Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/twgk7h14

BACTERIOLOGICAL PROFILE OF SURGICAL SITE INFECTIONS ALONG WITH THEIR ANTIBIOGRAM AT A TERTIARY CARE HOSPITAL IN A RURAL AREA OF JHARKHAND.

Dr Om Prakash Bharati[1*], Dr Kasturi[2], Dr Srishti Gunjan[3]

[1*,2,3]Assistant Professor, Department of Microbiology, Laxmi Chandravansi Medical College and Hospital, Palamu, India

***Corresponding Author:** Dr Om Prakash Bharati
*Assistant Professor, Department of Microbiology, Laxmi Chandravansi Medical College and Hospital, Palamu, India

Abstract
Introduction- Surgical site infection (SSI) is one of the significant post-operative complications. SSIs can be prevented by determining the factors causing post-operative infection, which then helps in proper antibiotic medication and improving infection control methods. However reducing post-operative infection has grown more difficult due to the increased bacterial resistance to antibiotics. Only few data is available regarding SSI and their antibiogram from countries like India, where healthcare system is not much developed. So this study was conducted to determine the bacteriological profile of surgical site infections as well as their antibiogram at a tertiary care hospital.

Material and method- The present study was a descriptive cross-sectional study carried out on 82 clinically suspected SSI patients. Swabs from surgical site were collected aseptically and then processed within 30 minutes. The laboratory samples were prepared for aerobic culture, direct microscopy, and sensitivity in compliance with standard methods. The data were analyzed using SPSS version 20 and p-value less than 0.05 was considered statistically significant.

Result- In present study laboratory findings revealed 68.29% of the samples to be positive for bacterial infection A statistically significant association of bacterial positivity with age, surgical duration and cardiac disease was observed. Our study showed predominance of Gram-negative bacteria over gram-positive bacteria. Among the gram-positive bacteria, Staphylococcus spp. and among the Gram-negative bacteria, Escherichia coli (E. coli) were the most common. The most effective antibiotics against gram-positive bacteria were Ofloxacin, Ampicillin, and Clindamycin. Highly effective antibiotics against gram negative bacteria included Aztreonam, Meropenem, Imipenem, Cefepime, and Amoxicillin-Clavulanate.

Conclusion- The observed antimicrobial resistance trends emphasize the need for continuous surveillance and rational antibiotic use. Focus should be on preventive measures, including optimizing surgical practices and improving antimicrobial stewardship, to reduce the incidence of SSIs and improve patient outcomes.

Keywords- Antibiotic, surgical site infection, SSI, bacteria, infection

Introduction-

Surgery patients are more susceptible to hospital-acquired infections, which can account for as much as 77% of patient mortality.[1] 12.3% of infections obtained in hospitals are the result of surgical site infections (SSI). One significant post-operative complication is SSI. It is the third most frequently reported nosocomial infection and makes up 14% to 16% of all nosocomial infections, making it a significant global public health concern.[2] Significant morbidity is linked to SSIs, and they have been implicated in almost one-third of postoperative mortality.[3] The incidence of SSI ranges from 2.5% to 41.9% worldwide.[4] A study indicates that SSI rates in India vary from 4 to 30%.[5] The Center for Disease Control and Prevention (CDC) defines SSI as an infection that results from an operation at or close to the site of infection and occurs 30 days following the procedure, or 1 year if prosthesis or a device has been implanted. The prevalence of SSIs can be attributed to a number of factors, including microbiological factors, surroundings and infection control practices of the hospital, age and immunity of the patients etc.[6] To develop SSI prevention methods, it is imperative to ascertain these variables. According to the literature, 60% of SSIs can be prevented. The majority of SSIs can be avoided with appropriate aseptic precautions and infection control procedures implemented in hospitals.[7] According to research by the World Health Organization (WHO) and others, surgeons who receive feedback on SSIs rate and related factors, report up to 50% lesser SSIs.[8] Infection control and prevention strategies of SSI are consequently aimed at limiting the number of microorganisms at surgical site.[9] Reducing post-operative infection has grown more difficult due to the increased bacterial resistance to antibiotics. Determining the factors causing post-operative infection has been proved to be decisive in proper antibiotic medication and infection control methods to be followed in the hospitals. According to bacterial investigations, SSIs are a global health concern and the causative agents associated with SSIs can differ depending on the location, type of treatment, surgeon, hospital, or even ward within the same hospital.[10] Gram negative bacteria now have become common in hospitals in recent years as a source of dangerous illnesses. However, Staphylococcus aureus[11] is the most frequently cultivated bacteria from surgical site infections, making up 20–40% of the infection.[12] Situation has gotten worse due to the overuse of wide spectrum antibiotics and the ensuing antimicrobial resistance (AMR). The complexity of choosing the right treatment protocols has increased due to the growing issue of antibiotic resistance, especially for Gram negative pathogens.[13] Particular causative pathogen, the basic pathophysiology, and the pharmacodynamics and pharmacokinetics of the medication should all be taken into consideration when selecting an antibiotic. It is imperative to adhere to a protocol that includes early-stage microorganism testing and analysis by culture and sensitivity assessment, to solve the current problem of antibiotic resistance. This is necessary to provide the right prescription and stay clear of any possible repercussions. The resistance patterns of bacteria linked to SSIs differ globally based on region, regional epidemiology reports, and testing methods. Most data regarding drug resistance were obtained from high-income nations.[13] However, there were relatively few publications regarding the prevalence of surgical site infections (SSIs) caused by antibiotic-resistant bacteria, especially in countries like India, where there is a lack of an advanced healthcare infrastructure, inadequate infection control strategies, crowded hospital wards, and a propensity for antimicrobial drug misuse. As a result, the problem of SSIs becomes even more complicated.[14] Hence this study was conducted to determine the prevalence and bacteriological profile of surgical site infections as well as their antibiogram at a tertiary care hospital.

