Original Article

Hospital acquired blood stream infections and resistogram pattern of Gram negative organisms in a tertiary care hospital of Kanchipuram.

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Abstract

In the present study, 220 blood samples were collected from patients attending Meenakshi Medical College Hospital & Research Institute. Blood BacT/ALERT FA plus (colour coded pale green) was used. Microbial organisms isolated from septicemia cases were identified as per standard protocol & antibiogram was done by Kirby Bauer disc diffusion method. The antibiotic sensitivity test was performed by Kirby Bauer diffusion technique with commercially available disc (HI-MEDIA) on Muller Hinton agar. We have found that out of 220 blood samples, 32 (14.5 %) were found to be positive, of which 18(56.2%) were males and 14(43.8%) were females in the age group of 21-40 and 41-60 years. 44.4% of male and 64.3% of female patients were between 21-40 years. We found that E.coli 19 (12.02%) were the predominant isolates followed by Klebsiella pneumoniae 17(10.75%). P.aeruginosa was 15 (9.49%). Enterobacter spp was 8 (5.06%). Citrobacter and Acinetobacter spp was 7 (4.43%). Moreover, the present study showed highest resistance to Amikacin (68.75%), Ceftazidime (59.4 %), and Ceftriaxone (56.3%). Further e moderate resistance was observed for Gentamicin (50%) and Ciprofloxacin (43.75%) and finally least resistance (37.5%) was observed for Ofloxacin followed by Imipenem 18.8% resistance. Taken together we suggest stringent surveillance studies are required to know the epidemiological pattern and to formulate antibiotic policy as well as infection control measures against these infections.

Keywords: prevalence, resistance, sepsis, infection, control.

Introduction

Blood stream infections (BSI) are leading causes of morbidity and mortality in healthcare setup and it is a raising alarm in public health sector worldwide. A wide range of microorganism has been described that cause BSI and its spectrum is subjected to geographical alteration (1). BSI have been classified into either community acquired (CA) or hospital acquired (HAI) infection for the epidemiological, infection prevention and control purposes (2) NI/HAI are commonly defined as those that have onset after admission or associated with acquisition in the hospital environment, whereas CAI have been defined as those present or incubating at the time of hospital admission (2, 3). Both gram positive, gram negative have been isolated from BSI and predominance of one type over others varies from place to place and even in the same place over time. Gram negative bacteria can results in septic shock and the mortality is greater and they are poly-microbial compared to gram positive bacteria. Hence, the
present study was designed to know the Hospital acquired blood stream infections and their resistogram pattern of gram-negative organism in a tertiary care hospital.

**Materials and Methods**

A total of 220 blood samples were collected from patients attending MMCH & RI from September 2014 – November 2015. Institutional ethical committee of Meenakshi Medical College and research Institute, Enathur, Kanchipuram, Tamil nadu, India, approved this study.

**Inclusion criteria**

Adult patients admitted to ICU who have been catheterized (Intravascular) for more than 48 hrs showing clinical signs of sepsis (12).

- **Signs of bloodstream infection**
- Fever
- Hypothermia, chills, rigors, hypotension tachycardia, tachypnea.

**Exclusion criteria**

All catheterized patients in ICU’s without any signs of sepsis.

**Blood Culture Processing**

Blood BacT/ALERT FA plus (colour coded pale green BioMérieux) were used and positive blood culture bottles were inoculated on blood agar, nutrient agar, chocolate agar, & Mac Conkey agar and gram staining was done from the positive BacT/ALERT bottles by using sterile syringes.

**Processing Outline**

Organism isolated from septicemia cases were identified as per standard protocol & antibiogram was done by Kirby Bauer disc diffusion method and further their resistant pattern was studied (5).

**Antimicrobial susceptibility test: (CLSI 2014)**

The antibiotic sensitivity test was performed by Kirby Bauer diffusion technique with commercially available disc (Himedia laboratories pvt. ltd mumbai) on Muller Hinton agar and results were interpreted according to the CLSI guidelines.

Colonies were taken from a primary culture plate to make a suspension of the test organism. Turbidity of the test suspension was tested against the turbidity of 0.5 McFarland standards. Use of too much inoculum was avoided by pressing against the sides of the tube. The surface of sensitivity testing agar was swabbed in three directions rotating the plate to ensure even distribution and antimicrobial discs were placed on inoculated plate (4).

<table>
<thead>
<tr>
<th>Antimicrobial Agent</th>
<th>Zone Diameter Interpretive Criteria (mm)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Concentration of the disc</td>
</tr>
<tr>
<td></td>
<td>Sensitive (mm or more)</td>
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<tr>
<td></td>
<td>Intermediate (mm)</td>
</tr>
<tr>
<td></td>
<td>Resistant (mm or less)</td>
</tr>
<tr>
<td>Amikacin (30 µg)</td>
<td>17</td>
</tr>
<tr>
<td>Ciprofloxacin (5 µg)</td>
<td>21</td>
</tr>
<tr>
<td>Ceftazidime (30 µg)</td>
<td>21</td>
</tr>
<tr>
<td>Ceftriaxone (30 µg)</td>
<td>21</td>
</tr>
<tr>
<td>Gentamicin (10 µg)</td>
<td>15</td>
</tr>
<tr>
<td>Ofloxacin (5 µg)</td>
<td>16</td>
</tr>
<tr>
<td>Imipenem (10 µg)</td>
<td>19</td>
</tr>
</tbody>
</table>

**Results**

A total of 220 blood samples were collected from patients who are clinically suspected of blood stream infections. Out of which 32 samples were catheter related blood stream infections. Patients from Intensive Care Unit of MMCH & RI, Kanchipuram were included in this study (Table 1) (Fig 1).

