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ORIGINAL ARTICLE

Incidence and risk factors for surgical site infections, identification of bacteria and antibacterial sensitivity patterns in Tertiary Care Hospital of Janaki Medical College, Surgery Department, Ramdaiya, Dhanusha, Nepal

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Abstract

Background: Incidence and risk factors for Surgical site, infections, identification of bacteria and anti- sensitivity patterns in in Tertiary care Hospital in Tertiary care Hospital, Nepal. Surgical site infection (SSI) appears in the post-operative period. Infection and sepsis in modern surgery continue to be a significant problem for health care professionals and patients alike. Multiple pre-operative, peri-operative, and post-operative causes can lead to SSIs, and bacteria are the major culprits behind infections. The study was conducted in patients who underwent surgery and followed clinical bacterial Infection. Their identification and antibacterial sensitivity patterns findings with multiple risk factors were identified. **Methods:** A cross-sectional study comprising 70 participants on the 2nd day of post-operative procedure were included, and samples around the incision site were collected for culture. Chain of sterility was maintained, and socio-demographic data were collected using a self-administered questionnaire. **Results:** 10% of surgical site swab cultures were positive for bacterial growth and were identified. Pain (80.0%) and redness (60.0%) were the most frequently reported local site clinical features. Vomiting and nausea (22.9%) were the most common systemic features, followed by fever (18.6%). The prediction of significant risk factors for SSI were age, body mass index, family size, education, consumers of over-the-counter, irrational antibiotic use, and operation duration were found. There were no association found between economic status, caste, tobacco, alcohol and gender in this study because of the limited no of subjects involved. *Escherichia coli* was the most common bacterial isolate (5 out of 7 positive isolates). Levofloxacin showed the highest sensitivity (100.0%), followed by Cefepime, Piperacillin-Tazobactam, and Ofloxacin (85.71% each), Amikacin, Ceftriaxone, and Cefoperazone (71.43% each), with Azithromycin having only 28.57% sensitive. **Conclusion:** SSI is one of the consequences of surgery, with bacteria playing a major role in resulting systemic and local symptoms. Judicious use of antibiotics empirically and after confirmation of isolates can present with better outcomes and health of patients who undergo surgery.

Key words: Incidence,risk factors, Clinical features, Surgical site infections, bacterial identification ,Sensitivity patterns to Antibiotics

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INTRODUCTION

Infection is defined as 'invasion and multiplication of microorganisms in body tissues, which may be clinically unapparent or result in local cellular injury because of competitive metabolism, toxins, intracellular replication, or antigen-antibody response.[1] Surgical site infection (SSI) appears in the post-operative period that occurs within 30 days of post-operative procedure.[2] Infection has always been a feature of human life, and sepsis in modern surgery continues to be a significant problem for health care practitioners across the globe.[3] Compared to patients undergoing surgery who do not have a SSI, those with a SSI are hospitalized approximately 7–11 days longer.[4] The incidence of SSI differs from one country to another according to the different system employed for the epidemiological control of hospital infections, while the global estimates of SSI have varied from 0.5% to 15%.[5,6] In the United States, every year SSI develops in 2–5% of patients, resulting in at least 5,00,000 infection, 3.7 million excess hospital days, and ₹ 1.6 billion in extra hospital charges.[7] Studies in India have consistently shown higher rates of SSI ranging from 16% to 38.8%.[8,9] In Nepal, some retrospective studies have suggested the prevalence rate of SSI to be 4–7% for all kinds of operations.[10-12] Baseline information regarding SSI, with feed-back of appropriate data to the surgeon, has been shown to be an important component of strategies to reduce SSI risk.[13] The risk of post-operative SSI increases when drain is placed at the site than the drain is not placed at the surgical site.[14] The SSI rate is estimated to be 2.5% in European countries.[15]

The study aimed to collect clinical symptoms and signs of SSI, risk factors, bacterial infection, bacterial identification, and their antibacterial sensitivity pattern in the surgery department of Janaki Medical College.

METHODS

Ethical Consideration

Ethical approval was obtained from the Ethical Review Committee of Janaki Medical College, Ramdaiya, Dhanusha, Nepal, before commencement of the Study (Ref. 025/ IRC-JMC/2024/019).

Study Design

A hospital-based prospective descriptive cross-sectional observational study was conducted.

