



## BACTERIAL BLOOD STREAM INFECTIONS (BSIS) IN A TERTIARY CARE HOSPITAL, KIMS, BHUBANESWAR

### Microbiology

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### ABSTRACT

**Aim:** This was a retrospective study to know the prevalence and antibiotic sensitivity pattern of different bacterial pathogens from culture positive blood stream infections (BSIs). Also to know the percentage of unusual pathogens and their sensitivity pattern isolated from BSIs.

**Materials & Methods:** Blood samples were collected from clinically diagnosed BSIs patient and processed by automated method (BacT/Alert & VITEK-2) for culture and antibiotic sensitivity.

**Result:** 5% of blood samples show culture positive. *Staphylococcus aureus* was the commonest bacterial pathogen followed by *Klebsiella sp.*, *Acinetobacter baumannii* & others. Tigecycline was the most sensitive drug for all bacterial pathogens. *Burkholderia cepacia* was the commonest unusual pathogen.

### KEYWORDS

BSI, Bacterial Pathogen, Automated Method, *Staphylococcus Aureus*, Unusual Pathogen.

#### Introduction:

Blood stream infection or BSI is the presence of microorganism in blood, which is threat to every organ in the body. Microbial invasion of blood stream can have serious immediate consequences such as shock, multiple organ failure and DIC. All four categories of microbes (bacteria, viruses, fungi & parasites) can cause BSI, however bacteria account for majority of BSI. Therefore timely detection of the causative agent is one of the most important goals of microbiology laboratory.<sup>1</sup> There are two major categories of blood stream infections according to source of infection, such as: Intravascular & Extravascular<sup>1</sup>. Clinically BSIs are classified into two types, Community acquired BSI & Hospital acquired BSI<sup>1</sup>.

Intravascular BSIs are infections originate within the cardiovascular system for e.g: Infective endocarditis, Mycotic aneurysm, Suppurative thrombophlebitis & intravascular catheter associated BSIs. These infections lead to continuous bacteremia which result into serious and life threatening events. Common bacteria causing intravascular BSI are: *Streptococci*, *Pneumococci*, *Staphylococcus aureus*, *Enterococci sp.*, Coagulase negative staphylococci, HACEK group & Gram negative bacilli. There are two types of intravascular catheter associated BSIs i.e: CRBSI & CLABSI. CRBSI (catheter related bloodstream infection) is the BSI attributed to an intravascular catheter by quantitative culture of the catheter tip or by differences in growth between catheter and peripheral venipuncture blood culture specimens. CLABSI (central line associated bloodstream infection) refers to bloodstream infections that appear in the presence of central line/central venous catheter or within 48 hours of removal of central line<sup>2</sup>.

Extravascular BSIs are either the organisms multiply at the primary site such as lungs and drained by lymphatics and reach the blood stream or organisms multiply more widely causing septicaemia. Through various routes the bacteria can get assess into body and cause BSI. The most common portals of entry for bacteremia are genitourinary tract (25%), followed by respiratory tract (20%), abscesses (10%), surgical site wound infections (5%).

Bacteremia is the presence of bacteria in blood without any multiplication. There are three types of bacteremia such as; Transient bacteremia, Continuous bacteremia, Intermittent bacteremia. Septicemia is a condition in which bacteria circulate, actively multiply and produce toxic substances in the bloodstream that cause harm to the host.

There are some unusual bacteria were isolated from blood samples and now days considered as pathogen. Such as *Burkholderia cepacia*,

*Ralstonia pickettii*, *Achromobacter xylosoxidans*, *Pasturella multocida*, etc<sup>3</sup>.

#### Materials & methods:

This retrospective study was carried out in the Dept. of Microbiology, KIMS, Bhubaneswar, Odisha over a period of one year.

Blood samples were collected in automated blood culture bottles from clinically diagnosed BSIs patients. Blood samples were processed by automated method. BacT/ALERT and VITEK-2 are two instruments used for automated culture & sensitivity. After collection the blood culture bottles were incubated in BacT/ALERT for five days. If blood culture bottles show growth positive, then blood from bottles plated in MacConkey agar & blood agar plates for isolation. Plates were kept in incubator for 48hrs at 37°C. After isolation of organism gram stain was performed from plates. According to gram stain either gram positive cocci(GPC), gram negative bacilli(GNB) cards were processed in VITEK-2 for identification and antibiotic sensitivity pattern of bacterial pathogen. Though this is an automated method it can identify the pathogen up to species level (99%probability) and antimicrobial sensitivity pattern of bacterial pathogen with MIC value.