Material and method-

The present study was a descriptive cross-sectional study carried out on outpatient department or hospitalized SSI patients at Laxmi Chandravansi Medical College & Hospital, Bisrampur, Jharkand for 6 months, from August 2024 to January 2025. Ethical approval was obtained from Institutional Ethics Committee, LCMCH, Bishrampur (LCMCH/Pri/IEC/11/2024). A total of 82 clinically suspected patients of SSI of any age and gender were enrolled from various departments of the hospital maintaining confidentiality of their identity. Clinically suspected SSI patients of all age groups and gender from various clinical departments, who developed infection within a year of the implant or within 30 days following other surgery, were included. The study excluded patients who either declined to participate or passed away within 48 hours after receiving an SSI diagnosis. When the dressings were changed, 24 to 48hours following the procedure, all surgical sites were examined, and the accompanying physician performed a clinical assessment of the sites. Clinical characteristics that were taken into consideration for the clinical suspicion of SSI were fever, pain, swelling, chills, redness, foul odor, any colored discharge and warm skin surrounding the surgical site. Pus or wound swabs from every clinically confirmed case of SSI were collected aseptically, immediately sent to the microbiology department for investigation, and processed within 30 minutes by putting the sample into 0.5ml of sterile normal saline test tubes. The laboratory samples were prepared for aerobic culture, direct microscopy, and sensitivity in compliance with standard methods. The Gram's staining of the swabs used to make the smear allowed to identify the morphological form of the bacterium. The required agar plates inoculated from the samples, included 'Blood Agar (BA), MacConkey Agar (MAC), and Nutrient Agar (NA)'. The plates were aerobically incubated for 18-24hours at 37°C. Differentiable microorganisms were identified from positive cultures using conventional microbiological methods based on their post-incubation morphological and biochemical characteristics.[15] In accordance with 'CLSI (Clinical Standard Laboratory Institute)' guidelines[16], each isolate was subjected to an antibiotic susceptibility test on Mueller Hinton Agar (MHA) medium using the appropriate antibiotics present in the hospital. An aseptic cotton tip applicator stick was employed to ensure homogeneity of a suspension on MHA. Reference strains of 'Escherichia coli or E. coli (ATCC 25922), Pseudomonas aeruginosa (ATCC 27853), Staphylococcus aureus or S. aureus (ATCC 25923), and Klebsiella pneumoniae (ATCC 700603)' were examined as controls. Standard strains of S. aureus and E. coli were used to check biochemical testing and reagents for gram stain, and to further verify the sterility, 5% of prepared media was incubated at 37°C for 24 to 48hours. Patients were requested to follow up at the hospital's surgical outpatient clinic within 30 days of discharge in order to participate in post-discharge surveillance. The patients' socio-demographic and clinical features were assessed using a preformed & semi-structured proforma. Patients were asked to provide a thorough medical history that included their age, sex, illness type, diagnosis, kind and length of surgery, use of antibiotics, and any co-occurring conditions. The data were loaded into a Microsoft Excel spreadsheet and SPSS version 20 was used to do the necessary statistical analysis. The information was computed and shown as numbers and percentages. The 'p-value less than 0.05 were considered statistically significant'.

Result-

The mean age of participants in this study was 46.47±18.09 years. Among the 82 individuals included in the study, 37 (45.12%) were males, while 45 (54.87%) were females as shown in figure 1.

