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RESEARCH ARTICLE

Clinical Profiles, Bloodstream Infections, and Antibacterial Susceptibility Patterns of Bacterial Isolates in a Tertiary Care Hospital: A Cross-sectional Study at Janaki Medical College Teaching Hospital, Ramdaiya, Dhanusha, Nepal

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ABSTRACT

Background: Bloodstream infections (BSIs) are among the leading causes of morbidity and mortality worldwide and are associated with prolonged hospitalization, increased health care costs, and adverse clinical outcomes. The emergence and spread of antibacterial resistance have further complicated the management of BSIs by limiting effective empirical treatment options. Knowledge of the local bacterial profiles and antibacterial susceptibility patterns is essential for guiding appropriate antibiotic therapy and strengthening antibacterial stewardship programs. This study aimed to evaluate the clinical profiles, bacterial spectrum, and antibacterial susceptibility patterns of BSIs among patients attending a tertiary care hospital in Nepal. **Methods:** A hospital-based prospective descriptive cross-sectional observational study was conducted at Janaki Medical College Teaching Hospital. Patients presenting to the tertiary hospital with fever for more than 3 days were evaluated. Blood culture was performed, bacterial isolates were identified, and antimicrobial susceptibility was assessed by conventional disk diffusion methods. Demographic, clinical, microbiological, and antibacterial susceptibility data were entered in Microsoft Excel 2010 and analyzed using the Statistical Package for the Social Sciences version 25. **Results:** A total of 200 blood culture samples were processed. Among them (35/200, 17.5%) were culture-positive. Gram-negative bacteria accounted for (28/35, 80%) of the isolates, while Gram-positive bacteria comprised (7/35, 20%). The predominant bacterial isolate was *Escherichia coli* (14/35, 40%), followed by *Salmonella* Typhi (7/35, 20%) and *Staphylococcus aureus* (7/35, 20%). Antibacterial susceptibility testing demonstrated the highest sensitivity to Amikacin (35/35,100%), followed by Levofloxacin (34/35, 97.14%), Piperacillin–tazobactam (30/35, 85.71%), Cefoperazone (28/35, 80.0%), Amoxicillin–Clavulanic acid (28/35, 80.0%), Ofloxacin (28/35, 80.0%), Clindamycin (26/35, 74.28%) and Azithromycin (20/35, 57.14). Lower susceptibility was observed for Ceftriaxone (16/35, 45.71%), Cefuroxime (13/35, 37.14%), and Cefepime (6/35, 17.14%), indicating relatively high resistance to cephalosporins. Fever was the presenting symptom (200/200, 100%), followed by headache (142/200, 71.0%), malaise (136/200, 68.0%), anorexia (128/200, 64.0%), nausea (69/200, 34.5%), delirium (61/200, 30.5%), and vomiting (49/200, 24.5%). **Conclusion:** BSIs remain a significant clinical challenge because of the increasing prevalence

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of antibacterial-resistant bacterial pathogens. Regular surveillance of bacterial isolates and antibacterial susceptibility patterns is essential for optimizing empirical antibiotic therapy, improving patient outcomes, and supporting antibacterial stewardship. Hospital-specific antibiograms should be updated periodically to guide clinicians in selecting effective antibacterial therapy.

Keywords: Antibacterial susceptibility, antibiogram, antimicrobial resistance, blood culture, bloodstream infection, clinical profiles, Nepal, tertiary care hospital

INTRODUCTION

Bloodstream infections (BSIs) are among the most severe infectious diseases encountered in clinical practice and remain a major cause of morbidity and mortality worldwide. They occur when pathogenic microorganisms invade the bloodstream, triggering a systemic inflammatory response that may progress to sepsis, septic shock, disseminated intravascular coagulation, multiple organ dysfunction syndrome, and death if not diagnosed and treated promptly. Patients with compromised immunity, particularly those with febrile neutropenia, malignancy, diabetes mellitus (DM), chronic kidney disease, or prolonged hospitalization, are at significantly higher risk of developing severe BSIs and their associated complications.[1]