Study Site

The study was conducted in the entire Tertiary Hospital of Janaki Medical College, Ramdaiya, Dhanusha.

Study Population

The study population comprised of patients presenting in the entire Tertiary Hospital of Janaki Medical College on the 2nd post-operative day in the Surgery Department. The incision site was sterile at the time of incision.

Study Duration

The Study was conducted over 1 year from November 26th, 2024 to October 13th, 2025.

Sampling Technique

Participants were selected using a random sampling technique.

Sample Size Determination

$$\text{Sample size}(S) = z^2 \times p \times q / d^2$$

Where q=1-p
P=0.05
Z^2=3.84
d=5%
S=73.

A sample size of 73 was determined, of which only 70 samples fit the inclusion criteria during the study period. Patients with clinical viral or fungal infection were excluded.

Study Variables

Age, sex, smoking, immunocompromised patients, bacteremia.

Inclusion Criteria

Patients with sterile skin site incision were made and operative procedure was done. Their incision site swab was taken in 2nd post-operative day.

Exclusion Criteria

Patients suffering from superficial bacterial infection that contaminated the sterile swab were excluded. Those who denied to give even verbal consent were excluded. Patients with clinical viral or fungal infection were excluded.

Informed Consent

Written and/or verbal Consent was taken from all eligible participants.

Methodology

Clinical symptoms and signs were collected. Each Surgical site was first washed with a sterile Gauze piece soaked with sterile Normal saline, gently from inward to outward. A sterile swab was either rubbed on an apparently healthy wound or an clinically looking infected wound from the living tissues and immediately transferred to Nutrient Broth. The swab was kept for at least 3 h. Subculture was done on blood agar and MacConkey agar plates and incubated at 37°C over 48 h. These plates were read, Gram-stained and bacteria were classified. The identification of bacteria was further made with biochemical methods from isolated colonies. Anti-bacterial sensitivity tests were done. Antibiotic susceptibility testing of bacterial isolates was done by the Kirby-Bauer disc diffusion method by a microbiologist. Data on clinical profiles and risk factors were computed in Microsoft Excel 2010, and finally, the magnitude of SSI were calculated and analyzed. Statistical analysis was done by using the Statistical Package for the Social Sciences version 25. Frequencies and percentages were calculated.

Case Definition

An SSI case was identified using the Centers for Disease Control and Prevention USA definition, which states that infection would be regarded as SSI if it occurs within 30 days of the procedure and has at least one of the following:

Purulent drainage from the wound, pain or tenderness, localized swelling, redness, malodour, fever.

RESULTS

Table 1 depicts in the study included 70 participants. The mean age of the participants was 40.64 ± 19.19 years, with a mean body mass index (BMI) of 20.87 ± 2.79 kg/m² and mean duration of surgery of 2.05 ± 0.76 h. Males constituted a slightly higher proportion (52.9%) than females (47.1%). The majority of participants were married (84.3%) and belonged to the Hindu religion (97.1%).

Most participants had no comorbidity (90.0%), while diabetes mellitus and hypertension were each present in 4.3%, and hypothyroidism in 1.4%. Regarding education, 40.0% had no formal education, while 21.4% had secondary-level education and 14.3% had intermediate-level education. The largest caste group was TMOC (58.6%), followed by Janjati (24.3%). Farmers (31.4%) and housewives (25.7%) were the predominant occupational groups.

Most participants were from the middle socioeconomic group (90.0%) according to the first socioeconomic classification presented. However, a separate variable labeled "Economic source" showed that 87.1% were classified as medium, 11.5% as poor, and 1.4% as high.

Table 1: Socio-demographic features of participants (n=70)

Characters	Frequency	Percentage
Age	40.64±19.19 years	
BMI	20.87±2.792	
Duration of surgery	2.05±0.76 h	
Gender		
Female	33	47.1
Male	37	52.9
Marital status		
Married	59	84.3
Unmarried	11	15.7
Past history		
None	70	100.0
Co-morbidity		
DM	3	4.3
HTN	3	4.3
Hypothyroidism	1	1.4
None	63	90.0
Religion		
Hindu	68	97.1
Muslim	2	2.9
Education		
Bachelor	2	2.9
Intermediate	10	14.3
None	28	40.0
Primary	15	21.4
Secondary	15	21.4
Caste group		
Brahaman	6	8.6
Chhetri	1	1.4
Dalit	4	5.7
Janjati	17	24.3
Muslim	1	1.4
TMOC	41	58.6
Occupation		
Business	4	5.7
Driver	1	1.4
Farmer	22	31.4
Foreign Employment	2	2.9
Housewife	18	25.7
Job	2	2.9
Jobless	1	1.4
General worker	1	1.4
Retired	6	8.6
Student	13	18.6

(Contd...)