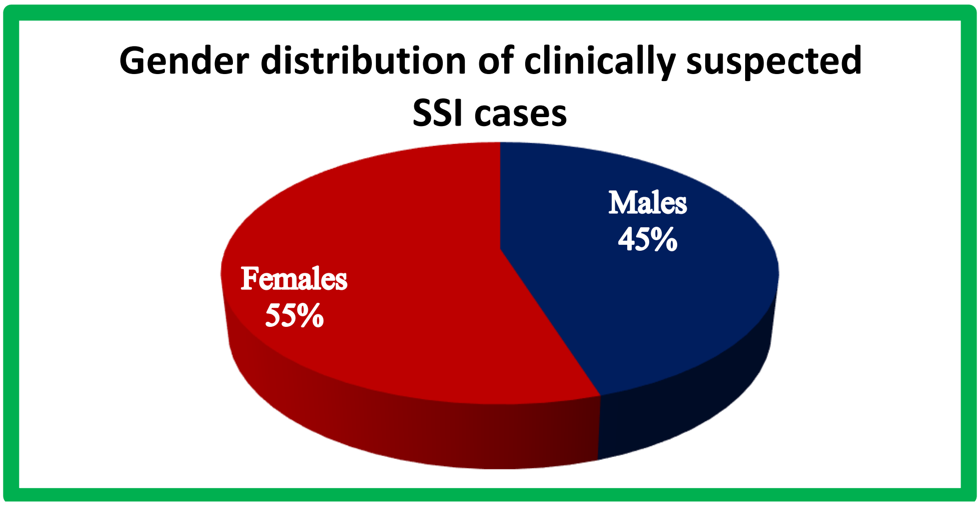

Figure 1- Gender distribution of clinically suspected SSI cases

As shown in table 1, the majority of suspected SSI cases (47.56%) belonged to the 40–60 years age group. A smaller proportion (26.82%) were aged between 20–40 years, while 18.29% were over 60 years old. The youngest age group (0–20 years) accounted for only 7.31% of the study population. Out of the total participants, 24 (29.26%) had pre-existing co-morbidities, while 58 (70.73%) did not have any associated conditions. Among those with co-morbidities, diabetes mellitus (50.00%) was the most prevalent condition, followed by cardiac disease (33.33%), thyroid disorder (29.16%), and respiratory disorders (29.16%). Tuberculosis was present in 12.50% of the cases. The majority of surgeries (73.17%) lasted less than 2 hours, while 22 (26.82%) had a duration exceeding 2 hours. Laboratory results indicated that 56 (68.29%) samples tested positive for bacterial infection, whereas 2 (31.70%) were negative.

Table 1- Distribution of participants based on different variables.

Variable		**n(%)**
Sex	Males	37 (45.12%)
	Females	45(54.87%)
Age	0-20years	6(7.31%)
	20-40years	22(26.82%)
	40-60years	39(47.56%)
	>60years	15(18.29%)
Associated Co-morbidity	Present	24(29.26%)
	Absent	58(70.73%)
Co-morbidities n=24	DM	12(50.00%)
	Cardiac disease	8(33.33%)
	Thyroid disorder	7(29.16%)
	Respiratory disorder	7(29.16%)
	Tuberculosis	3(12.50%)
Surgery duration	<2hrs	60(73.17%)
	>2hrs	22(26.82%)
Laboratory investigation	Positive samples	56(68.29%)
	Negative Samples	26(31.70%)

As seen in table 2, a statistically significant association was observed between age and bacterial positivity (P = 0.0056). Cases with age >60 years showed highest bacterial positivity with 86.66% cases and 2(13.33%) patients of this age group were negative. 74.35% patients were bacterial positive from 40–60 years group and 10(25.64%) showed negative results.

The 20–40 years age group had a positivity rate of 54.54% and 9(40.90%) patients of this age group were negative, while the 0–20 years group showed more negative cases i.e. 4(66.66%) whereas 2(33.33%) were bacterial positive. Bacterial positivity was higher among females compared to males. 35(77.77%) females were positive and 10(22.22%) were negative whereas 22(59.45%) males were bacterial positive with 15(40.54%) negative males. This difference was not statistically significant (P = 0.0730). Bacterial positivity rate was found to be more among those with co-morbidities. It was seen that, among participants with pre-existing co-morbidities, 75% tested positive for bacteria, while only 67.24% of those without co-morbidities had positive cultures.

However, difference was not statistically significant (P = 0.4875). Bacterial positivity was higher in surgeries lasting >1 hours (71.87%) compared to those lasting <1 hours (50%), with a significant association observed (P = 0.0201).

Table 2- Association of different variables with bacterial positivity.

