DISSERTATION SUBMITTED FOR THE MASTER'S DEGREE IN MEDICAL MICROBIOLOGY

TITLE

PATTERN OF MICROORGANISM FOUND IN BLOODSTREAM INFECTION IN THE TERTIARY CARE HOSPITAL IN NORTH INDIA- A RETROSPECTIVE STUDY.

SUBMITTED

BY

PURVI GOTHI

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DEPARTMENT OF MICROBIOLOGY

INTEGRAL INSTITUTE OF MEDICAL SCIENCE&RESEARCH INTEGRAL UNIVERSITY DASUALI KURSI ROAD, LUCKNOW – 226026, U.P

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A

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In partial fulfilment of the requirements for the award of degree

Masters of Science

In

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By

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I hereby declare that this dissertation entitles "**PATTERN OF MICROORGANISM FOUND IN BLOODSTREAM INFECTION IN THE TERTIARY CARE HOSPITAL IN NORTH INDIA - A RETROSPECTIVE STUDY**" is bonafide and genuine research work carried out by me under the guidance of Dr. **Mohd Saquib** Assistant Professor, Department of Microbiology, Integral Institute of Medical Sciences and Research, Lucknow.

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This is to certify that research work entitled "**Pattern of Microorganism Found In Bloodstream Infection In Tertiary Care Hospital - A Retrospective Study**" submitted by **Purvi Gothi, Dr.Mohd. Saquib** for ethical approval before the Institutional Ethics Committee IIMS&R.

The above mentioned research work has been approved by Institutional Ethics Committee, IIMS&R with consensus in the meeting held on **19 May 2022**.

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Date: **PURVI GOTHI**

INDEX

LIST OF ABBREVIATIONS

BSI	BLOODSTREAM INFECTION
E.COLI	*ESCHERICHIA COLI*
CRBSI	CATHETER – RELATED BLOODSTREAM INFECTION
ESBL	EXTENDED – SPECTRUM BETA - LACTAMASE
MBL	METALLO-BETA LACTAMASE
CONS	*COAGULASE – NEGATIVE STAPHYLOCOCCUS*
S.AUREUS	*STAPHLOCOCCUS AUREUS*
ICU	INTENSIVE CARE UNIT
K.PNEUMONIAE	*KLEBSIELLA PNEUMONIAE*
A.BAUMANNII	*ACINETOBACTER BAUMANII*
P.AERUGINOSA	*PSEUDOMONAS AERUGINOSA*
CRGNB	CARBAPENEM RESISTANT GRAM NEGATIVE BACILLI
VRE	VANCOMYCIN RESISTANT *ENTEROCOCCI*
GNB	GRAM NEGATIVE BACILLI
GPC	GRAM POSITIVE COCCI
MRSA	METHICILLIN – RESISTANT *S.AUREUS*
MSSA	METHICILLIN-SENSITIVE *S.AUREUS*
MRCONS	METHICILLIN RESISTANT COAGULASE NEGATIVE STAPHYLOCOCCUS
MDRGNB	MULTI DRUG RESISTANT GRAM NEGATIVE BACILLI
KPC	KLEBSIELLA PRODUCING CARBAPENEMASE

INTRODUCTION

INTRODUCTION

Bacteremia is defined as presence of viable bacteria in the bloodstream. Under normal circumstances, bloodstream is considered to be sterile. Dissemination of bacteria in the bloodstream leads to serious consequences like shock, disseminated intravascular coagulation and multi organ failure.[1]

If the clinical sign and symptom are obtained before and within 48 hours then it is considered to be community - acquired bloodstream infection. A patient is considered to be suffering from nosocomial infection, if they demonstrate the symptoms after 48 hours of admission, or within 48 hours of admission, if transferred from another medical facility.[2]

Bacteremia can be classified into three types:

1. Transient bacteremia: common in daily minor events such as tooth brushing or chewing food.
2. Continuous bacteremia: continuous presence of bacteria in the bloodstream such as in case of septic shock and endocarditis.
3. Intermittent bacteremia: In case of meningitis, pneumonia and undrained abscess bacteria are found in the blood intermittently.[3,4]

The microorganisms commonly found in bloodstream infection are *S.aureus, E.coli, klebsiella, Pseudomonas aeruginosa, Enterococci, salmonella enterica,*

*Streptococci and Coagulase – negative staphylococci***.** Among which *E.coli, S.aureus and P.aeruginosa* are the pathogen which commonly associated with mortality. The factors on which mortality depends are age, hospital stay, comorbibity, antibiotic sensitivity and biofilm formation.[5,6,7,8,9]

The prevalence of bacteremia is common in old age. Due to atypical clinical presentation in old age diagnosis of bloodstream infection is difficult in them. In many studies it has been seen that infection of gram negative organism is more common in old age and in pediatrics than gram positive organism. Bloodstream infection is associated with higher mortality in pediatric age group.[10,11,12,13]

It has been seen that in intensive care unit the prevalence of central and peripheral catheters associated bloodstream infection are more common. *Coagulase – negative staphylococci*, *staphylococcus aureus*, gram negative bacilli and yeast are the common microorganisms associated with catheter devices. If the catheter is inserted for short duration then it can be colonised by any of the microorganism and if the catheter is inserted for the long duration then the colonization of *S.epidermidis* is more common.[14,15,16]

According to Centre for Disease Control and Prevention following are the criteria to define CRBSI:

(1) Patient develops at least one of the symptoms from fever, hypotension or chill.

(2) Before the development of infection, the central venous access device should be in use for at least 48 hours.

(3) The pathogen should be isolated from more than one peripheral or central venous blood culture which is different from the infection of another site and uncommon to skin contaminants.

(4) The pathogen which is isolated from the blood culture show antigen test positive.

(5) Fever, hypothermia, bradycardia, apnea, and one of the criteria from 1 to 3 is seen in patient of less than one year.[17]

Following are the some measures to prevent CRBSI:

1. Personnel should be trained to take aseptic precaution during the insertion of the catheter.
2. Use of subclavian vein for the insertion of catheter instead of the femoral vein because it is associated with the high risk of CRBSI.
3. Perform hand hygiene before the insertion of the catheter.
4. The skin should clean with the use of 0.5 % of chlorhexidene plus alcohol before the insertion of the catheter
5. Use of cap, mask , sterile gloves , sterile gown and sterile full body drape reduces the chance of infection.[18]

In co morbidities like haematological malignancies, neurobalstoma, and acute leukemia, central line bloodstream infection pose a greater risk. In the

neutropenic patients the bloodstream infection is the most common invasive infection ranges between 20-25%.[19,20,21,22,23]