Table 1: *(Continued)*

Characters	Frequency	Percentage
Socio-economic status		
Low	7	10.0
Middle class	63	90.0
Antibiotic use		
None	10	14.3
Yes	60	85.7
OTC drugs		
None	15	21.4
Yes	55	78.6
Alcohol		
None	58	82.9
Yes	12	17.1
Smoker		
None	55	78.6
Yes	15	21.4
Economic source		
Medium	61	87.1
High	1	1.4
Poor	8	11.5
Residency		
Concrete	50	71.4
Non-concrete	20	28.6
Traditional healer		
None	47	67.1
Yes	23	32.9
Vaccination		
None	34	48.6
Yes	36	51.4
Vehicle use		
Ambulance	9	12.9
Bike	18	25.7
Bus	19	27.1
Car	1	1.4
On foot	13	18.6
Tempo	9	12.9
Vehicle	1	1.4
Family history		
None	70	100.0
Lab test interest		
None	9	12.9
Yes	61	87.1
Vector/Carrier		
Both	62	88.6
None	8	11.4

(Contd...)

Table 1: *(Continued)*

Characters	Frequency	Percentage
Disease concept		
None	21	30.0
Yes	49	70.0
Drinking water		
Hand pump	64	91.4
Spring	3	4.3
Well	3	4.3
Washing water		
Hand pump	63	90.0
Spring	3	4.3
Well	4	5.7
Sanitary latrine		
None	8	11.4
Yes	62	88.6
Sanitary barrier		
None	9	12.9
Yes	61	87.1
Waste disposal		
Burial	7	10.0
Ditch	4	5.7
None	7	10.0
Farming	52	74.3
Air pollution		
None	15	21.4
Yes	55	78.6
Veg/Non veg		
Non veg	61	87.1
Veg	9	12.9
Milk/Meat		
Both	59	84.3
Milk	11	15.7
Preservative food		
None	16	22.9
Yes	54	77.1
Roasted food		
None	8	11.4
Yes	62	88.6
Food adulteration		
None	10	14.3
Yes	60	85.7
Balanced diet		
None	7	10.0
Yes	63	90.0
Domestic sanitation		
None	9	12.9
Yes	61	87.1

(Contd...)

Table 1: *(Continued)*

Characters	Frequency	Percentage
Garbage disposal		
Burial	5	7.1
Ditch	4	5.7
None	6	8.6
Yes	55	78.6
Safe kitchen		
None	8	11.4
Yes	62	88.6
Personal hygiene		
No	4	5.7
Yes	66	94.3
Pet/Animal		
None	20	28.6
Yes	50	71.4
Cooking status		
Gas	14	20.0
Gas/wood	53	75.7
Wood	3	4.3
Immunosuppression drug		
None	70	100.0
DM/HTN		
Both	2	2.9
DM	1	1.4
HTN	3	4.3
None	64	91.4
Malnutrition		
None	70	100.0
Obesity		
None	69	98.6
Yes	1	1.4
Pre-operative infection		
None	68	97.1
Yes	2	2.9
Blood transfusion		
None	64	91.4
Yes	6	8.6
Hypoxia		
None	69	98.6
Yes	1	1.4
Peri-operative hypothermia		
None	70	100.0
Anticoagulant		
None	70	100.0
Post-operative hyperglycemia		
None	70	100.0
Total	70	100.0

DM: Diabetes mellitus, HTN: Hypertension, OTC: Over-the-counter, BMI: Body mass index, TMOC: Terai-Madheshi other Caste

A high proportion of participants reported previous antibiotic use (85.7%) and over-the-counter (OTC) drug use (78.6%). Alcohol consumption was reported by 17.1%, while 21.4% were smokers. Regarding residential conditions, 71.4% lived in concrete houses and 28.6% in non-concrete houses. Nearly one-third (32.9%) reported using traditional healers.