Variable		Positive samples	Negative Samples	P value
Age	0-20years	2(33.33%)	4(66.66%)	**0.0056**
	20-40years	12(54.54%)	10(45.45%)	
	40-60years	29(74.35%)	10(25.64%)	
	>60years	13(86.66%)	2(13.33%)	
Sex	Males	22(59.45%)	15(40.54%)	0.0730
	Females	35(77.77%)	10(22.22%)	
Associated Co-morbidity	Present	18(75.00%)	6(25.00%)	0.4875
	Absent	39(67.24%)	19(32.75%)	
Surgery duration	>1hrs	46(71.87%)	14(23.33%)	**0.0201**
	<1hrs	11(50.00%)	11(50.00%)	

Table 3 shows association of co-morbidities with bacterial positivity. Among participants with DM, 91.66% had bacterial positivity compared to 65.71% in those without DM. However, this difference was not statistically significant (P = 0.0712). Participants with cardiac disease had a bacterial positivity rate of 37.50% while it was 72.97% among those without cardiac disease, and this difference was statistically significant (P = 0.0384). Bacterial positivity was 57.14% in those with thyroid disorders and 70.66% in those without, with no significant association observed (P = 0.4575). Participants with respiratory disorders had a bacterial positivity rate of 42.85%, whereas those without had a higher positivity rate (72%). The difference was not statistically significant (P = 0.1093). Bacterial positivity was lower in those with tuberculosis (33.33%) compared to those without (70.88%), and this difference was not statistically significant (P = 0.1655).

Table 3- Association of different co-morbities with bacterial positivity.

Co-morbidities		Positive samples	Negative samples	p-value
DM	Present	11(91.66%)	1(8.33%)	0.0712
	Absent	46(65.71%)	24(34.28%)	
Cardiac disease	Present	3(37.50%)	5(62.50%)	**0.0384**
	Absent	54(72.97%)	20(27.02%)	
Thyroid disorder	Present	4(57.14%)	3(42.855)	0.4575
	Absent	53(70.66%)	22(29.33%)	
Respiratory disorder	Present	3(42.855)	4(57.14%)	0.1093
	Absent	54(72.00%)	21(28.00%)	
Tuberculosis	Present	1(33.335)	2(66.66%)	0.1655
	Absent	56(70.88%)	23(29.11%)	

As depicted in figure 2, a total of 56 bacterial isolates were identified from the positive samples. Among the gram positive bacteria, Staphylococcus spp. was the most prevalent, accounting for 15 (26.31%) of the isolates and Coagulase-negative Staphylococcus (CONS) was detected in 5 (8.77%) of cases. Among the gram-negative bacteria, Escherichia coli (E. coli) was the most common gram-negative bacterium, found in 12 (21.05%) cases followed by Pseudomonas aeruginosa, Citrobacter spp, Klebsiella spp, Acinetobacter spp and Proteus spp found in 8 (14.03%),7 (12.28%), 6 (10.52%), 2 (3.50%) and 1 (1.75%) cases respectively. The findings indicate a predominance of Gram-negative bacteria (63.16%) over Gram-positive bacteria (35.08%), with Staphylococcus spp. and E. coli being the most frequently isolated pathogens.