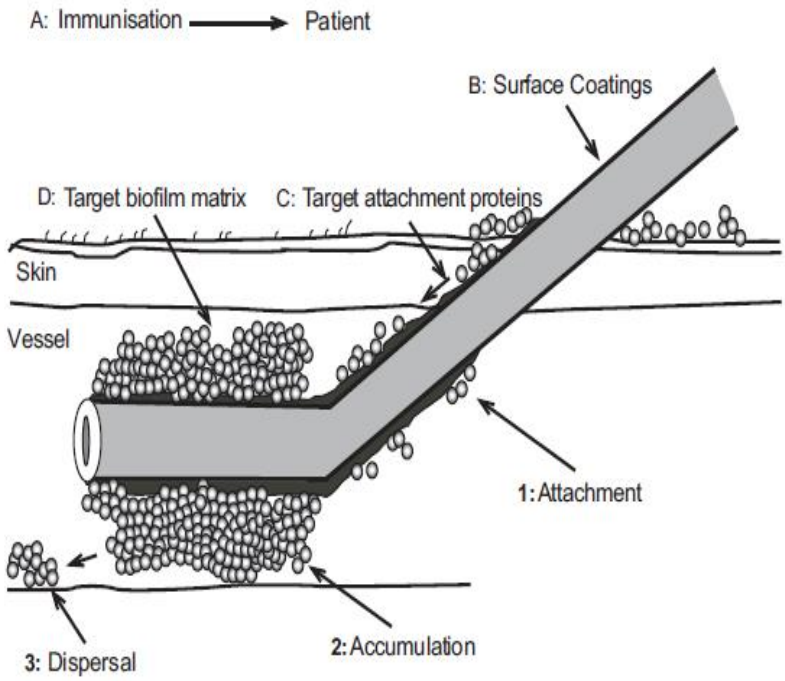
The spread of multi drug resistant organism increases a global risk to public health. ESBL producing Enterobacteriaceae are primarily responsible .The number of cases of infection with fluoroquinolone resistant and third generation cephalosporin resistant *E.coli* and *klebsiella* are increasing.[24]

Biofilm consist of millions of sessile bacteria embedded within a self secreted polysaccharide matrix they are capable to adhere to plastic surfaces and damaged tissues .Biofilm contributes in the pathogenecity of the microorganism. The following are the some mechanism through which biofilm develops resistance against drugs.

1. Reduced penetration of the drug through biofilm may increases the resistance of biofilm. Although many antibiotics like rifampicin, daptomycin, ciprofloxacin are able to penetrate the biofilm.
2. Psl, an exopolysaccharide is produced by certain strain of pseudomonas aeruginosa make the biofilm resistant at early stages to colistin, polymyxin B, tobramycin and ciprofloxacin.
3. The available nutrient sources are utilised by the surface cell of biofilm so it leads to deprivation of oxygen and nutrient in the deeper layer due to this the rate of multiplication of bacteria is slower at deeper layer. The

antibiotics are actively worked against fast growing cell than the slow growing cells.

4. The one of the important component of the bacterial biofilm is extracellular DNA or eDNA. The eDNA also contributes in developing resistance against several antimicrobial agents.[25]



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Early diagnosis is necessary to control the bloodstream infection. Blood culture is considered to be the gold standard method for the diagnosis of BSI. Blood volume is an important criterion for the blood culture positivity. Presence of normal skin flora in blood culture represents contaminants. Contamination is

defined as the positivity of the blood culture by an organism which is not present in the bloodstream but obtained in the blood culture during the processing of the blood culture specimen.[26]

To isolate the bacteria at faster rate automated blood culture are useful such as BACT/ALERT® 3D, BACTECTMFX and BACTEC 9240 it is based on fluorometric based technique by quenching oxygen principle. It helps in early diagnosis of bacteria.[27,28]

Treatment is based on the antimicrobial susceptibility pattern, microbial trends and epidemiological data.[1]

AIM AND OBJECTIVES

AIM AND OBJECTIVE

AIM:

To determine the pattern of microorganisms associated with blood stream infection in an academic based tertiary care hospital in north India

OBJECTIVE:

1. To identify the micro-organism and identify their antimicrobial sensitivity isolated from blood samples.

2. To estimate the prevalence of multi drug resistant organisms isolated from blood samples.

MATERIAL AND METHODS

MATERIAL AND METHODS

The study is hospital based cross sectional retrospective study which includes data of five year from 1 January 2017 to 31 December 2021which were evaluated for positive blood samples and antimicrobial susceptibilities. The data will be taken from the maintained record in the registers of the bacteriology lab of Integral Institute of Medical Sciences and Research (IIMS&R). The positive blood culture and antibiotic sensitivity result will be recorded in the Ms-excel spreadsheet format. The samples were received from various departments – Medicine, Causality, Pediatrics, ICU, Emergency, TB Chest, Psychiatric, Surgery, Ophthalmology, Orthopaedics and Obstetrics & gynecology.

The microorganisms were isolated with the help of conventional blood culture method and BACTEC BD 9050 blood culture system. The subculture was performed on the Blood agar and MacConkey agar. The positive blood culture was further processed with the help of gram staining and biochemical test. Antibiotic susceptibility testing was performed by using Kirby –Bauer disk diffusion method. The strains were used for quality control are:

Escherichia coli (ATCC 25922)

Staphylococcus aureus (ATCC 25923)

Enterococcus faecalis (ATCC 29212)

Pseudomonas aeruginosa (ATCC 27853)

REVIEW OF LITERATURE

REVIEW OF LITERATURE

EPIDEMOLOGY:

Bloodstream infection is associated with mortality, morbidity and increased financial burden for treatment. Therefore, early detection and identification of the bacteria along with antimicrobial sensitivity testing are the important for better prognosis. In a year 100- 150 cases per 100,000 people were detected suffering from bloodstream infection in a population based study conducted in high income Countries.[30,31,32,33,34,35]

According to a study, the incidences of hospital – acquired bloodstream infection were more than community acquired bloodstream infection. The incidence rates were 57.3% and 42.7% respectively. The majority of hospital acquired BSI cases (82%) were associated with atleast one comorbid illness.[36]

The study was conducted on Geriatric patients, to demonstrate the mortality rate in patient over 75 years of age. The patient admitted in the hospital during the first week shown mortality rate about 40%, the mortality rate on average of 11 days was about 19%, the mortality rate after 15 days of admission in the hospital was 62% and after 30 days of hospitalization was about 87%. While receiving antibiotics treatment 62% were died. The *E.coli* predominated in older age.[37]

The study was conducted in European Country, to determine the trends of microorganism in bloodstream infection in pediatrics. The most commonly

isolated microorganism was *S.aureus* succeeded by *E.coli*. Different age groups show different trends of microorganism. The children belongs to age group less than 2 years were most frequently affected with *E.coli* and *CONS*. *S.pneumoniae* was predominated in the age group between 2 to 5 years of age. The age group lies between 10 and 15 years was more commonly associated with the infection of *S.aureus*.[38]

Another study conducted in Middle East Country, includes 10 years data which contains 31380 blood samples with the positivity rate of 23.5%. Out of which gram positive bacteria, gram negative bacteria and yeast were isolated in the range of 44.8%, 49.9% and 5.2% respectively. *CONS* were most commonly isolated followed by *E.coli*. Due to the association of *CONS* with catheter related infection and their ability of formation of biofilm on medical devices *CONS* are considered to be the important pathogen.[39]