Vaccination status was almost evenly distributed, with 51.4% vaccinated and 48.6% unvaccinated. Most participants used public or local transportation, particularly bus (27.1%) and motorcycle/bike (25.7%), while 12.9% arrived by ambulance. All participants reported no family history of the condition under investigation.

With respect to environmental and hygiene-related characteristics, 91.4% used hand-pump water for drinking, while 90.0% used hand-pump water for washing. Sanitary latrines were available to 88.6% of participants and sanitary barriers to 87.1%. Farming was the most frequently reported method of waste disposal (74.3%), which is an important finding requiring clarification because "farming" as a waste-disposal category may represent a data-entry or questionnaire-classification issue. Air pollution exposure was reported by 78.6%, and 87.1% of participants reported consuming a non-vegetarian diet.

Table 2 presents the clinical symptoms and local wound-related findings among the 70 study participants. Fever was reported in 13 (18.6%) participants, while headache was present in 10 (14.3%). Vomiting and nausea were each reported in 16 (22.9%) participants. Malaise was reported in 8 (11.4%) participants, and anorexia in 10 (14.3%) participants. No participant had delirium during the assessment period.

The most prominent clinical finding was redness at the surgical site, which was observed in 42 (60.0%) participants. Overall, the findings demonstrate that local inflammatory changes, particularly surgical-site redness, were considerably more common than systemic symptoms, such as fever, headache, malaise, and anorexia.

Table 3 presents the distribution of local symptoms and wound-related manifestations among participants. Pain was the most frequently reported symptom, present in 56 (80.0%) participants. Swelling was observed in 28 (40.0%) participants, while wound discharge was reported by 17 (24.3%) participants. Itching was reported in 12 (17.1%) participants, and an abnormal smell from the wound was reported in 9 (12.9%) participants.

Overall, the findings indicate that pain and swelling were the most common local symptoms, whereas itching and foul-smelling discharge were less frequently reported. The presence of wound discharge and abnormal smell may indicate local wound infection and should therefore be interpreted together with other clinical findings and microbiological results.

Table 2: Systemic Features of participants after surgery (n=70)

Clinical features	Frequency	Percentage
Fever		
None	57	81.4
Yes	13	18.6
Headache		
None	60	85.7
Yes	10	14.3
Vomiting		
None	54	77.1
Yes	16	22.9
Nausea		
None	54	77.1
Yes	16	22.9
Malaise		
None	62	88.6
Yes	8	11.4
Anorexia		
None	60	85.7
Yes	10	14.3
Delirium		
None	70	100.0
Redness		
None	28	40.0
Yes	42	60.0
Total	70	100.0

Table 3: Features of surgical site after surgery (n=70)

Clinical features	Frequency	Percentage
Pain		
None	14	20.0
Yes	56	80.0
Swelling		
None	42	60.0
Yes	28	40.0
Itching		
None	58	82.9
Yes	12	17.1
Discharge		
None	53	75.7
Yes	17	24.3
Smell		
None	61	87.1
Yes	9	12.9
Total	70	100.0
Pain		
None	14	20.0
Yes	56	80.0
Swelling		
None	42	60.0
Yes	28	40.0
Itching		
None	58	82.9
Yes	12	17.1
Discharge		
None	53	75.7
Yes	17	24.3
Smell		
None	61	87.1
Yes	9	12.9
Total	70	100.0

Table 4 shows the distribution of bacterial isolates obtained from the study participants. Bacterial growth was detected in 7 (10.0%) participants, while no bacterial growth was observed in 63 (90.0%) participants. Among the identified bacterial isolates, *Escherichia coli* was the most frequently isolated organism, accounting for 5 (7.1%) cases, followed by *Staphylococcus aureus* in 2 (2.9%) cases among culture-positive cases. Thus, *E. coli* constituted the predominant bacterial isolate in the present study.

Table 5 compares the presence of clinical wound-related features between patients with negative and positive bacterial cultures. Of the 70 participants, 63 (90.0%) had negative cultures, and 7 (10.0%) had positive cultures.

Among participants with redness, 2 (4.8%) had positive cultures, whereas 5 (17.9%) of those without redness had positive cultures. Pain was present in 56 participants, of whom 3 (5.4%) had positive cultures, compared with 4 (28.6%) among those without pain. For swelling, 2 (7.1%) of participants with swelling had positive cultures compared with 5 (11.9%) without swelling. Similarly, positive cultures were identified in 1 (8.3%) participant with itching and 6 (10.3%) without itching.