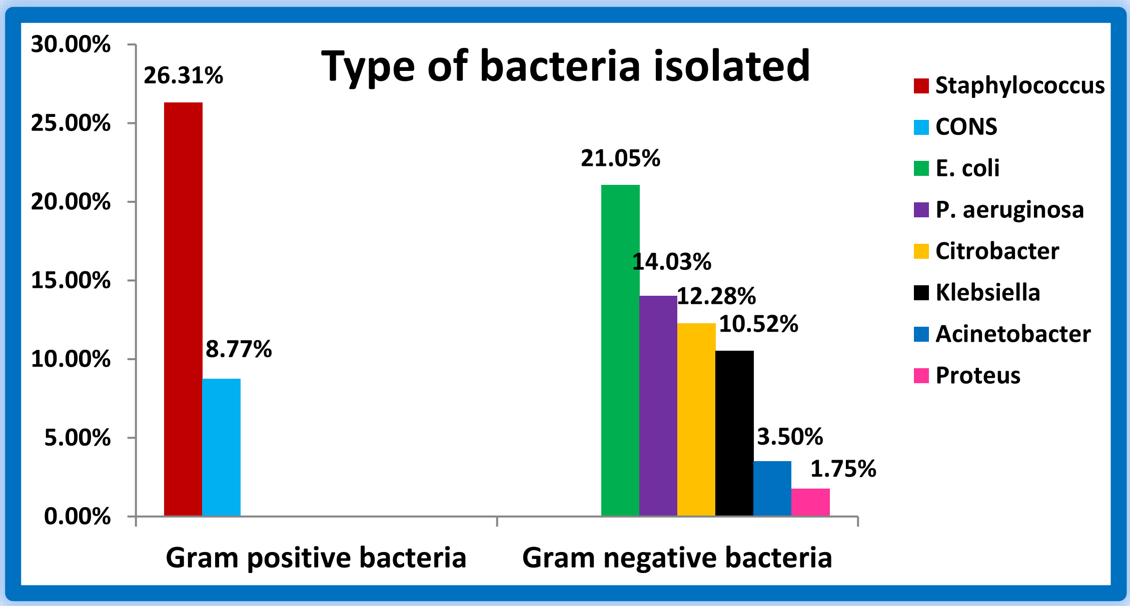

Figure 2- Distribution of positive cases based on the type of bacteria isolated

A total of 20 gram positive bacterial isolates were analyzed for their antibiotic sensitivity showed in table 4. Staphylococcus spp. and CONS showed variation across different drugs. Highly effective antibiotics were Ofloxacin, Ampicilin and Clindamycin. Ofloxacin exhibited the highest overall sensitivity i.e. 75% (80% in Staphylococcus spp. and 60% in CONS). Ampicillin was effective in 86.66% of Staphylococcus spp. and 40% of CONS, with an overall sensitivity of 75%. Clindamycin showed 80% sensitivity in Staphylococcus spp. but was ineffective against CONS (0%), with an overall sensitivity of 60%. Moderately effective antibiotics were Erythromycin, Gentamicin, Ciprofloxacin and Levofloxacin. Erythromycin showed 40% sensitivity in Staphylococcus spp. and 60% in CONS, with an overall 45% sensitivity. Gentamicin was effective in 20% of Staphylococcus spp. and 80% of CONS, with an overall 35% sensitivity. Ciprofloxacin and Levofloxacin each showed 30% overall sensitivity. Least effective antibiotics included Cefoxitin, Amikacin, Vancomycin and Linezolid. Cefoxitin had 25% overall sensitivity. Vancomycin and Linezolid were highly effective against CONS (80%), but none of the Staphylococcus spp. were sensitive to these antibiotics, with an overall sensitivity of 20%. Amikacin was effective in 20% of cases.

Table 4- Antibiotic sensitivity pattern of gram-positive bacteria.

Antibiotic	**Staphylococcus n=15**	**CONS n=5**	**Total n=20**
Gentamicin	3(20%)	4(80%)	7(35%)
Amikacin	1(6.66%)	3(60%)	4(20%)
Ampicilin	13(86.66%)	2(40%)	15(75%)
Ciprofloxacin	5(33.33%)	1(20%)	6(30%)
Levofloxacin	2(13.33%)	4(80%)	6(30%)
Erythromycin	6(40%)	3(60%)	9(455)
Ofloxacin	12(80%)	3(60%)	15(75%)
Cefoxitin	3(20%)	2(40%)	5(25%)
Vancomycin	0(0%)	4(80%)	4(20%)
Linezolid	0(0%)	4(80%)	4(20%)
Penicilin	7(46.66%)	1(20%)	8(40%)
Clindamycin	12(80%)	0(0%)	12(60%)

A total of 36 gram negative bacterial isolates were analyzed for their antibiotic sensitivity depicted in table 5. Highly effective antibiotics against gram negative bacteria were Aztreonam, Meropenem, Imipenem, Cefepime and Amoxicillin-Clavulanate. Aztreonam showed the highest sensitivity, with 86.1% of isolates responding, including 100% sensitivity in E. coli, Klebsiella, and Proteus. Meropenem was effective against 80.5% of isolates, showing 100% sensitivity in E. coli and Klebsiella. Imipenem had 72.2% sensitivity, with 100% effectiveness in E. coli and Klebsiella. Cefepime was effective in 72.2% of isolates, showing high sensitivity in Klebsiella (83.3%) and E. coli (75%). Amoxicillin-Clavulanate had 77.7% sensitivity, with 100% effectiveness against Citrobacter, Acinetobacter, and Proteus. Moderately effective antibiotics were Tetracycline, Piperacillin, Gentamicin, Levofloxacin and Ciprofloxacin. Tetracycline showed 61.1% sensitivity, with high activity against Klebsiella (83.3%) and E. coli (75%). Piperacillin was effective in 50% of cases, with higher activity against E. coli (66.6%). Gentamicin showed 52.7% sensitivity, being most effective against P. aeruginosa (75%) and Proteus (100%). Levofloxacin had 55.5% sensitivity, showing 100% effectiveness against Acinetobacter. Ciprofloxacin was effective in 44.45% of cases but showed poor activity against Acinetobacter and Proteus. Less effective antibiotics were Amikacin, Ceftazidime and Ceftriaxone. Ceftazidime and Ceftriaxone had lower effectiveness, with 38.8% and 36.1% sensitivity, respectively. Amikacin showed 44.4% sensitivity, with higher activity in Klebsiella (66.6%) but poor response in Citrobacter (14.2%) and Acinetobacter (0%).