The study was conducted in a tertiary care hospital, in which 1895 samples were included out of which gram positive cocci (60.37%), gram negative bacilli (36.29%) and yeast (3.33%) were isolated. The most common pathogen isolated was *S.aureus* followed by *CONS*. Among *S.aureus* the infection with MSSA (59%) was more predominant than the infection with MRSA (41%).[1]

Another study was conducted in North India; the culture positivity rate was 12.7% in which prevalent isolate was *CONS* followed by candida species in ICU patient. The most frequently isolated Candida species were *Candida*

tropicalis and *Candida haemulonii*. Among gram negative bacilli the infection with *Klebsiella* species was most common to be isolated followed by *Acinetobacter* species.[40]

The study conducted in tertiary care hospital, to determine the severity of hospital- acquired bloodstream infection due to gram negative bacilli. About 208 patients were diagnosed with incidence of bloodstream infection due to gram-negative bacilli. The incidence of 12.8cases/1000 admissions was shown. Out of which, in a medical ward 66.3% patients were admitted, in an intensive care unit19.7% patients were admitted and in a surgical ward 13.9% patients were admitted. *E.coli* was the common pathogen to be isolated succeeded by *K.pneumoniae* (20%), *A.baumannii* (10%) and *P. aeruginosa* (8%). The highest mortality rates were associated with *P.aeruginosa* (58.8%), *A.baumannii* (38.1%), and *K.pneumoniae* (33.3%)[41]

The study includes 90 hospitals from which 28318 microorganism of BSI were isolated in which the most common isolates were *E.coli* (33.4%), *S.aureus* (16.7%) and *K.pneumoniae* (7.1%). The study observed a rising trends of *E.faecium, K.pneumoniae and P.aeruginosa* with increasing hospitalization duration.[42]

Bloodstream infection in cancer and burn patients:

In a study, 393 samples were collected from 123 patients suffering with febrile neutropenia out of which 20.6% were isolated to be positive for blood culture. In this 41.9% were gram positive and 46.9% were gram negative isolates. The most common gram negative microorganism to be isolated was *K.pneumoniae* (39.47%). The most common gram positive microorganism to be isolated was *CONS* (67.64%).[43]

The study includes data on acute leukaemia in children. Total patients were 73 out of which 25 had suffered from BSI. Overall 36 positive blood cultures were isolated. The most predominated organism was *staphylococcus* about 72.2%.[44]

It has been seen in a study, from 109 patients with hematological malignancies 32 patients showed an episode of BSI with Multi drug resistant gram negative bacilli (MDRGN) and 77 were suffered from BSI with non-MDRGN bacilli. The most common encountered MDRGN bacilli were *P.aeruginosa* (37.5%), after that *E.coli* (34.4%) and *K.pneumoniae* (25%) were isolated. The most common microorganism encountered with non-MDRGN were *E.coli* (70.1%) followed by *P.aeruginosa* (13%).[45]

The study conducted on burn patients, the study period ranges between 2000 - 2014. Total burn patients were 2464 out of which 2.96% patients showed the positive episodes of BSI with 103 isolates. The blood cultures were reported

positive with the help of BACTEC 9240. The predominated isolates were *P.aeruginosa* (17.5%), *S.aureus* (16.5%) and *K. pneumoniae* (15.5%). The rate of imipenem resistant P.aeruginosa was progressively increases throughout the study period.[46]

Central line bloodstream infection (CLBSI):

Central line bloodstream infection is the second predominant infection in intensive –care unit, the incidence rate in developing countries were ranging from 1.7 to 44.6 per 1,000 catheter days **.**Central line bloodstream infections were defined as: who had used central venous catheters for more than two days in patients with bloodstream infection, and were using till the date of infection or had removed the catheter the day before. The most common pathogens responsible were belonging to *ESKAPE* group (*Enterococcus faecium, Staphylococcus aureus, klebsiella pneumonia, Acinetobacter baumani, Pseudomonas aeruginosa, and Enterobacter species).*[47, 48]

The study was conducted in South American country, the total of 1,988 cases of hospital acquired infection were found out of which 742 cases were associated with CLBSI. The most frequent microorganisms found in the study were *CONS, K.pneumoniae, P.aeruginosa* and *Acinetobacter* species. In this study the CLBSI rate were 2.73% infections per 1000 catheter days.[49]

Hand hygiene, aseptic precautions, educational programs and proper maintenance of catheter are all the factors which help in reducing the CRBSI. In a study after an intervention program the CRBSI rates were reduces from 6.7-6.2/1000 catheter days in 2007-2008 to 3.7- 4.3 /1000 catheter days in 2009-2010. In 2011the rates were reduces to 1.5/1000 catheter days.[44]

Another study was conducted in North American country, to demonstrate the trends of central line bloodstream infection. The rates of infection were progressively decreases 159 in 2016,124 in 2017,111 in 2018 and 85 in 2019. The incidences of infection with Enterobacteriaceae were also decreases. The most predominant microorganisms were *Enterococcus* spp and *candida* accounting for 40% of overall infection.[50]

ETIOLOGY:

The sepsis caused by gram positive organism have increased may be due to higher use of invasive procedure and the rising cases of hospital – acquired infection. Recurrent use of antibiotics for longer period in ICU patient increases the risk of developing bacterial resistance against antibiotics. Respiratory tract, gastrointestinal, urinary tract, skin and soft tissue, osteoarticular, gynaecological and central nervous system are the sites of infection with severe sepsis. Among these the most common site of infection is respiratory tract infection associated with higher mortality. In women genitourinary infection are more common.[51,52,53,54,55]

In the study conducted on old age people, shown that urinary tract infection was the more common cause of bloodstream infection in old age people. The condition in people with UTI associated with bacteremia is worse than in the people with UTI without bacteremia.[37,56, 57]

The other study shows the most common cause of septicaemia were urinary tract infection (23%) followed by, vascular access (19%), pulmonary infections (9%), biliary tract (9%) and skin and soft tissues infections (4%).[41]

It was reported that *candida* have become the common cause of bloodstream infection. Use of broad spectrum antibiotics, surgical instruments, invasive procedures and use of life saving devices may be the cause of candidemia. The non *candida albicans* species were also reported as a cause of bloodstream infection.. The most common species associated with BSI was *Candida tropicalis*.[58,59]

According to the study conducted in mid – Norway, the iron deficiency, alcohol intake, obesity, poor lifestyle, smoking are the risk factor which contributes in the development of BSI. In an another investigations it has been seen that - diabetes, renal failure and liver disease are also considered to be the important risk factors.[36,60,61,62,63]

Trends of antimicrobial resistance in microorganism:

Antimicrobial resistant organism increases the burden of bloodstream infection. The study shows patients with vancomycin resistant *Enterococci* (VRE) or Carbapenem- resistant gram negative bacilli (CRGNB) have associated with higher mortality rates. This study includes 171 patients out of which 100 patients were CRGNB and 71 were VRE. In 28 days the mortality rates were 42.7% and 29.2% for VRE and CRGNB respectively. The most common microorganism among CRGNB were *A.baumannii* (38%) followed by *K.pneumoniae* (15.2%), *P.aeruginosa* (7.6%), *E.coli* (5.8%).[64]