The discovery of antibiotics during the twentieth century revolutionized the treatment of infectious diseases and substantially reduced infection-related morbidity and mortality. However, the widespread and often inappropriate use of antimicrobial agents in human medicine, veterinary practice, and agriculture has accelerated the emergence and dissemination of antimicrobial resistance (AMR). The increasing prevalence of multidrug-resistant (MDR) bacteria has become a major global public health challenge, limiting therapeutic options, prolonging hospital stays, increasing healthcare costs, and contributing to poor clinical outcomes.[2]

According to the Global Burden of AMR Study, AMR was directly responsible for approximately 1.27 million deaths worldwide and contributed to nearly 4.95 million deaths in 2019. In India alone, an estimated 297,000 deaths were directly attributable to AMR, while more than 1,042,500 deaths were associated with drug-resistant bacterial infections.[2] These alarming statistics highlight the urgent need for continuous surveillance of bacterial pathogens and their antibacterial susceptibility profiles to guide evidence-based empirical antibiotic therapy. Both Gram-positive and Gram-negative bacteria are important etiological agents of BSIs. Common Gram-positive pathogens include *Staphylococcus aureus*, coagulase-negative staphylococci, *Enterococcus* species, and *Streptococcus pneumoniae*, whereas *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Acinetobacter* species, *Salmonella* species, and *Enterobacter* species are among the predominant Gram-negative pathogens. Several studies have demonstrated increasing resistance among *E. coli*, *K. pneumoniae*, *S. pneumoniae*, *Shigella* species, and *Vibrio cholerae* to commonly prescribed first-line antibiotics. Conversely, many Gram-positive organisms continue to show relatively high susceptibility to amikacin (AK) and vancomycin while exhibiting substantial resistance to cefuroxime (CXM) and cotrimoxazole.[3] Gram-negative bacteremia is generally associated with a more severe clinical course, higher rates of septic shock, and mortality ranging from 12% to 38%.[4]

Early diagnosis through blood culture and timely administration of appropriate antibacterial therapy remain the cornerstones of effective management of BSIs. Because bacterial epidemiology and antibacterial susceptibility patterns vary across geographical regions and healthcare institutions, local surveillance data are essential for developing hospital-specific antibiograms, guiding empirical antibiotic selection, and strengthening antibacterial stewardship programs.

Despite the growing burden of antibacterial resistance, data on the clinical presentation, bacterial etiology, and antibacterial susceptibility patterns of BSIs in Nepal remain limited, particularly in the Madhesh Province. Therefore, this study aimed to evaluate the clinical profiles of patients with BSIs, identify the bacterial pathogens isolated from blood cultures, determine their antibacterial susceptibility patterns, and generate local evidence to support effective empirical antibiotic therapy and antibacterial stewardship at Janaki Medical College Teaching Hospital, Ramdaiya, Dhanusha, Nepal.

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. 023/IRC-JMC/2024/017).

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 patients presenting to the entire Tertiary Hospital of Janaki Medical College with fever >3 days.

Study Duration

The study was conducted over 1 year, from November 12th, 2024, to October 13th, 2025.

Sampling Technique

Participants were selected using a random sampling technique.

Sample Size Determination

Sample size(S)=$z^2 x p x q/d^2$

Where q=1-p

P=0.12

Z^2=3.84

d=5%

S=163.

Study Variables

Age, sex, smoking, immunocompromised patients, bacteremia.

Inclusive Criteria

Patients presenting with fever for more than 3 days during the study period were selected by random sampling, from whom written/verbally informed consent was obtained. They were included in the study.

Exclusive Criteria

Patients suffering from clinical viral and fungal infections and/or using antibiotics for more than 48 h were excluded from the study.

Sample Collection and Analysis

A volume of 3 mL of blood sample was drawn from each patient in the peripheral vein aseptically and immediately poured into 27 mL of sterile brain heart infusion broth (BHI). The blood sample and BHI broth were thoroughly mixed to avoid clotting of the blood and immediately transported to the incubator. The broth was incubated at 37°C for 3 days. The blood culture bottle was shaken and was subcultured at 24th, 48th and 72nd h of incubation at 37°C on blood agar and MacConkey agar plates for 24 h. These plates were read. Gram stain was done, and bacteria were classified accordingly. Further, the identification of bacteria was made using the biochemical method. Antibacterial susceptibility testing of bacterial isolates was done by Kirby–Bauer disc diffusion method by the microbiologist. Data on clinical profiles Demographic characters were collected and computed in Microsoft Excel 2010. Statistical analysis was done using Statistical Package for the Social Sciences version 20. Frequencies and percentages were calculated.