Table 5- Antibiotic sensitivity pattern of gram-positive bacteria.

Antibiotic	**E. coli n=12**	**P.aeruginosa n=8**	**Citrobacter n=7**	**Klebsiella n=6**	**Acinetobacter n=2**	**Proteus n=1**	**Total n=36**
Gentamicin	5(41.6%)	6(75%)	3(42.8%)	3(50%)	1(50%)	1(100%)	19(52.75)
Amikacin	7(58.3%)	3(37.5%)	1(14.2%)	4(66.6%)	0(0%)	1(100%)	16(44.4%)
Ampicillin	3(255)	8(100%)	7(100%)	3(50%)	2(100%)	1(100%)	24(66.6%)
Ciprofloxacin	5(41.6%)	7(87.5%)	2(28.5%)	2(33.3%)	0(0%)	0(0%)	16(44.45)
Levofloxacin	5(41.6%)	6(75%)	4(57.1%)	3(50%)	2(100%)	0(0%)	20(55.5%)
Imipenem	12(100%)	2(25%)	4(57.1%)	6(100%)	1(50%)	1(100%)	26(72.2%)
Ceftriaxone	7(58.3%)	3(37.5%)	2(28.5%)	1(16.6%)	0(0%)	0(0%)	13(36.1%)
Piperacilin	8(66.6%)	3(37.5%)	4(57.1%)	3(50%)	0(0%)	0(0%)	18(50%)
Meropenem	12(100%)	5(62.5%)	5(71.4%)	6(100%)	0(0%)	1(100%)	29(80.5%)
Ceftazidime	3(25%)	6(75%)	3(42.8%)	1(16.6%)	1(50%)	0(0%)	14(38.8%)
Aztreonam	12(100%)	5(62.5%)	6(85.7%)	6(100%)	1(50%)	1(100%)	31(86.1%)
Cefepime	9(75%)	6(75%)	4(57.1%)	5(83.3%)	1(50%)	1(100%)	26(72.2%)
Tetracycline	9(75%)	3(37.5%)	4(57.1%)	5(83.3%)	0(0%)	1(100%)	22(61.1%)
Amoxicilin-Clavulanate	8(66.6%)	6(75%)	7(100%)	4(66.6%)	2(100%)	1(100%)	28(77.7%)

Discussion-

In present study, the mean age of participants was 46.47±18.09 years, with a higher proportion of females (54.87%) than males (45.12%). Laboratory findings revealed that 68.29% of the samples tested positive for bacterial infection, confirming that a significant proportion of suspected cases were indeed due to microbial involvement. In our study females showed a non-significantly higher bacterial positivity rate compared to males. This finding aligns with the study by Brown et al., 2020[17] suggesting that while gender may influence infection rates, it is often not a significant independent risk factor. The highest prevalence of suspected SSIs was observed in the 40–60 years age group (47.56%), which is in agreement with previous studies by Smith et al., 2018[18] and Johnson et al., 2020.[19] A statistically significant association was observed between age and bacterial positivity, with the highest positivity rate seen in patients aged >60 years. This finding is in agreement with the study by Smith et al., 2019[20] and Johnson et al., 2021[21] indicating that older individuals have a higher susceptibility to bacterial infections due to age-related immune decline and comorbid conditions. Younger age groups exhibited lower positivity. Our findings are in agreement with Lee and Kim (2018),[22] who reported similar trends in bacterial infections among different age groups. Comorbid conditions played a significant role in our study population, with 29.26% of participants having at least one pre-existing condition. Diabetes mellitus was the most frequently observed comorbidity. This finding is consistent with prior research that highlights diabetes as a major risk factor for SSIs due to impaired wound healing and immune response.[23] Among participants, bacterial positivity rates were non-significantly higher in DM patients. Similar trends were reported in previous studies, where DM has been associated with an increased risk of infections due to impaired immune function and delayed wound healing.[24,25] Bacterial positivity was non-significantly lower in those with tuberculosis. This finding aligns with research by Williams et al. (2021),[26] which suggested that tuberculosis patients may have differing microbial colonization patterns due to prolonged antibiotic treatments. Participants with cardiac disease had a significantly lower bacterial positivity rate. These findings contrast with prior study by Brown et al., 2019[23] indicating that cardiac patients, particularly those with valvular diseases, often have increased susceptibility to infections. Bacterial positivity was non-significantly lower in those with thyroid disorders, supporting earlier research by Lee & Kim, 2017,[27] suggesting no direct link between thyroid dysfunction and infection risk. Participants with respiratory disorders also showed non-significantly lower bacterial positivity rate, which aligns with Martinez et al. (2018), [28] who reported similar trends in patients with chronic respiratory conditions. In this study, the majority of surgeries were completed in >1 hour. Surgical duration was found to be a statistically significant predictor of bacterial positivity. Similar findings have been reported in research by Gonzalez et al., 2017[29] and Martinez et al., 2019,[30] suggesting that prolonged surgical time increases the risk of bacterial contamination and subsequent SSIs. Our study showed predominance of Gram-negative bacteria over gram-positive bacteria, which is consistent with prior studies,[28,31] which highlight gram-negative organisms as the leading causative agents in SSIs. Among the gram-positive bacteria, Staphylococcus spp. was the most prevalent, and among the Gram-negative bacteria, Escherichia coli (E. coli) were the most common. The most effective antibiotics against gram-positive bacteria were Ofloxacin, Ampicillin, and Clindamycin. Ofloxacin exhibited the highest overall sensitivity at 75%, with Staphylococcus spp. showing 80% sensitivity and CONS 60%.