In a study which includes data on pediatrics patients showed the resistant rate of E.coli were below 10% for aminoglycosides, piperacillin –tazobactam and third / fourth generation cephalosporins. In non – E.coli Enterobacteriaceae the resistant were higher for all antibiotics as compared to E.coli. Only one case resistant to carbapenem was found among Enterobacteriaceae i.e. *Citrobacter freundii* but sensitive to meropenem and imipenem.[38]

In another study of community acquired infection, infection with extended spectrum beta –lactamase (ESBL) were more frequent. *E.coli* and *K.pneumoniae* producing ESBL were predominantly isolated and no cases associated with VRE and CRGNB were found.[37]

The study was conducted in Middle East Country, to show the trends of ESBL producing *E.coli* and *Klebsiella pneumoniae* bloodstream infections, total of 1071 strains were isolated out of which 632 were *E.coli* and 439 were *Klebsiella* pneumoniae . Overall ESBL positivity rate were 34%. 35% *E.coli* and 31% *k.pneumoniae* strains were ESBL positive. ESBL producing strain found most sensitive to meropenem, amikacin, ertapnem and imipenem and most resistant to ciprofloxacin, cefepime, trimethoprim-sulfamethoxazole and ceftriaxone. ESBL producing strain were more commonly isolated from emergency services (28%) followed by the ICU (26.5%), pediatrics clinic (19.4%).[65]

In a study there were 208 patients of BSI among which 38% were ESBL producer, 27.5% were carbapenemase resistant. Among this 50% of *E.coli* were ESBL producing with resistant to gentamicin (11%) and ciprofloxacin (83%). Klebsiella Producing Carbapenemase (KPC) producing *K.pneumoniae* were 12% of the total.[41]

In another study, the carbapenemase producing bacteria, metallo - beta lactamase and KPC were 52.9%, 41.2% and 11.8% respectively. Among non fermenters 83% *Acinetobacter* and 67% *pseudomonas aeruginosa* were resistant to carbapenem. Tigecyclin and colistin were effective antibiotics.[40]

In the study 90.3% of *CONS* and 32% of *S.aureus* were methicillin – resistant. 12.1% of *Enterococcus* was vancomycin resistant. 40.6% of *E.coli* and 30.7%

of *klebsiella* were ESBL positive. *Klebsiella* showed resistance against carbapenem more than 20%.[39]

In the study, *P.aeruginosa* and *Acinetobacter* were showed high resistant to carbapenem about 82.7 % and 80.6% respectively, *E.coli* showed resistant to third and fourth generation cephalosporins about 21.4%, *klebsiella pneumoniae* showed resistant to third and fourth generation cephalosporin and carbapenem about 55.3% and *CONS* and *S.aureus* were resistance to oxacillin about 74.3% and 71.4% respectively.[49]

In the study, *Klebsiella* and *E.coli* showed high resistant to ertapenem, meropenem, beta- lactam beta lactamase inhibitors (BBLI) combinations, cephalosporins and fluoroquinolone about 70% - 90%. Overall resistance of carbapenem in all isolates were 44.8%, BBLI was 27.7%, and aminoglycosides was 38.8%, the resistance against colistin was 27.7% and against cefepime was 22%. Among gram positive cocci *CONS* showed high resistant against methicillin about 12.8%.[43]

In a study, 208 episodes of community acquired *staphylococcus aureus* were observed. Out of which 136 episodes were Methicillin- resistant *S.aureus* (MRSA) and 72 episodes were Methicillin- susceptible *S.aureus* (MSSA). Isolates from 12 patients were resistant to both methicillin and clindamycin and isolates from 6 patients were susceptible to methicillin but resistant to clindamycin.[66]

The cross-sectional study was done to demonstrate the diagnosis of pediatrics sepsis by conventional blood culture and automated blood culture system. Total 100 samples were taken, out of which 36 positive specimens were detected by BACTEC 9240 and 24 positive specimens were detected by conventional method. Most of the samples were detected positive by BACTEC 9240 within 24 hours as compared to conventional method which detects positive sample within 48 hours. BACTEC associated with higher specificity.[67]

RESULT

RESULT

A total of 1570 blood samples were received from various departments in between 1 January 2017 to 31 December 2022. The positive blood samples isolated were 474 from 441 patients with a positivity rate of 30.19%.

The most common isolates were 286 (60.33%) of GPC followed by 161 (33.96%) of GNB and 27 (5.69%) of fungi represented in graph 1. In GPC the predominated isolates were *Coagulase – negative staphylococcus* (*CONS)* and *S.aureus* followed by *Enterococcus*. Overall percentage of *CONS*, *S.aureus* and *Enterococci* were 25.94%, 25.73% and 8.01% respectively.

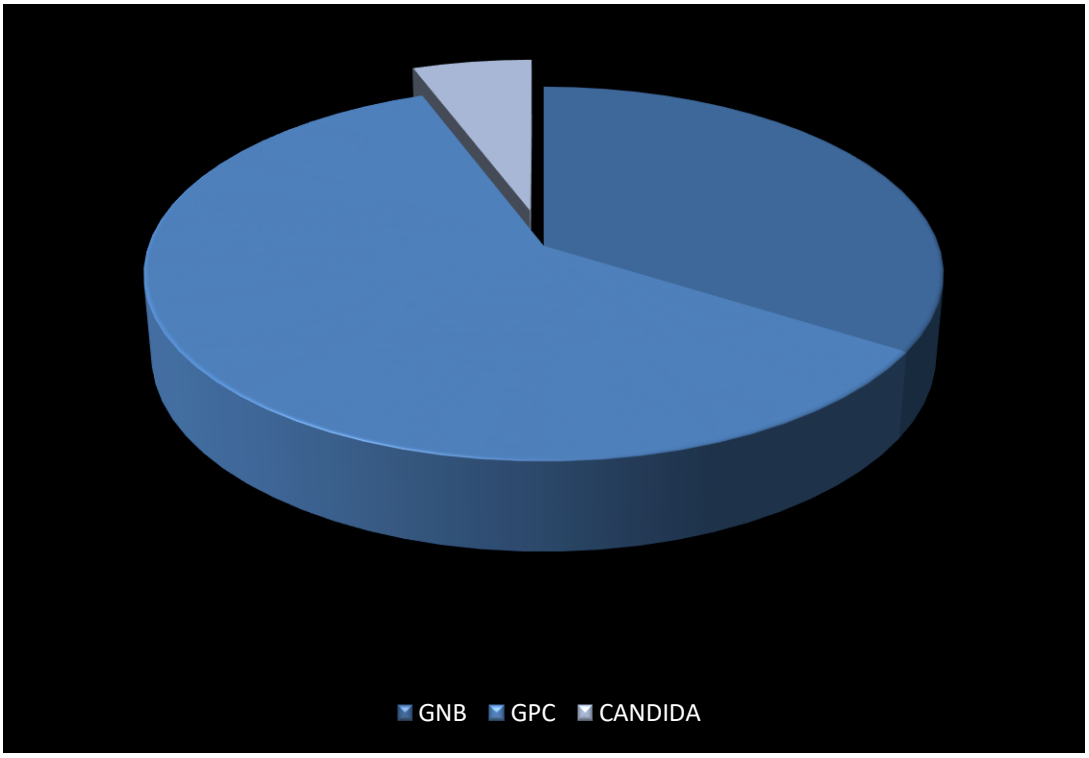
Among GNB the most common isolates were *Acinetobacter* followed by *Klebsiella*, *Pseudomonas* and *E.coli*. Their overall percentages were 9.07%, 8.01%, 7.17% and 7.17% respectively. Other isolates found in blood samples were *Streptococcus pyogenes*, *Enterobacter*, *S.typhi* and *Citrobacter*.