The strongest apparent association was observed with abnormal wound smell: 4 (44.4%) participants with smell had positive cultures compared with 3 (4.9%) among those without smell. Discharge also showed a notable difference, with positive cultures in 4 (23.5%) participants with discharge compared with 3 (5.7%) without discharge.

It demonstrates the antibacterial sensitivity pattern of the bacterial isolates obtained from the study participants. Among the tested antibiotics, LE showed the highest

sensitivity (100.0%), followed by CPM, PIP-T, and OF, each demonstrating 85.71% sensitive. CTR, AK, and CPZ showed a sensitivity rate of 71.43% each. Lower sensitivity was observed with AMX-C-(57.14%), CXM(42.86%), CD(42.86%) and AZM (28.57%). These findings highlight the importance of culture and antibacterial susceptibility testing for guiding appropriate antibiotic therapy in patients with suspected surgical-site infections.

Table 4: Type of bacterial isolates from surgical site incision (n=70)

Organism	Frequency	Percentage
Bacterial isolates		
None	63	90.0
Escherichia coli	5	7.1
Staphylococcus aureus	2	2.9
Total	70	100.0

Table 5: Distribution of clinical features of surgical site incision with positive cases (n=70)

Clinical features	Negative		Positive	
	Count	n (%)	Count	n (%)
Redness				
None	23	82.1	5	17.9
Yes	40	95.2	2	4.8
Pain				
None	10	71.4	4	28.6
Yes	53	94.6	3	5.4
Swelling				
None	37	88.1	5	11.9
Yes	26	92.9	2	7.1
Itching				
None	52	89.7	6	10.3
Yes	11	91.7	1	8.3
Smell				
None	58	95.1	3	4.9
Yes	5	55.6	4	44.4
Discharge				
None	50	94.3	3	5.7
Yes	13	76.5	4	23.5
Total	63	90.0	7	10.0

The analysis of potential risk factors for culture-positive SSIs identified several demographic, anthropometric, educational, behavioural, and procedural factors. Age appeared to be an important factor, with culture-positive SSIs observed among patients aged 11–12 years (28.5%) and those aged 35–75 years (71.5%). Regarding BMI, overweight status was reported among 28.5% of patients aged 11–12 years, whereas 71.5% of adult patients aged 35–75 years had a BMI within the range of 18.5–23 kg/m^2. A family size of more than five members was also identified as a potential contributing factor.

Educational status varied among affected patients, with 43.0% having no formal education, while 28.5% had completed primary education and 28.5% had completed secondary education. Notably, all patients with culture-positive SSIs (100%) reported irrational antibiotic use and/or OTC antibiotic consumption. A longer duration of surgery, defined as 2 h or more, was also identified as a potential procedural risk factor for culture-positive SSI.

In contrast, no association was observed between culture-positive SSI and socioeconomic status, caste, tobacco consumption, or alcohol use in this study. Some studies differ in these views, as explained in the discussion part. Hence, these findings should be interpreted cautiously because of the limited sample size, which may have reduced the statistical power to detect significant associations. Gender distribution was approximately equal, suggesting no substantial gender-related difference in the occurrence of culture-positive SSI in the study population.

DISCUSSION

Of the 70 patients enrolled in this study, the mean age was 40.64 ± 19.19 years, the mean BMI was 20.87 ± 2.79 kg/m^2, and the mean duration of surgery was 2.05 ± 0.76 h. There was a near-equal gender distribution, with males comprising a slight majority (52.9%) over females (47.1%). The majority of participants were married (84.3%), Hindu by religion (97.1%), and belonged to the Terai-Madheshi other caste pressed caste/ethnic category (58.6%), followed by the Janajati (24.3%), Brahman (8.6%), Dalit (5.7%), Chhetri (1.4%), and Muslim (1.4%) groups.