Informed Consent

Written and verbal consent was obtained from all eligible participants.

RESULTS

Table 1 includes detailed socio-demographic characters of participants along with further elaboration on various heading as below.

Socio-demographic Characteristics

A total of 200 patients clinically suspected of BSI were enrolled in the study. The largest age group was 20–40 years (69, 34.5%), followed by 40–60 years (48, 24.0%), >60 years (39, 19.5%), 10–20 years (34, 17.0%), and <10 years (10, 5.0%). The study population comprised (101, 50.5%) females and (99, 49.5%) males, showing an almost equal gender distribution.

Most participants (159, 79.5%) had a normal body mass index (BMI), whereas (23, 11.5%) were overweight and (18, 9.0%) were underweight. The majority of patients were residents of Dhanusha district (179, 89.5%), followed by Mahottari (13, 6.5%), Siraha (4, 2.0%) and other districts (4, 2.0%).

Regarding marital status, (141, 70.5%) participants were married and (58, 29.0%) were unmarried. The median family size ranged between five and seven members, with the highest proportion belonging to families of six members (55, 27.5%).

Spectrum of Disease Presentation

Unexplained fever was accounted for in 83 (41.5%) patients, followed by AE with COPD (20, 10%), hypertension (14, 7%), UTI and pneumonia (13, 6.5%) cases each, while URTI was reported in 9 (4.5%), community-acquired pneumonia (8,4%), and Sinusitis (7,3.5%). Enteric fever and DM (6, 3%) participants each, and several other conditions, each contributing <1% of cases.

Educational and Socioeconomic Characteristics

Nearly half of the participants (98, 49.0%) were illiterate, while (46, 23.0%) had completed secondary education and (38, 19%) had primary education. Only a small proportion had completed higher education.

Most of the participants belonged to the middle socioeconomic class (173, 86.5%), while (26, 13.0%) belonged to the lower socioeconomic class and only (1, 0.5%) belonged to the higher socioeconomic class. The majority of participants were from the Terai Madhesi other caste group (119, 59.5%), followed by Janajati (49, 24.5%), Dalit (11, 5.5%), Muslim (11, 5.5%), Brahman (6, 3.0%), and other caste groups.

The most common occupations were farming (45, 22.5%), housewives (45, 22.5%), students (43, 21.5%), and business (14,7%).

Behavioral Characteristics

Prior antibiotic use was reported by 92 (46.0%) participants, while 108 (54.0%) had not received antibiotics before presentation.

Self-medication with over-the-counter drugs was common and reported by 161 (80.5%) participants. Smoking and alcohol consumption were reported by 30 (15.0%) and 18 (9.0%) participants, respectively. Traditional healers had been consulted by 69 (34.5%) participants before seeking hospital care.

Environmental and Hygiene Characteristics

Most households obtained drinking water from hand pumps (183, 91.5%), while hand pumps were also the major source of washing water (186, 93.0%).

Improved sanitation practices were common, with 190 (95.0%) households having sanitary latrines, 180 (90.0%) maintaining sanitary barriers, and 189 (94.5%) practicing appropriate waste disposal. Domestic sanitation (193, 96.5%), garbage disposal (193, 96.5%), safe kitchens (190, 95.0%), and personal hygiene (191, 95.5%) were reported by the majority of participants.

Dietary and Lifestyle Characteristics

Most participants consumed a non-vegetarian diet (154, 77.0%), while 155 (77.5%) regularly consumed both milk and meat products.