The incidences of bacteremia were almost equally distributed among male and female, the rates were 51.8% and 47.8% respectively. The positive blood cultures were most commonly isolated from the 0-2 years age group (151/474).

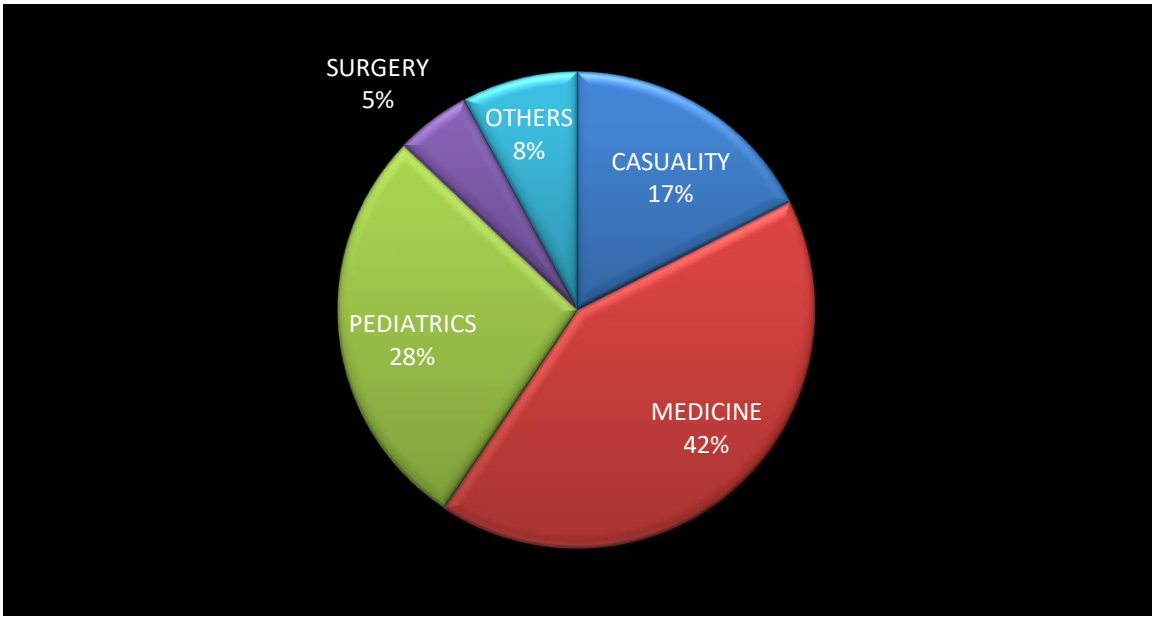
The blood samples were most commonly received from the medicine department followed by pediatrics and causality represented in graph 2.

Graph 3 represents the antimicrobial resistant pattern of *CONS*. The predominated isolate in this study was *CONS* in which MRCONS were 68.42%.

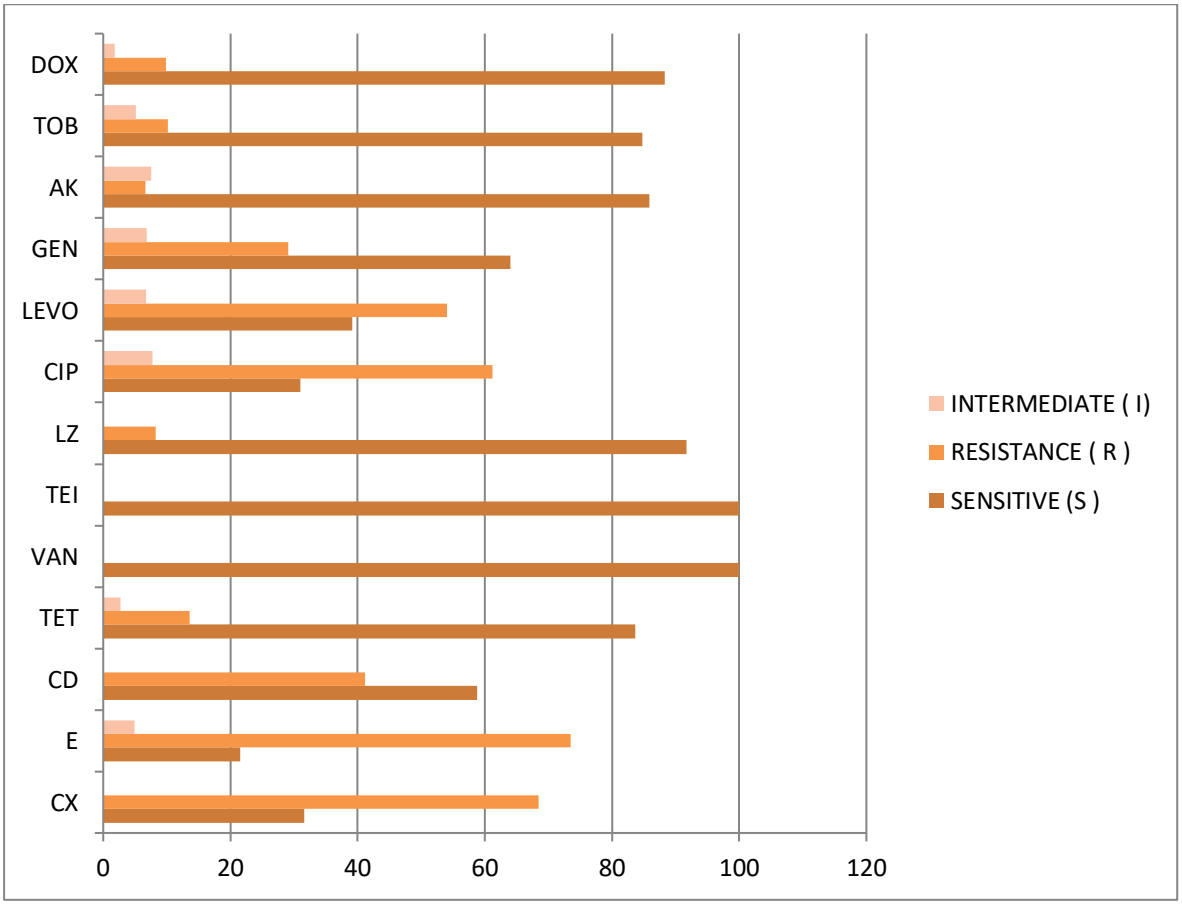
The isolates were 100% sensitive to vancomycin and teicoplanin. The *CONS* demonstrated a considerable resistance against ciprofloxacin and levofloxacin the rates were 61.2% and 54.05% respectively.