The wide age spread (mean 40.64 ± 19.19 years) reflects a general surgical population rather than a single age band, which is consistent with hospital-based SSI studies in which age group 40–60 yrscovers more population in Nepal.[16]

Table 6: Sensitivity of antibacterial agents against positive bacterial isolates (*n*=7)

Drug	CTR	CPM	PIP-T	LE	AK	AMX-C	OF	AZM	CPZ	CXM	CD
Sensitive	5	6	6	7	5	4	6	2	5	3	3
Sensitive %	71.43	85.71	85.71	100.00	71.43	57.14	85.71	28.57	71.43	42.86	42.86

CTR: Ceftriaxone, CPM: Cefepime, PIP-T: Piperacillin-Tazobactam, LE: Levofloxacine, AK: Amiikacin, AMX-C: Amoxicillin- Clavulanic Acid, OF: Ofloxacin, AZM: Azithromycin, CXM: Cefuroxime, CD: Clindamycin, CPZ: Cefoperazone

The very high rate of prior antibiotic use (85.7%) and OTC drug use (78.6%). This far exceeds the antibiotic self-medication prevalence typically reported in Nepal and the wider WHO South-East Asia Region. Nepal and Bhatta, in a systematic review of self-medication with antibiotics across the World Health Organization (WHO) South-East Asia Region, reported an overall pooled prevalence of 42.64%, describing India and Nepal as among the countries where the practice was most widespread.[2] The very high combined burden of antibiotic and OTC drug exposure in this population with well-documented contribution of antibiotic misuse to antimicrobial resistance in Nepal[2,17] and it may explain the low bacterial culture-positivity rate found among post-operative wound specimens in this study, since prior antibiotic exposure suppresses bacterial growth on culture and can produce false-negative microbiological results.

The WHO estimates that SSI incidence is at 11.8/100 surgical procedures worldwide, with a cumulative incidence of 8.6–16.0% reported across Low- and middle-income countries.[6]

Clinically, pain (80.0%) and redness (60.0%) were the most frequently reported local site features, followed by swelling (40.0%), wound discharge (24.3%), itching (17.1%), and malodorous smell (12.9%). Systemically, vomiting and nausea (22.9%) each and fever (18.6%) were relatively uncommon. Mirroring the cardinal signs of infection, the criteria for SSI, although the relatively low proportion of purulent discharge and fever suggests that most locally symptomatic wounds in the study are more common than microbiologically confirmed SSI.[10,18] The prediction of significant risk factors for SSI were age, BMI, family size, education, consumers of OTC, irrational antibiotic use, and operation duration were found. There were no association found between economic status, caste, tobacco, alcohol, and gender in this study, but one study found that the importance of wound infection in both economic and human terms should not be underestimated; cigarette smoking did not show a significantly difference when compared with non-smokers ($P < 0.09$, odds ratio 2.11, 95% confidence interval 0.87–5.08).[13] Another study found that a higher incidence of surgical wound infection occurs in cigarette smokers than in non-smokers and abstinence before surgery.[19]

Among the seven positive isolates, LE showed the highest sensitivity (100.0%), followed by CPM, PIP-T and OF (85.71%) each, Amikacin, CTR and CPZ (71.43%) each, Amoxicillin-Clavulanate (57.14%), CXM and CD (42.86%) each, and AZM, which showed the lowest sensitivity (28.57%).

Limitations of the Study

The number of culture-positive isolates was very small ($n = 7$), which limits the generalizability of the sensitivity percentages reported and makes formal statistical comparison with larger series difficult. The study was conducted at a single center, limiting generalizability to district- or provincial-level studies. High rates of self-reported prior antibiotic and OTC drug use may have reduced bacterial yield on culture, potentially underestimating the true burden of infection. Most subjects are of Dhanusha district in Nepal, limiting generalization.

Strength of the Study

The study identified the clinical features of SSIs, with isolation of bacterial causes. The study was able to identify the most sensitive antibacterial and also warn further practice regarding reliable and sensitive use of antibacterials. The study also highlights the necessity of larger cohort studies and supports the need of antibacterial stewardship.

CONCLUSION

SSI is one of the consequences of surgery, with bacteria playing a major role in resulting systemic and local symptoms. *E. coli* was more frequently isolated, and the isolates retained good *in vitro* sensitivity to LE, CPM, PIP-T, OF, and Amikacin, but poor sensitivity to AZM and only moderate sensitivity to CD and CXM. They may warrant more cautious empirical use before confirmatory culture and sensitivity results. Curative treatment to SSI with proper evaluation and monitoring improves the SSI rate. Given the small isolate number, the prediction of significant risk factors for SSI were age, BMI, family size, education, consumers of OTC, irrational antibiotic use, and operation duration were found. Patterns should be verified through larger, prospective, multi-center surveillance before being used to revise institutional antibiotic policy.

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