Table 1: Sociodemographic characteristics of participants (*n*=200)

Characters	*n*	Percentage	Characters	*n*	Percentage
Age range			BMI		
<10	10	5.0	Normal	159	79.5
10–20	34	17.0	Overweight	23	11.5
20–40	69	34.5	Under weight	18	9.0
40–60	48	24.0	Total	200	100
>60	39	19.5	Marital status		
Total	200	100	Baby	1	0.5
Gender			Married	141	70.5
Female	101	0.5	Unmarried	58	29.0
Male	99	49.5	Total	200	100
Total	200	100	Occupation		
Home district			Baby	5	2.5
Baglung	2	1.0	Business	14	7.0
Dhanusha	179	89.5	Driver	2	1.0
India	1	0.5	Farmer	45	22.5
Kathmandu	1	0.5	Foreign Emplo.	7	3.5
Mahottari	13	6.5	Guard	1	0.5
Siraha	4	2.0	Homemaker	45	22.5
Total	200	100	Labor	5	2.5
Family size			Medical	4	2.0
1	1	0.5	Office job	7	3.5
2	12	6.0	Retired	13	6.5
3	11	5.5	Play group	2	1.0
4	21	10.5	Plumber	1	0.5
5	32	16.0	Student	43	21.5
6	55	27.5	Teacher	3	1.5
7	31	15.5	None	3	1.5
8	24	12.0	Total	200	100
9	3	1.5	Antibiotic use empirical		
10	7	3.5	None	108	54.0
11	1	0.5	Yes	92	46.0
12	1	0.5	Total	200	100
15	1	0.5	OTC drugs		
Total	200	100	None	39	19.5
Religion			Yes	161	80.5
Buddhist	1	0.5	Total	200	100
Hindu	194	97.0	Alcohol		
Muslim	5	2.5	None	182	91.0
Total	200	100	Yes	18	9.0
Washing water			Total	200	100
Hand pump	186	93.0	Drinking water		
Spring	2	1.0	Hand pump	183	91.5
Water supply	1	0.5	Jar	3	1.5
Well	11	5.5	Spring	2	1.0
Total	200	100.0	water supply	1	0.5
SES class			Well	11	5.5
High	1	0.5	Total	200	100

(Contd...)

Table 1: *(Continued)*

Characters	*n*	Percentage	Characters	*n*	Percentage
Low	26	13.0	Diagnosis		
Middle	173	86.5	Acute pharyngitis	2	1
Total	200	100	AE with COPD	20	10
Traditional healer			Sinusitis	7	3.5
None	131	65.5	CAP	8	4.0
Yes	69	34.5	UTI	13	6.5
Total	200	100	Pneumonia	13	6.5
Vaccination			URTI	9	4.5
None	56	28.0	PTB	3	1.5
Yes	144	72.0	Asthma	1	0.5
Total	200	100	Enteric fever	6	3.0
Vehicle use			DM	6	3.0
Ambulance	6	3.0	HTN	14	7.0
Auto	2	1.0	CKD	1	0.5
Bike	59	29.5	Hypothyroidism	1	0.5
Bus	51	25.5	RHD	3	1.5
Cycle	4	2.0	Dia. Nephropathy	1	0.5
Motorcycle	2	1.0	Frozen Shoulder	1	0.5
On foot	21	10.5	Stroke	8	4.0
Tempoo	53	26.5	Unexplained Fever	83	41.5
Van	2	1.0	Total	200	100
Total	200	100	Caste group		
Education			Brahman	6	3.0
Baby	3	1.5	Chhetri	2	1.0
Bachelor	6	3.0	Dalit	11	5.5
Illiterate	98	49.0	Janajati	49	24.5
Master	2	1.0	Muslim	11	5.5
MBBS	4	2.0	Rajput	1	0.5
PCL	1	0.5	Tharu	1	0.5
Playgroup	2	1.0	TMOC	119	59.5
Primary	38	19	Total	200	100
Secondary	46	23.0	Economic source		
Total	200	100	Enough	181	90.5
Cooking status			Low	9	4.5
Firewood	30	15.0	Poor	10	5
Gas	107	53.5	Total	200	100
Gas/wood	63	31.5	Sanitary barrier		
Total	200	100	None	20	10
Vector/carrier			Yes	180	90.0
Mos/fly	189	94.5	Total	200	100
No	11	5.5	Waste disposal		
Total	200	100	None	11	5.5
Disease concept			Yes	189	94.5
No	66	33.0	Total	200	100
Yes	134	67.0	Air pollution		
Total	200	100	None	42	21.0
Domestic sanitation			Yes	158	79.0

(Contd...)