#### Result:

About 5200 blood samples were processed, out of which 251(5%) show culture positivity. The maximum number culture positivity were isolated from 60-80 years of age and this was depicted in pie chart-1. Maximum number BSIs were isolated from ICU, followed by NICU, NeuroICU, Paediatric ward & others (pie chart-2). Most common bacterial pathogen isolated was *S.aureus* (14%) followed by *Klebsiella sp.* (13%), *Acinetobacter sp.* (10%) *E.faecalis* (10%) & *Pseudomonas sp.* (6%) and these were shown in Table-1. Among unusual pathogens *Burkholderia cepacia* was maximum percentage of isolation followed by *R.pickettii*. TABLE-2. The antibiotic sensitivity pattern shown by different bacterial isolates were depicted in graphs (graph-1,2,3,4). Percentages of common bacteria prevalent in different ICUs were shown in TABLE -3. Prevalence of CLABSI in our setup was 4% and shown in TABLE-4.

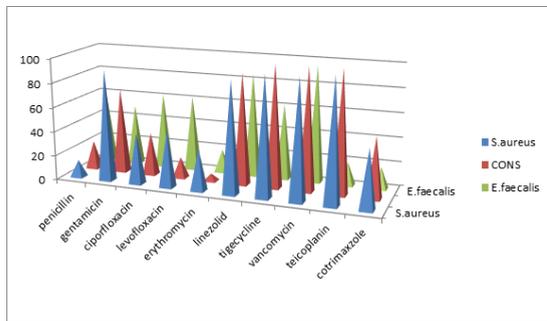
#### Discussion

Blood stream infections are one of the most common aetiology of preventable death in a developing country. Knowledge of its aetiology as well as antibiotic sensitivity is essential for planning antimicrobial policy & for infection prevention and control measures<sup>5</sup>. This was a retrospective study where causative bacterial pathogen of BSIs and their antibiotic sensitivity pattern has been studied. In our study, the percentage of bacterial BSIs were high in the age of group 61-80 years

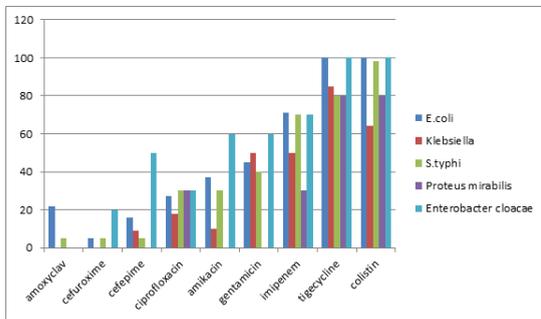
(chart-1). 5200 blood samples were processed, out of which 251(5%) were culture positive, which correlated with the study of N.Thacket et al, TMH, showing BSIs (6.97%)<sup>6</sup>. Most common bacterial pathogen was *S.aureus* (14%) followed by *Klebsiella sp.* (13%), *Acinetobacter sp.* (10%) *E.faecalis* (10%) & *Pseudomonas sp.*(6%) which also correlated well with study conducted at the AIIMS , NEWDELHI<sup>7</sup>. There were some unusual bacterial pathogens isolated like *B.cepacia*, *R.picketii*, *S.paucimobilis*, *A.xylosoxidans*, *S.marcescenes* & others. Bacteria were most sensitive to tigecycline and colistin<sup>8</sup>. In gram positive cocci, the most sensitive antibiotics were tigecycline, linezolid and vancomycin. Most of the bacteria were resistant to amoxycylav, cefuroxime & ciprofloxacin. Among unusual bacterial pathogens, *B.cepacia* & *R.picketii* were multidrug resistant bacteria<sup>9</sup>. BSI was more prevalent in main ICU followed by NICU, Neuro ICU<sup>10</sup>.

