.5)	4 (30.8)	66 (46.8)	
External fixation	28 (18.2)	4 (30.8)	24 (17.0)	
Pins and wires	23 (14.9)	1 (7.7)	22 (15.6)	
Is there fracture?				
Yes	172 (81.9)	13 (92.9)	159 (81.1)	0.473
No	38 (18.1)	1 (7.1)	37 (18.9)	
Types of fractures				
Open fracture	76 (44.2)	7 (53.8)	69 (43.4)	0.565
Closed fracture	96 (55.8)	6 (46.2)	90 (56.6)	
If open fracture, classification				
GA1	2 (2.6)	0 (0.0)	2 (2.9)	0.305
GA2	24 (31.6)	0 (0.0)	24 (34.8)	
GA3A	25 (32.9)	4 (57.1)	21 (30.4)	
GA3B	22 (28.9)	3 (42.9)	19 (27.5)	
GA3C	3 (3.9)	0 (0.0)	3 (4.3)	
Types of anaesthesia given				
General	83 (39.5)	4 (28.6)	79 (40.3)	0.573
Regional	127 (60.5)	10 (71.4)	117 (59.7)	
Duration of surgery				
0–60 min	55 (26.2)	3 (21.4)	52 (26.5)	0.246
60–120 min	136 (64.8)	8 (57.1)	128 (65.3)	
>120 min	19 (9.0)	3 (21.4)	16 (8.2)	
Anatomical location of the surgery				
Upper limb	45 (21.4)	0 (0.0)	45 (23.0)	0.003
Lower limb	137 (65.2)	11 (78.6)	126 (64.3)	
Spine	2 (1.0)	1 (7.1)	1 (0.5)	
Pelvic	6 (2.9)	2 (14.3)	4 (2.0)	
Foot and ankle	12 (5.7)	0 (0.0)	12 (6.1)	
Clavicle	8 (3.8)	0 (0.0)	8 (4.1)	
Number of staff in the surgical room during surgery				
3–5 Staff	9 (4.3)	0 (0.0)	9 (4.6)	0.150
6–9 Staff	164 (78.1)	9 (64.3)	155 (79.1)	
>9 Staff	37 (17.6)	5 (35.7)	32 (16.3)	

TABLE 4 Post-operative factor associated with surgical site infection after trauma and orthopaedic surgery.

Variables	Total	Surgical site Yes ($n = 14$)	Infection No ($n = 196$)	*p*-value
Was there a blood transfusion after surgery?				
Yes	19 (9.0)	1 (7.1)	18 (9.2)	0.797
No	191 (91.0)	13 (92.9)	178 (90.8)	
Which type of blood group was given after surgery?				
Blood Group A	6 (31.6)	0 (0.0)	6 (33.3)	0.030
Blood Group B	2 (10.5)	1 (100.0)	1 (5.6)	
Blood Group AB	2 (10.5)	0 (0.0)	2 (11.1)	
Blood Group O	9 (47.4)	0 (0.0)	9 (50.0)	
Which type of dressing was done after surgery?				
Gauze only	92 (43.8)	4 (28.6)	88 (44.9)	0.035
Gauze and saline	45 (21.4)	1 (7.1)	44 (22.4)	
Gauze and povidone	43 (20.5)	7 (50.0)	36 (18.4)	
Gauze and savlon/alcohol	30 (14.3)	2 (14.3)	28 (14.3)	
Classifications of the surgical wound after surgery				
Clean	84 (40.0)	6 (42.9)	78 (39.8)	0.470
Clean-contaminated	40 (19.0)	4 (28.6)	36 (18.4)	
Contaminated	61 (29.0)	4 (28.6)	57 (29.1)	
Dirty	25 (11.9)	0 (0.0)	25 (12.8)	

and place of study, type of hospital, surgical team and type of surgery.

Although SSI was observed to be high in the age categories 11–20, 21–30 and >50 years, this finding was not statistically significant, as reported previously indicating age alone is not a risk factor for SSI.[11,12] However, other studies stressed old age is a risk factor for the development of SSI probably mainly due to elderly-associated morbid conditions like the depression of the body's immunity, reduced appetite causing poor nutrition status and diabetes mellitus.[16,17]

The current study showed a higher proportion of males in comparison to females (ratio 2.2:1). This predominance of males in operated patients has been previously illustrated in other studies from India, Iran and South India.[18–20] For patient-related risk factors that predispose to SSI following TOS, the results revealed that none of the factors was significantly associated with SSI. This finding is in contrast to a report that identified gender, poorly controlled diabetes mellitus, chronic alcoholism and ASA Score as independent risk factors of SSI following TOS.[21]

For the preoperative risk factors, blood transfusion before surgery emerged as an independent risk factor of SSI following TOS. This finding is in line with other studies where blood transfusion before surgery was an independent risk factor.[22–24] Other factors such as the washing of the surgical site with water and soap before surgery, the type of solution used in the skin preparation, whether antibiotics were given before surgery, types of antibiotics that were given before surgery and the types of blood transfused before surgery were also assessed but none of these was a predictor of SSI following TOS.