Table 1: *(Continued)*

Characters	*n*	Percentage	Characters	*n*	Percentage
None	7	3.5	Total	200	100
Yes	193	96.5	Milk/meat		
Total	200	100	Both	155	77.5
Herd immunity			Milk	45	22.5
No	10	5.0	Total	200	100
Yes	190	95.0	Balanced diet		
Total	200	100	None	22	11
Garbage disposal			Yes	178	89
None	7	3.5	Total	200	100
Yes	193	96.5	Residency		
Total	200	100	Non-concrete	34	17
Smoker			Concrete	166	83
None	170	85.0	Total	200	100
Yes	30	15.0	Veg/non veg		
Total	200	100.0	non veg	154	77.0
Malnutrition			Veg	46	23.0
No	196	98.0	Total	200	100
Yes	4	2.0	Preservative food		
Total	200	100	None	20	10
Roasted food			Yes	180	90
None	30	15.0	Total	200	100
Yes	170	85.0	Pet animal		
Total	200	100	None	196	98.0
Food adulteration			Yes	4	2.0
None	34	17.0	Total	200	100
Yes	166	83.0	Obesity		
Total	200	100	No	196	98.0
Safe kitchen			Yes	4	2.0
None	10	5.0	Total	200	100
Yes	190	95.0	Sanitary latrine		
Total	200	100	None	10	5.0
Lab test interest			Yes	190	95.0
No	11	5.5	Total	200	100
Yes	189	94.5			
Total	200	100			

BMI: Body mass index, OTC: Over-the-counter, DM: Diabetes mellitus, HTN: Hypertension, CKD: Chronic kidney disease, CAP: Community acquired pneumonia, TMOC: Terai madhesi other caste

Consumption of preserved foods (180, 90.0%), roasted foods (170, 85.0%), and perceived food adulteration (166, 83.0%) was common. A balanced diet was reported by (178, 89.0%) participants.

Domestic animal ownership was reported by 123 (61.5%) participants. Cooking was primarily performed using liquefied petroleum gas (107, 53.5%), whereas 63 (31.5%) used both gas and firewood, and 30 (15.0%) relied exclusively on firewood. Only 4 (2.0%) participants were obese, and 4 (2.0%) were malnourished.

Clinical Characteristics

All 200 (100%) participants presented with fever, which was the principal clinical feature leading to blood culture evaluation. Other common presenting symptoms included headache in 142 (71.0%)

Table 2: Clinical profiles of participants

Symptoms/signs	Frequency	Percent	Symptoms/signs	Frequency	Percent
Fever			Malaise		
Yes	200	100.0	No	64	32.0
Headache			Yes	136	68.0
No	58	29.0	Total	200	100.0
Yes	142	71.0	Anorexia		
Total	200	100.0	None	72	36.0
Vomiting			Yes	128	64.0
No	151	75.5	Total	200	100.0
Yes	49	24.5	Delirium		
Total	200	100.0	No	139	69.5
Nausea			Yes	61	30.5
No	131	65.5	Total	200	100.0
Yes	69	34.5			
Total	200	100.0			

Table 3: Profile of bacterial isolates from positive cultures (n=35)

S. N.	Bacterial isolates	Number of positive isolates	n%
1	*Escherichia coli*	14	40
2	*Enterobacter*	2	5.7
3	*Salmonella* Typhi	7	20
4	*Staphylococcus aureus*	7	20
5	*Klebsiella* spp.	4	11.5
6	*Pseudomonas aeruginosa*	1	2.8

Table 4: Sensitivity profile of antibiotics against bacterial isolates (n=35)

Antimicrobial agent	Sensitive, n (%)
Amikacin	35 (100.00)
Levofloxacin	34 (97.14)
Piperacillin–tazobactam	30 (85.71)
Cefoperazone	28 (80.00)
Amoxicillin–clavulanic acid	28 (80.00)
Ofloxacin	28 (80.00)
Clindamycin	26 (74.28)
Azithromycin	20 (57.14)
Ceftriaxone	16 (45.71)
Cefuroxime	13 (37.14)
Cefepime	6 (17.14)

participants, malaise in 136 (68.0%), and anorexia in 128 (64.0%).Nausea was reported by 69 (34.5%) participants, while delirium was observed in 61 (30.5%) patients. Vomiting was present in 49 (24.5%) participants. Further details are in Table 2. Overall, constitutional symptoms were highly prevalent among patients with suspected BSI, with fever accompanied by headache, malaise, and anorexia being the most frequent clinical manifestations. Gastrointestinal symptoms such as nausea and vomiting were less common, whereas nearly one-third of patients presented with altered mental status (delirium), suggesting severe systemic illness in a substantial proportion of cases.