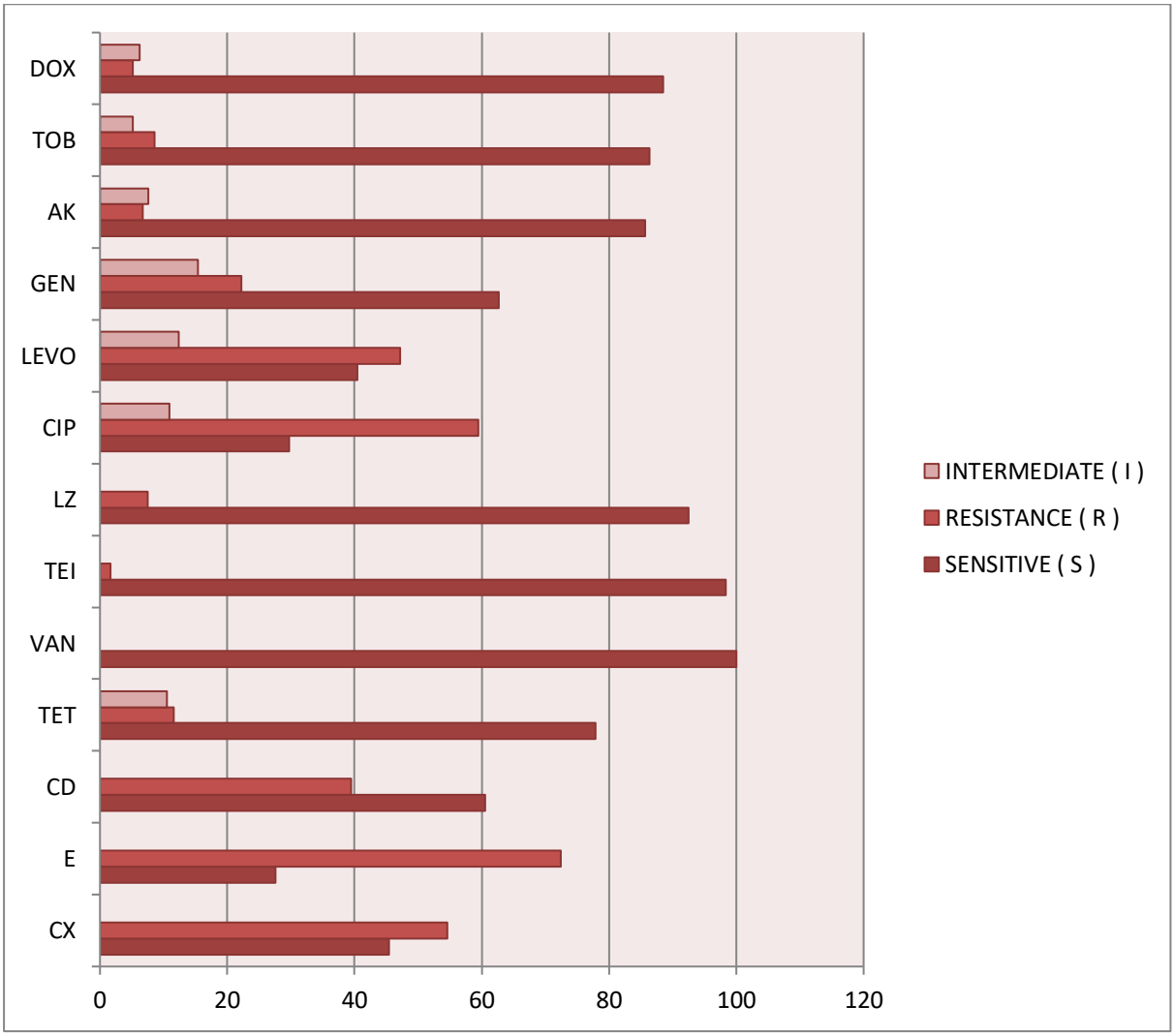
Graph 1: Distribution of various isolated organism



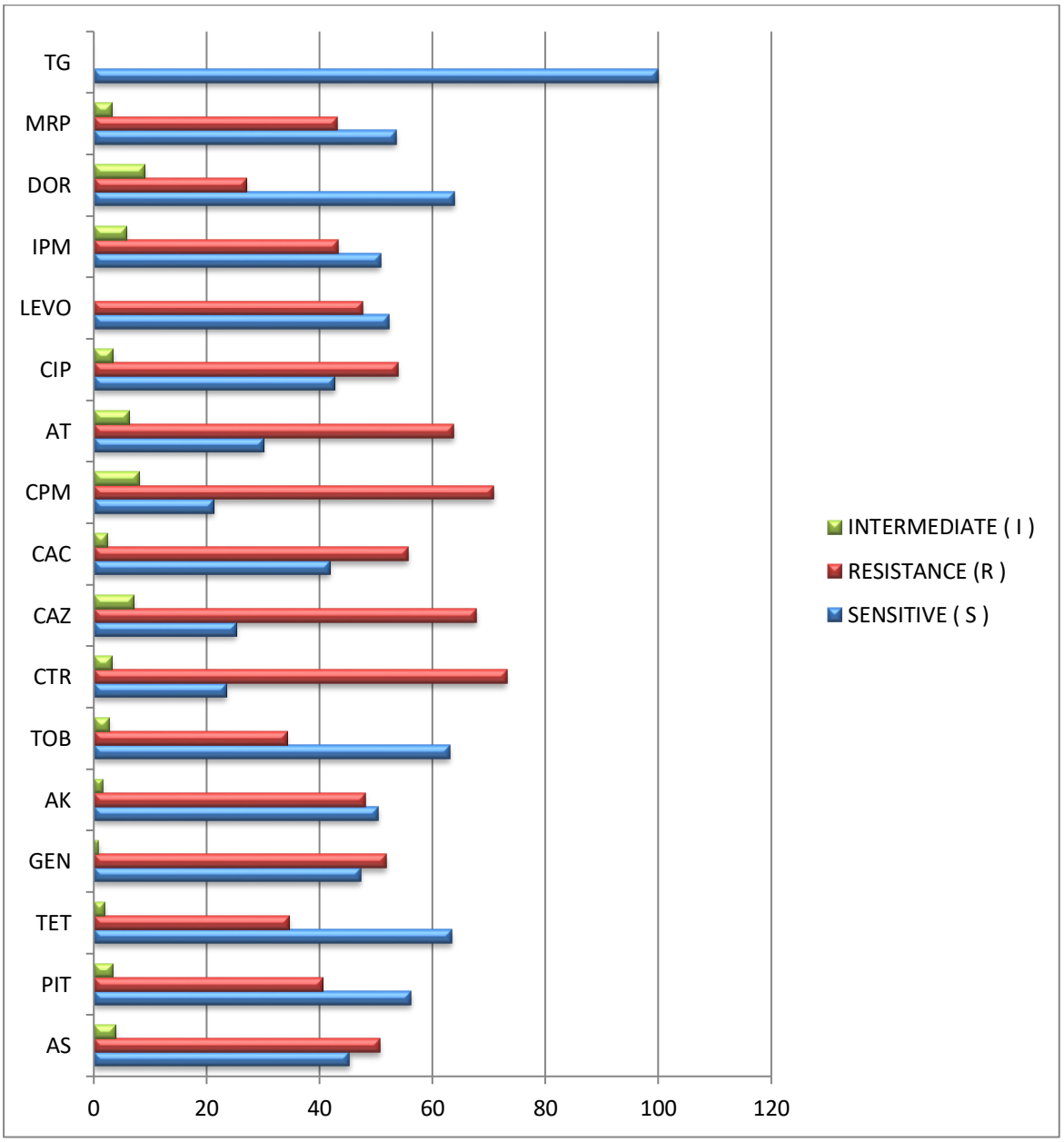
Graph: 2 Samples received from different departments