These results are consistent with prior studies, [32,33] that identified Ofloxacin and Clindamycin as highly effective treatments for gram-positive infections. Moderately effective antibiotics included Erythromycin, Gentamicin, Ciprofloxacin, and Levofloxacin. Erythromycin had an overall sensitivity of 45%. Least effective antibiotics included Cefoxitin, Amikacin, Vancomycin, and Linezolid. Vancomycin and Linezolid were highly effective against CONS (80%), but none of the Staphylococcus spp. isolates were sensitive to these drugs. These findings align with previous research by Jones et al., 2021,[34] indicating that resistance to Vancomycin in Staphylococcus spp. is an emerging concern. Highly effective antibiotics against gram negative bacteria included

Aztreonam, Meropenem, Imipenem, Cefepime, and Amoxicillin-Clavulanate. Aztreonam exhibited the highest sensitivity (86.1%), with E. coli, Klebsiella, and Proteus showing 100% sensitivity. These results are consistent with findings by Patel et al. (2017),[35] who reported carbapenems as highly effective against gram-negative surgical infections. Moderately effective antibiotics included Tetracycline, Piperacillin, Gentamicin, Levofloxacin, and Ciprofloxacin.

Tetracycline showed 61.1% sensitivity, with high effectiveness against Klebsiella (83.3%) and E. coli (75%). Less effective antibiotics included Amikacin, Ceftazidime, and Ceftriaxone, which exhibited sensitivities of 44.4%, 38.8%, and 36.1%, respectively. The reduced efficacy of these antibiotics may be attributed to emerging antimicrobial resistance trends, as documented in studies by Roberts et al. (2018).[36]

Conclusion-

This study highlights the significant burden of surgical site infections (SSIs) in a tertiary care hospital in a rural area of Jharkhand, emphasizing the need for effective infection control measures. The findings revealed a high prevalence of SSIs, with a predominance of Gram-negative bacteria, particularly Escherichia coli and Pseudomonas aeruginosa, while Staphylococcus aureus was the most common Gram-positive pathogen. Age, presence of comorbidities (especially diabetes), and prolonged surgical duration were key factors associated with bacterial positivity.

The study also highlights the growing challenge of antimicrobial resistance, as many commonly used antibiotics demonstrated reduced efficacy. Carbapenems and Aztreonam were the most effective antibiotics against Gram-negative isolates, while Ofloxacin, Ampicillin, and Clindamycin were the best options for Gram-positive bacteria. These findings emphasize the need for improved infection control, targeted antibiotic use, and routine microbial surveillance to reduce SSIs and enhance patient outcomes in resource-limited healthcare settings. Future research should focus on molecular mechanisms of resistance and the development of alternative therapeutic strategies.

Conflict of interest: None

Source of funding: Nil

References-

1. Amare B, Abdurrahman Z, Moges B, Ali J. Prospective surgical site bacterial infections and drug susceptibility patterns at Gondar university teaching Hospital, Northwest Ethiopia. J Bacteriol Parasitol. 2011;2(8):1000126. doi:10.4172/2155-9597.1000126
2. Valecha SM, Saswade MN. An original research paper on incidence and risk factors for surgical site infections following major abdominal surgeries in obstetrics and gynaecology. Int J Reprod, Contracept, Obstet Gynecol. 2017;6(5):1859–63
3. Mukagendaneza MJ, et al. Incidence, root causes, and outcomes of surgical site infections in a tertiary care hospital in Rwanda: a prospective observational cohort study. Patient Saf Surg. 2019;13(1):1–8
4. Mawalla B, Mshana SE, Chalya PL, Imirzalioglu C, Mahalu W. Predictors of surgical site infections among patients undergoing major surgery at bugando medical centre in North western Tanzania. BMC Surg. 2011;11:21. doi:10.1186/1471-2482-11-21
5. Suchitra J, Laxmidevi N. Assessing risk factors, outcomes and antimicrobial sensitivity patterns. Afr J Microbiol Res. 2009;3(4):175– 9
6. Narula H, Chikara G, Gupta P. A prospective study on bacteriological proϐ‹ le and antibiogram of postoperative wound infections in a tertiary care hospital in Western Rajasthan. J Family Med Prim Care 2020; 9:1927-34