Positive Culture and Antibiotics

Table 3 represents the type of positive culture from total samples. Among the 200 blood culture specimens processed, 35 (17.5%) yielded bacterial growth, while 165 (82.5%) showed no growth. Of the 35 culture-positive isolates, *E. coli* were the most frequently isolated pathogen, accounting for 14 (40%) isolates. *Salmonella* Typhi and *S. aureus* were the second most common pathogens, each isolated in 7 (20%) cases, while *Klebsiella* spp. accounted for 5 (14.28%). *Enterobacter* spp. 2 (5.71%) and *P. aeruginosa* 1 (2.85%) were the least frequently isolated organisms.

Overall, Gram-negative bacteria predominated, comprising 28 (80%) of the isolates (*E. coli*, *Salmonella* Typhi, *Enterobacter* spp., *Klebsiella* spp., and *P. aeruginosa*.), whereas Gram-positive bacteria accounted for 7 (20%), represented exclusively by *S. aureus*.

As in Table 5, Among the 35 bacterial isolates with positive culture, 16 (45.71%) were obtained from patients who had received antibiotics within the

Table 5: Distribution of positive cases with few sociodemographic variables and clinical features

Independent variables	Isolates (*n*=200)			
	Negative (*n*=165, 82.5%)		Positive (*n*=35, 17.5%)	
	Count	*n*%	Count	*n*%
Age range in years				
<10	10	100.0	0	0.0
10–20	24	70.6	10	29.4
20–40	55	79.8	14	20.2
40–60	43	89.6	5	10.4
>60	33	84.6	6	15.4
Gender				
Female	80	79.2	21	20.8
Male	85	85.9	14	14.1
Antibiotic USE				
None	92	85.2	16	14.8
Yes	73	79.3	19	20.7
OTC drugs				
None	29	74.4	10	25.6
Yes	136	84.4	25	15.6
Headache				
No	47	81.1	11	18.9
Yes	118	83.1	24	16.9
Vomiting				
No	127	83.0	24	17.0
Yes	38	77.5	11	12.5
Delirium				
No	109	78.4	30	21.6
Yes	56	91.8	5	8.1
Nausea				
No	110	83.4	22	16.6
Yes	55	80.8	13	19.2
Anorexia				
None	58	80.6	14	19.4
Yes	107	83.5	21	17.5
Malaise				
No	48	75.0	16	25.0
Yes	117	86.1	19	13.9
Total	165	82.5	35	17.5

OTC: Over-the-counter

preceding 48 h, while 19 (54.29%) were obtained from patients who had not received antibiotics. Thus, bacterial growth was observed in both groups, with a slightly higher proportion among patients who had not received antibiotics.

Table 4 demonstrates the antibacterial susceptibility of 35 bacterial isolates. AK exhibited 100% antibacterial sensitivity. This was followed by Levofloxacin (LE) (97.14%) and Piperacillin–Tazobactam (PIT) (85.71%).

Three antibacterial agents, Cefoperazone (CPZ), Amoxicillin–Clavulanic Acid (AMX-C), and Ofloxacin (OF), each demonstrated an 80.0% susceptibility pattern. Clindamycin showed susceptibility in 74.28% of isolates, whereas azithromycin was effective against 57.14% of isolates.

Lower susceptibility rates were observed for Ceftriaxone (CTR) (45.71%) and CXM (37.14%). Cefepime (CPM) demonstrated the poorest activity, with only 17.14% of bacterial isolates remaining susceptible.

Overall, aminoglycosides and fluoroquinolones exhibited the highest *in vitro* activity against the bacterial isolates, whereas third- and fourth-generation cephalosporins showed comparatively lower effectiveness.