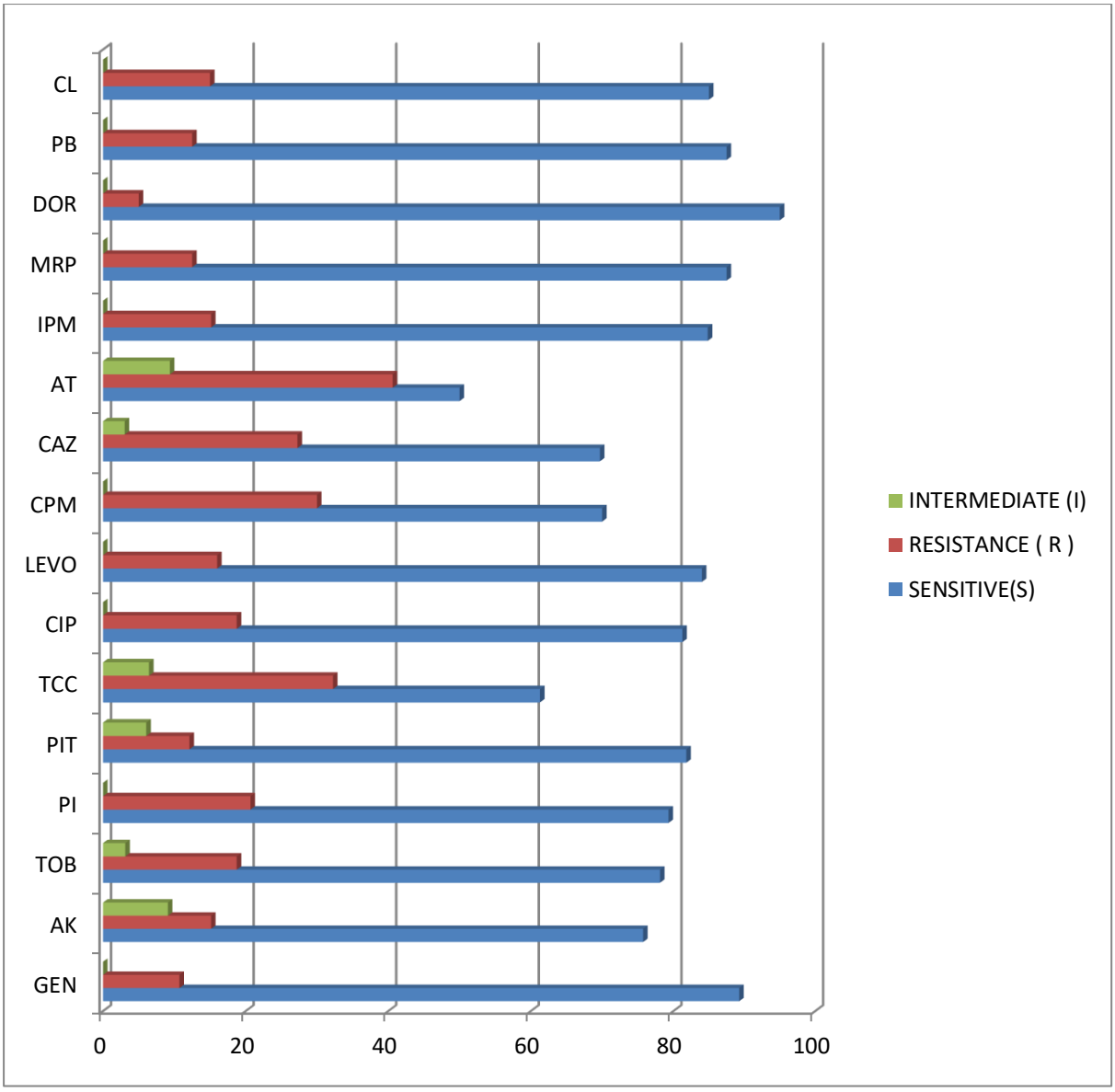
Graph 3: Resistant pattern of *CONS*



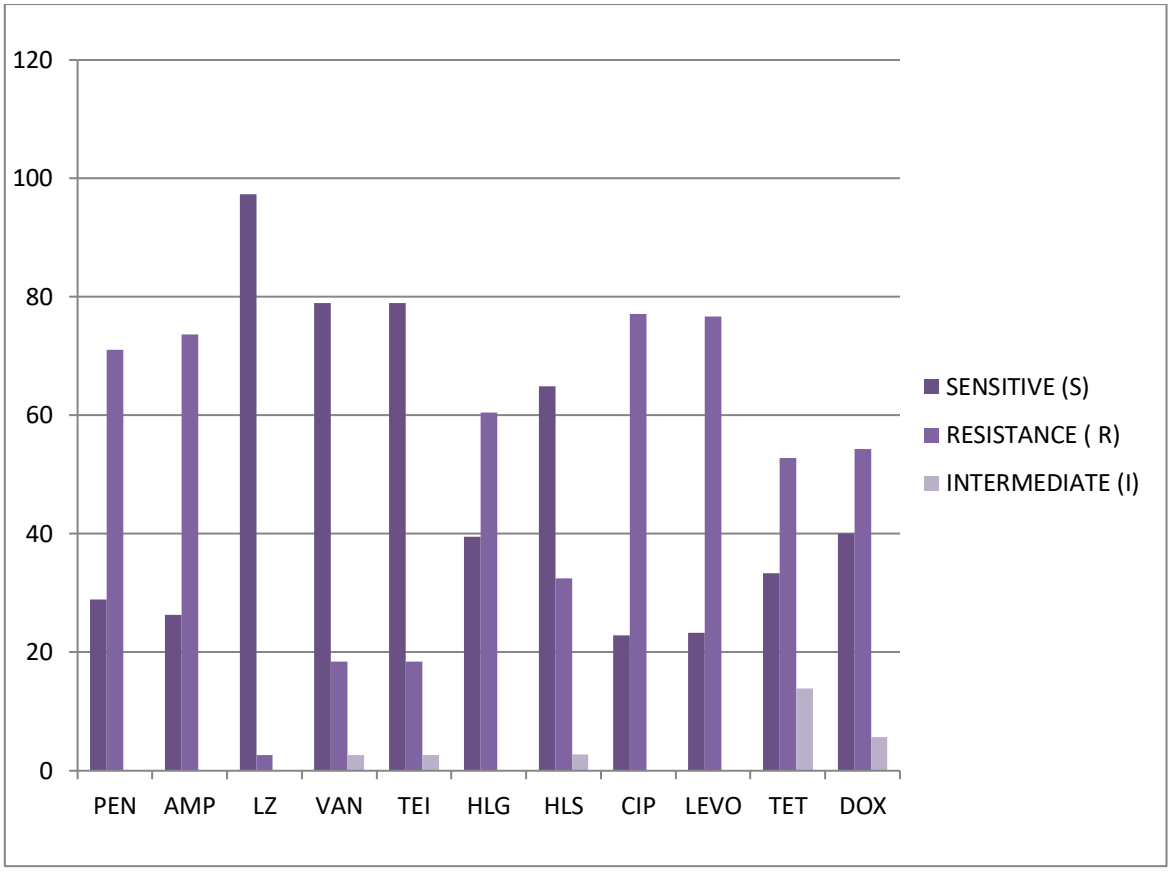
Graph 4: Resistant pattern of *S.aureus*