The anatomical location of the surgery was a significant intra-operative factor associated with SSI after TOS, which conforms to previous findings.[21,25] In contrast to this study, it has been reported that the types of fracture and operation duration are independent risk factors of SSI,[26] however, our study found an increasing odds of developing SSI for a longer duration of surgery and open fractures but was not significant though, whilst another identified types of open fractures (Gustilo-Anderson classification) as such.[21] Furthermore, increased operating room staff has been reported as a risk factor for SSI.[27]

Amongst the factors considered for post-operative risk factors, only the type of dressing used on the surgical site and the type of blood group transfused after surgery were profoundly linked to SSI. Studies suggest that the use of povidone-iodine in surgical site dressing is a predictor of SSI. This is attributed to the shorter activity span of povidone-iodine due to inactivation by serum proteins and blood compared to chlorhexidine.[28] Similarly, povidone-iodine irrigation before skin closure at the surgical site did not prevent SSIs.[29] Other studies however identified the use of povidone-iodine for surgical site

TABLE 5 Predictors of surgical site infection after trauma and orthopaedic surgery.

Variables	COR (95% CI)	*p*-value	AOR (95% CI)	*p*-value
Gender				
Male	1 (Ref)			
Female	2.32 (0.78–6.92)	0.130		
Residential area				
Urban	1 (Ref)			
Peri-urban	1.18 (0.19–7.31)	0.863		
Rural	2.78 (0.72–10.64)	0.137		
Hypertension				
No	1 (Ref)			
Yes	1.47 (0.31–7.03)	0.632		
Type of surgery				
Elective	1 (Ref)			
Emergency	1.00 (0.12–8.21)	1.000		
Type of procedure				
No implant used	1 (Ref)			
Implant used	5.07 (0.65–39.69)	0.122		
Is there fracture				
No	1 (Ref)			
Yes	3.025 (0.38–23.86)	0.293		
Type of fracture				
Closed fracture	1 (Ref)			
Opened fracture	1.52 (0.49–4.73)	0.468		
Type of anaesthesia used				
Regional	1 (Ref)			
General	0.59 (0.18–1.96)	0.390		
Duration of surgery (min)				
0–60	1 (Ref)			
60–120	1.08 (0.28–4.24)	0.909		
>120	3.25 (0.60–17.71)	0.173		
Was the surgical site washed with soap and water before surgery?				
Yes	1 (Ref)			
No	1.22 (0.33–4.56)	0.765		
Blood transfusion before surgery				
No	1 (Ref)		1 (Ref)	
Yes	3.33 (1.09–10.20)	0.035	3.53 (1.01–11.33)	0.034
Blood transfusion after surgery				
No	1 (Ref)			
Yes	0.76 (0.09–6.16)	0.798		
Which type of dressing was used on the surgical site after surgery?				
Gauze and savlon/alcohol	1 (Ref)		1 (Ref)	
Gauze and saline	0.50 (0.05–4.61)	0.541	0.42 (0.05–3.99)	0.454
Gauze and povidone	4.28 (1.18–15.51)	0.027	4.08 (1.10–15.08)	0.035
Gauze only	1.57 (0.27–9.04)	0.613	1.31 (0.22–7.80)	0.763

TABLE 6 Criteria used in the diagnosis of surgical site infection (SSI) after trauma and orthopaedic surgery.

Variables	Frequency ($N = 14$)	Percentage (%)
Fever?		
Yes	2	14.3
No	12	85.7
Swelling of the site?		
Yes	1	7.1
No	13	92.9
Erythema?		
Yes	5	35.7
No	9	64.3
Pain and tenderness		
Yes	5	35.7
No	9	64.3
Serous discharge or pus from the site?		
Yes	14	100.0
No	0	0.0
Separation of tissues?		
Yes	2	14.3
No	12	85.7
Types of surgical site infection diagnosed		
Superficial SSI	12	85.7
Deep SSI	2	14.3
Organ/space SSI	0	0.0

dressing resulted in a significant reduction in the incidence of SSI.[30] Literature is therefore inconclusive on the role of povidone-iodine in SSI as such further research in this direction will be relevant.

In conclusion, the study reported the overall incidence rate of SSI after TOS to be 67 per 1000 surgically operated patients. Blood transfusion before surgery and the type of dressing used on the surgical site after surgery were identified as independent risk factors of SSI following TOS. Local and global measures that limit the rates of SSI after TOS should be adopted especially in managing high-risk patients such as those who require preoperative blood transfusion. An expanded multicentre study is required to ascertain the role of blood transfusion in SSI especially in TOS. Similarly, the role of wound dressing agents in SSI should be explored further.

4.1 | Limitation

The exclusion criteria used may have unintended implications for the incidence value reported due to selection bias. Also, an expanded study in terms of number and geographical area could influence the results. There could be bias in the type of surgical procedure experienced by the patients and multiple surgeons. There may be some confounders beyond the scope of this study which could influence our findings.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to report.

DATA AVAILABILITY STATEMENT

The data for the study is available with the corresponding author upon appropriate request.

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