DISCUSSION

This study enrolled 200 patients with suspected BSI and found culture positivity in 35 cases (17.5%). This figure sits close to the 13.3% growth rate reported by Shrestha *et al*. from Nepal Medical College and Teaching Hospital, where 13.3% of 2,766 blood samples showed bacterial growth,[5] and to the 13.5% positivity found in a large 23-year retrospective analysis from Kathmandu,[6] where 30,353 of 224,741 blood cultures (13.5%) exhibited growth of non-contaminant bacteria. It is higher than the 7.28%[7] and 10.49%[8] positivity rates reported from other Nepalese tertiary centers. *E. coli* was the leading isolate in our study (14/35, 40%), followed equally by *Salmonella* Typhi and *S. aureus* (7/35 each, 20%). This pattern of Gram-negative predominance, led by *E. coli*, mirrors the broader regional picture: A Kathmandu-based tertiary hospital study[8] found *Salmonella* Typhi in 71% of cases followed by *Salmonella* Paratyphi A (16%), *E. coli* (5.3%) and *K. pneumoniae* (0.5%), while a Dharan-based neonatal study[9] reported that Gram-negative bacteria accounted for 71.7% of isolates, with *E. coli* the most common, followed by *Klebsiella* and *Enterobacter*, and *S. aureus* was the most common Gram-positive organism. Other tertiary-hospital data similarly show *E. coli* and *Klebsiella* dominating Gram-negative isolates, with rates around *Klebsiella* spp. (23%) followed by *E. coli* (20%). The relatively high share of *Salmonella* Typhi in our sample is consistent with the endemic nature of enteric fever in the Terai belt of Nepal, where Dhanusha district lies, and supports the practice of including enteric fever in the differential of undifferentiated febrile illness in this region.

AK (35/35, 100%) and LE (34/35, 97.14%) showed the highest sensitivity among the panel tested, while CPM (6/35, 17.14%), CXM (13/35, 37.14%) and CTR (16/35, 45.71%) showed comparatively poor activity. This declining susceptibility to cephalosporins is consistent with the growing burden of extended-spectrum β-lactamase (ESBL) producers described across Nepal; a Kathmandu study[10] of urinary *E. coli* and *K. pneumoniae* found that 13.51% of *E. coli* and 16.55% of *K. pneumoniae* isolates were confirmed ESBL producers, with high resistance to CTR, amoxicillin, fluoroquinolones and co-trimoxazole, and a molecular study noted that recent Nepalese AMR surveillance shows emerging resistance to virtually all classes of frontline drugs.[11]

Bacteremia was more frequent in the 10–20-year (10/34, 29.4%) and 20–40-year (14/69, 20.2%) age groups than in children under 10 (0%) or the elderly, and positivity was somewhat higher in females (21/101, 20.8%) than males (14/99, 14.1%). Fever was universal by design (an inclusion criterion), and headache (142/200, 71%), malaise (136/200, 68%), and anorexia (128/200, 64%) were the next most common features.

Nearly half of participants (82/200, 46%) reported prior antibiotic use, and 161/200 (80% reported over-the-counter drug use, reflecting the same irrational-use pattern that the introduction links to rising resistance. This local pattern mirrors the wider South Asian AMR burden: globally, an estimated 4.95 million deaths were associated with bacterial AMR in 2019, including 1.27 million deaths directly attributable to it,[12] and future AMR deaths are forecast to be highest in South Asia, with 11.8 million deaths directly due to AMR projected between 2025 and 2050.[13]

BSIs remain a major cause of morbidity and mortality, particularly in low- and middle-income countries where delayed diagnosis, empirical antibiotic use, and increasing antibacterial resistance complicates patient management. The present study evaluated the clinical profile, bacterial spectrum, and antibacterial susceptibility patterns among patients with suspected BSIs at Janaki Medical College Teaching Hospital, Nepal. The findings provide valuable baseline information for empirical antibiotic selection and local antibacterial stewardship.

In this study, the blood culture positivity rate was 17.5% (35/200). This finding is comparable to several studies from South Asia, where blood culture positivity rates have ranged from 10% to 20%, depending on patient selection, timing of specimen collection, prior antibiotic exposure, and microbiological techniques employed. Lower culture positivity may be attributed to prior antibiotic administration before blood collection, inadequate bacterial load, or infections caused by fastidious organisms that are difficult to isolate using conventional culture methods.