**TABLE – 1: Percentage of isolation of common bacterial pathogens**

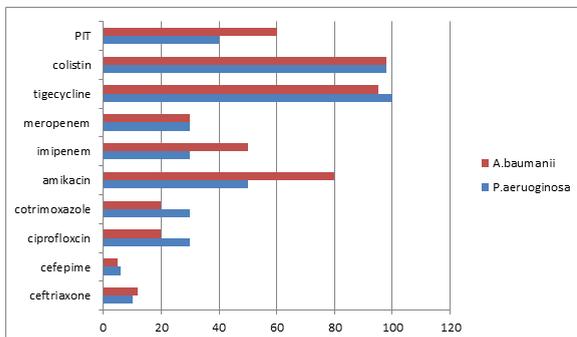
Name of bacteria	Percentage(%) of isolation
<i>S.aureus</i>	14%
<i>k.pneumoniae</i>	13%
<i>Acinetobacter baumannii</i>	10%
<i>E.coli</i>	10%
<i>S.haemolyticus</i>	7%
<i>Pseudomonas aeruginosa</i>	6%
<i>S.epidermidis</i>	5%
<i>S.typhi</i>	2%
<i>Enterobacter cloacae</i>	2%
<i>S.saprophyticus</i>	2%
<i>Proteus mirabilis</i>	3%



**GRAPH – 1: Antibiotic Sensitivity pattern of gram positive cocci**



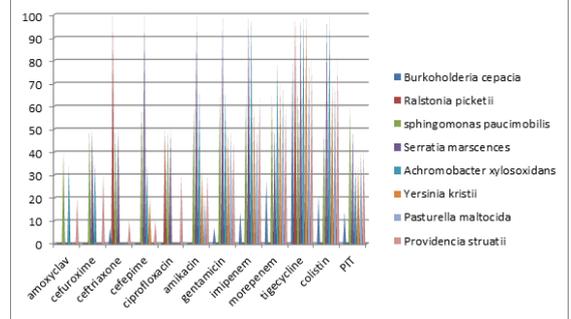
**GRAPH – 2: Antibiotic Sensitivity pattern of gram negative bacilli(fermenters)**



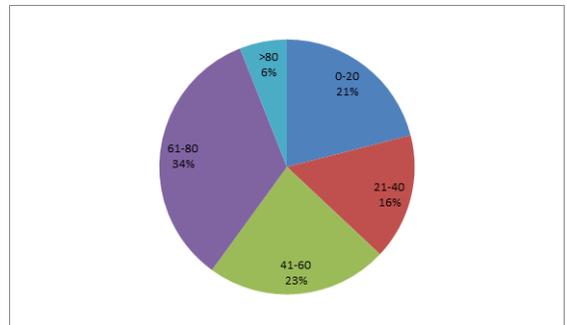
**GRAPH – 3: Antibiotic Sensitivity pattern of Paeruginosa & A.baumannii**

**TABLE – 2: Percentage of Culture isolation of unusual bacterial pathogens**

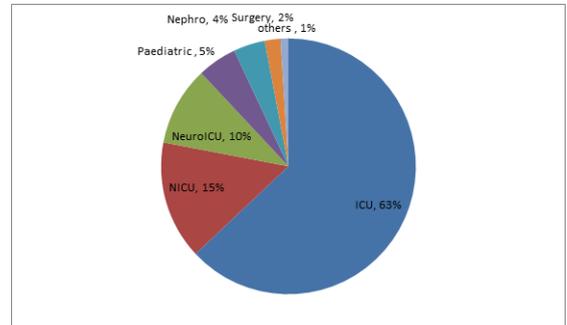
Unusual bacterial pathogen	Percentage(%) of isolation
<i>Burkholderia cepacia</i>	6%
<i>Achromobacter xylosoxidans</i>	1%
<i>Providencia stuartii</i>	2%
<i>Pasturella maltocida</i>	1%
<i>Serratia marcescens</i>	1%
<i>Ralstonia pickettia</i>	1%
<i>Yersinia kristenii</i>	1%



**GRAPH – 4: Antibiotic Sensitivity pattern of unusual bacterial pathogens**



**CHART – 1: Age wise isolation of culture positive BSIs**



**CHART – 2: Percentage of culture positive BSIs from different ICUs & wards**

**TABLE – 3: Most Common bacterial isolates from different ICUs**

Different ICUs	Common bacterial isolates
ICU	<i>Klebsiella sp.</i> , <i>E.faecalis</i> , <i>A. baumannii</i> & <i>S.aureus</i>
NICU	<i>S.aureus</i> & <i>A.baumannii</i>
Neuro ICU	<i>S.aureus</i>
PICU	<i>S.aureus</i> & <i>CONS</i>

**TABLE – 4: Prevalence of CLABSI in our Hospital**

No. of blood samples processed for C/S	No of culture positive blood samples	CLABSI	Source	Common bacterial pathogen
5200	251(5%)	11(4%)	ICU(80%) Ward(20%)	<i>S.aureus</i> <i>A.baumannii</i> <i>CONS</i> <i>Klebsiella sp.</i>

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