Graph 5: Resistant pattern of Enterobacteriaceace



Graph 6: Resistant pattern of *Pseudomonas*



Graph 7: Resistant pattern of *Enterococcus*

Graph 4 represents the antimicrobial sensitivity pattern of *S.aureus*. Total of MRSA recognised were 54.62% and MSSA were 45.37%. The sensitivity against clindamycin was 60.50%. No resistant isolate was identified against vancomycin. Nine (7.5%) Linezolid resistant and two (1.65%) teicoplanin resistant cases were detected.

Graph 5 represents the pattern of antimicrobial sensitivity against order enterobacterales. Overall they showed high level of resistance against Cephalosporin and Azetronam. The emerging resistance has been observed

against Carbapenem. The ESBL and MBL producing isolates were 12.5% and 34.64% respectively.

Graph 6 represents the antimicrobial sensitivity trends against *Pseudomonas*. It showed moderate rate of resistant against Ticarcillin / Calvulanic acid (TCC) (32.25), Cefepime (30%), Ceftazidime (32.25%) and Azetronam (40.62%). In rest of the antibiotics pseudomonas showed more sensitivity as compared to resistant.

Graph 7 demonstrates the antimicrobial sensitivity pattern against *Enterococcus*. It showed high resistant to penicillin (71.05%), Ciprofloxacin (77.14%), and levofloxacin (76.66%). The resistance rate against vancomycin was 18.42%.

27 isolates of *candida* were isolated. All are sensitive to Voriconazole, Amphotericin B, Itraconazole and Fluoroquinolone.

DISCUSSION

DISCUSSION

Bloodstream infection is a serious problem therefore early detection and identification is a need of time and understanding the pattern of antimicrobial resistance against blood borne pathogen is important for better prognosis. In present study the blood culture were processed with the help of BACTEC BD 9050 with the positivity rate of 42.10% and conventional culture method with the positivity rate of 26.79%.The positivity rate with BACTEC is more as compared to conventional culture method seen in other study also [67] Maximum of GNB species was isolated by the BD BACTEC 9050.

The present study includes the culture positivity rate 30.19% which is consistent with the finding of other studies[68,69, 39] However many other studies showed low culture positivity rate ranges from 12% to 16%.[1,40] It depends upon the number or volume of blood culture samples taken [70]. The most common causative agents of BSI isolated in the study were *CONS* and *S.aureus* which were also remain predominated isolates in other studies [1,39,43]. The emerging infection with *Enterococcus* (8.01%) was observed in this study which was also found in other studies.[42, 50] The infection with gram negative bacilli was commonly found in old age people and patient suffering with malignancies [37, 43, 45].In this study the most commonly isolated microorganisms were *Acinetobacter* followed by *Klebsiella, pseudomonas* and *E.coli*.

In our study most of the organism isolated from the age group of 0-2 years. The most common isolates observed were *S.aureus* (22.8%) followed by 15.68% of *candida* and *klebsiella* each in contrary to other study which showed the children belongs to age group less than 2 years were most frequently affected with *E.coli* and *CONS*.[38]

Out of total 122 isolates of *S.aureus* the detection rates of MRSA and MSSA were 54.62% and 45.37% respectively. Our findings coincide with other two studies as well. [1, 66] In our study the overall isolates of S.aureus were 100% sensitive to vancomycin but showed 1.65% and 7.5% resistance against teicoplanin and Linezolid respectively. In a study the resistance were observed against Linezolid but 100% sensitivity was seen against teicoplanin and vancomycin.[39] In another study the 100% sensitivity was observed against vancomycin, Linezolid and vancomycin.[40] Other alternative drugs for the treatment are amikacin and tobramycin showed 85.71% and 86.32% sensitivity rates respectively.

In present study the MRCONS isolates were 68.42%. The emerging infection with MRCONS poses a greater risk which is seen in other study also [39]. In our study *CONS* showed resistance against all antibiotics except vancomycin and teicoplanin. *CONS* showed considerable resistance against ciprofloxacin, levofloxacin and gentamicin in contrary to other study in which the sensitivity rates of these drugs were more than 90%.[1]

The vancomycin which is 100% sensitive against *CONS* and *S.aureus*, the Enterococcus develops 18.42% resistance against vancomycin. The same resistance pattern was observed with teicoplanin (18.42%). The increasing trends of resistance against vancomycin and teicoplanin are also consistent with the findings of other study.[39] The study also showed resistance against Linezolid which was about 2.63%. The high resistance were observed against ciprofloxacin and levofloxacin.

Among GNB, the ESBL and MBL producing isolates were 12.5% and 34.64% respectively. The most commonly isolates producing ESBL and MBL were *E.coli, Klebsiella* and *Acinetobacter*. The *Klebsiella* and *Acinetobacter* showed great resistance against carbapenem [64]. The ESBL and MBL producing isolate showed high resistance against amikacin, gentamicin, and cefepime and 100% sensitivity against tigecycline. In contrary to other study which showed that ESBL producing isolates were sensitive to amikacin [65]. However, many studies showed ESBL resistance against gentamicin and cefepime [41, 65]. Tigecycline is the drug of choice against ESBL and MBL.

In our study the *pseudomonas* showed low range of resistance against carbapenem as compared to other studies [40, 49]. The resistant rates against imipenem, meropenem and doripenem were 15.15%, 12.5% and 5% respectively.

CONCLUSION

CONCLUSION

BSI is the major health problem and the isolation of microorganism with blood culture method and testing of antimicrobial profile is the gold standard method. Limited use of antibiotics and proper aseptic precautions such as maintaining hand hygiene may prevent the spread of bloodstream infection. Teicoplanin and vancomycin are the drugs of choice against infection with MRSA and MRCONS. ESBL and MBL producing isolates are posing greater risk to the public health. Judicious use of carbapenems in combination with aminoglycoside and Tigecycline are effective for the treatment of infection with MDR Enterobacteriaceae. Controlled use of antibiotics and good policies to overcome the increasing resistance against antibiotics is the need of time.

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