The majority of participants were young- and middle-aged adults (20–40 years), with nearly equal representation of males and females. Similar demographic patterns have been reported in studies from Nepal and neighboring countries, where the economically productive age group is more frequently exposed to infectious diseases because of greater occupational and community exposure. Most participants had normal BMI and no documented comorbid illness, suggesting that BSIs can occur even among individuals without significant underlying diseases. However, hypertension and DM were the most common comorbidities, consistent with previous reports identifying these conditions as risk factors for severe infections.

Fever was the predominant presenting symptom, occurring in all patients, followed by headache, malaise, anorexia, nausea, delirium, and vomiting. These findings are consistent with the clinical manifestations of systemic bacterial infection described in previous studies. The relatively high proportion of patients presenting with delirium (30.5%) may indicate severe systemic illness and possible sepsis, particularly among elderly patients. Constitutional symptoms such as malaise and anorexia further reflect the systemic inflammatory response associated with BSIs.

Nearly half of the participants (92/200, 46.0%) reported antibiotic use before hospital presentation, while more than four-fifths (162/200, 80.5%) had used over-the-counter medications. These findings are clinically important because indiscriminate antibiotic consumption before blood culture collection can reduce culture positivity and contribute to the emergence of AMR. Similar concerns have been raised across South Asia, where unrestricted access to antibiotics and self-medication remain major contributors to MDR bacterial infections. These findings underscore the need for stricter regulation of antibiotic dispensing and improved public awareness regarding rational antimicrobial use.

Among the culture-positive isolates, *E. coli* was the predominant pathogen (40%), followed by *Salmonella* Typhi and *S. aureus* (20% each), while *Enterobacter* species accounted for only 5.7% of isolates. Overall, Gram-negative bacteria constituted approximately three-quarters of all isolates, demonstrating their predominance in BSIs in the present study. Similar observations have been reported from Nepal, India, and other developing countries, where Gram-negative organisms, particularly *E. coli* and *Klebsiella* species, have emerged as the leading causes of bacteremia because of increasing healthcare-associated infections and AMR.[14]

The antibacterial susceptibility profile revealed that AK demonstrated excellent activity, with 100% susceptibility among all isolates. High susceptibility was also observed with LE (97.14%) and PIT (85.71%), indicating that these agents remain effective therapeutic options for BSIs in our setting. Moderate susceptibility was observed for CPZ, AMX-C, and OF (80.0%) each. Whereas substantially lower susceptibility was found for CTR (45.71%), CXM (37.14%), and CPM (17.14%). These findings suggest increasing resistance to cephalosporins, which may reflect prolonged and indiscriminate use of these antibiotics in routine clinical practice.[15]

The predominance of Gram-negative organisms together with reduced susceptibility to cephalosporins has important implications for empirical antibiotic therapy. Routine use of third- and fourth-generation cephalosporins without microbiological confirmation may contribute to treatment failure and further accelerate antibacterial resistance. Therefore, empirical antibiotic selection should be guided by local antibiogram data and revised periodically through continuous surveillance.

This study has several strengths. It provides recent data on the demographic characteristics, clinical presentation, bacterial etiology, and antibacterial susceptibility patterns of BSIs in a tertiary care hospital in Madhesh Province, Nepal. These findings can support clinicians in selecting appropriate empirical antibiotics and contribute to the development of institutional antimicrobial stewardship policies.

However, several limitations should be acknowledged. The study was conducted at a single tertiary care center with a relatively small number of culture-positive isolates, limiting the generalizability of the findings. Anaerobic bacteria, fungal pathogens, and molecular diagnostic methods were not included. In addition, antibacterial susceptibility was evaluated using conventional disk diffusion methods only, without determination of minimum inhibitory concentrations. Future multicenter studies involving larger sample sizes, molecular characterization of resistant organisms, and extended antibacterial resistance surveillance are recommended.

CONCLUSION

BSIs in the present study were predominantly caused by Gram-negative bacteria, particularly *E. coli*. Fever was the most frequent clinical presentation, and prior antibiotic exposure was common. AK, LE, and PIT demonstrated the highest antibacterial activity, whereas cephalosporins exhibited considerably lower susceptibility. Continuous surveillance of bloodstream pathogens and regular updating of hospital antibiograms are essential to optimize empirical therapy, improve patient outcomes, and strengthen antibacterial stewardship programs.

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