7. Mathur P, Mittal S, Trikha C, et al. Protocol for developing a survelliance system for surgical site infections. Indian J Med Mirobiol 2019; 37:318-325.
8. Sharma M, Bittu R, Garg K, Sehra H, Kewalramani S. Prevalence of Post-operative Surgical site infection in a district Hospital of western Rajasthan India. Int Multispeciality J Health. 2017;3(3):59–63
9. Gallo J, Nieslanikova E. Prevention of prosthetic joint infection: from traditional approaches towards quality improvement and data mining. J Clin Med. 2020;9(7):2190.
10. Owens CD, Stoessel K. Surgical site infections: epidemiology, microbiology and prevention. J Hosp Infect. 2008; 70 (Suppl 2): 3-10.
11. Regmi SM, et al. Bacteriological profle and antimicrobial susceptibility patterns of wound infections among adult patients attending Gandaki Medical College Teaching Hospital, Nepal. J Gandaki Med College-Nepal. 2020;13(1):60–4
12. Sida H, Pethani P, Dalal H, Shah N, Shaikh. Current microbial isolates from wound samples and their susceptibility pattern in a tertiary care hospital. Natl J Integr Res Med. 2018;9(2):17–21.
13. Emori TG, Gaynes RP. An overview of nosocomial infections, including the role of the microbiology laboratory.Clin Microbiol Rev. 1993;6(4):428-42. doi: 10.1128/CMR.6.4.428, PMID 8269394.
14. Moradali MF, Ghods S, Rehm BHA. Pseudomonas aeruginosa lifestyle: a paradigm for adaptation, survival, and persistence. Front Cell Infect Microbiol. 2017;7:39. doi: 10.3389/fcimb.2017.00039, PMID 28261568.
15. Collee JG, Fraser AG, Marmion BP, Simmons A. Mackie and McCartney – Practical Medical Microbiology. 14th edn. New Delhi: Elsevier; 2007. p. 53–94.
16. Horan TC, Andrus M, Dudeck MA. CDC/NHSN surveillance defnition of health care-associated infection and criteria for specifc types of infections in the acute care setting. Am J Infect Control. 2008;36(5):309–32
17. Gender and infection risk: An epidemiological perspective. Infectious Disease Journal, 27(1), 45-52.
18. Surgical site infections in middle-aged populations: A comprehensive study. Journal of Surgical Research, 220, 45-52.
19. Risk factors for SSIs: A systematic review. International Journal of Surgery, 58, 112-120.
20. Age-related immune decline and infection susceptibility. Journal of Geriatric Medicine, 34(2), 89-97.
21. Surgical site infections in elderly populations: A retrospective analysis. Surgical Science Review, 29(4), 112-124.
22. Bacterial infections across different age groups: A clinical review. Clinical Microbiology Journal, 20(3), 178-185.
23. Diabetes and surgical site infections: A meta-analysis. Diabetes & Surgery, 12(2), 89-97.
24. Diabetes and infection risk: A comprehensive review. Journal of Clinical Microbiology, 38(4), 210-225.
25. Surgical site infections and diabetes mellitus. Diabetes & Surgery, 12(2), 89-97.
26. Immunosuppression and infection risk in malignancy and tuberculosis patients. Infectious Disease Journal, 29(3), 178-185.
27. Pediatric surgical infections: Incidence and prevention. Pediatric Surgery Journal, 33(4), 200-208.
28. Infection control measures in surgery: Effectiveness and challenges. Journal of Infection Control, 40(5), 120-135.
29. The impact of prolonged surgery on infection rates.Surgical Practice Review,15(1),33-41
30. Surgical infection prevention strategies: An evidence-based approach. Journal of Infection Control, 42(2), 99-115.
31. Surgical duration and its impact on infection rates.Surgical Practice Review,15(1), 33-41.

32. Antibiotic resistance trends in Gram-positive bacteria. Journal of Infection Control, 29(3), 112-124.
33. Clindamycin efficacy in Gram-positive infections. Journal of Antimicrobial Research, 15(2), 55-72.
34. Vancomycin resistance in Staphylococcus species: A growing concern. Microbial Resistance Journal, 50(4), 210-230.
35. Carbapenem efficacy against Gram-negative pathogens. Antibiotic Stewardship Journal, 34(1), 89-101.
36. Emerging resistance patterns in surgical infections. Clinical Infectious Diseases, 40(2), 178-190.