Out of the total 220 blood samples, 32 (14.5 %) isolates were found to be positive. Male 18(56.2%) were commonly affected than females 14(43.8%) (Table 2).
The predominant percentage of patients were noted between 21-40 and 41-60 years. 44.4% of male and 64.3% of female patients were between 21-40 years, which is followed by 22.2% of male and 14.3% of female were between 41-60 years. 11.2% male and 7.1% of female were more than 60 years and 22.2% of male and 14.3% of female were seen after 0-20 years (Table 3).

Among isolates, 27 isolates grown in blood culture only gram-negative organisms were taken for our study. We found E.coli 19 (12.02%) were the predominant isolate in BSI followed by Klebsiella pneumoniae 17(10.75%). P.aeruginosa was 15 (9.49%). Enterobacter spp was 8 (5.06%). Citrobacter and Acinetobacter spp was 7 (4.43%) (Table 4) (Fig 2).
The antibiotic resistance pattern for gram negative has shown the highest resistance towards Amikacin (68.75%), Ceftazidime (59.4%), and Ceftriaxone (56.3%). Further moderate resistance was observed for Gentamicin (50%), Ciprofloxacin (43.75%) and finally least resistance (37.5%) was observed for Ofloxacin followed by Imipenem 18.8% resistance (Table 5) (Fig 3).
Discussion

Blood stream infections present the bacteremia originating from an intravenous catheter and are associated with the higher rate of morbidity and mortality in critically ill patients.

In current study, among the total 220 samples, 32 (14.5 %) showed growth in culture which is comparatively less than other studies who reported 24.9 %, 28%,18.6%,25% and 17% respectively (12,13,14, 15, 16). A study from AIIMS, New Delhi have reported 17.27% rate of catheter related sepsis (17). Our culture positivity rates have indicated that Males (56.2%) were commonly affected than females (43.8%), which is comparable with the studies by other groups. Male preponderance, 60.2%, 61.7%, and 58.8% were reported in the studies (16, 18, 19). However, many studies documented male predominance, in another study, reported the female predominance in his study (12). Male preponderance is attributed to the external activities, in most of the studies (9, 11). In present study, taken the age group between 21-40 years and 40 – 60 years showed more incidence of CRBSI. This is in line with the studies conducted by Dileep Kumar Sharma et al (12). We Have found E.coli 19 (12.02%) were the predominant isolate in BSI followed by Klebsiella pneumoniae 17(10.75%). P.aeruginosa was 15

<table>
<thead>
<tr>
<th>Organism</th>
<th>Percentage of isolation (N=32)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escherichia coli</td>
<td>19 (12.02%)</td>
</tr>
<tr>
<td>Klebsiella pneumoniae</td>
<td>17(10.75%)</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>15 (9.49%)</td>
</tr>
<tr>
<td>Enterobacter spp.</td>
<td>8(5.06%)</td>
</tr>
<tr>
<td>Citrobacter</td>
<td>7 (4.43%)</td>
</tr>
<tr>
<td>Acinetobacter spp.</td>
<td>7 (4.43%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Antibiotics (mcg)</th>
<th>No. of Resistant</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amikacin (30 µg)</td>
<td>22</td>
<td>68.75%</td>
</tr>
<tr>
<td>Ciprofloxacin (5 µg)</td>
<td>14</td>
<td>43.75%</td>
</tr>
<tr>
<td>Ceftazidime (30 µg)</td>
<td>19</td>
<td>59.4%</td>
</tr>
<tr>
<td>Ceftriaxone (30 µg)</td>
<td>18</td>
<td>56.3%</td>
</tr>
<tr>
<td>Gentamicin (10 µg)</td>
<td>16</td>
<td>50%</td>
</tr>
<tr>
<td>Ofloxacin (5 µg)</td>
<td>12</td>
<td>37.5%</td>
</tr>
<tr>
<td>Imipenem (10 µg)</td>
<td>6</td>
<td>18.8%</td>
</tr>
</tbody>
</table>
(9.49%). were the common isolates among the CRBSI (6, 7).

In many other studies the commonest isolates causing CRBSI were *Pseudomonas aeruginosa* 16%, coagulase negative staphylococci 8%, *E. coli* 8%, *Klebsiella pneumoniae* 8%, and *Acinetobacter baumanii* 4%. Gram negative bacteria were commonly isolated in various studies (8, 12, 13, 14, 20). The distribution and relative rank of these species varied with geographical area and environment of critical care units (10).

Most concerns about resistance have focused primarily on hospitals and the developing world, as the problem is now increasing at an alarming rate. In fact, various forms of antimicrobial resistance now pervade all communities and all health care settings, including the physician's office and the home care environment. As a result, family physicians are confronted with new diagnostic challenges, complicated therapeutic choices, rising treatment costs and an increased risk of patient morbidity and mortality.

**Conclusion**

The various microbiological pattern of CRBSI warrants the need for an ongoing review of the causative organisms and their antimicrobial susceptibility pattern, therefore, it is advisable to monitor continuously the sensitivity pattern of isolates. So as to make a rational use of antibiotics. Early initiation of suitable antimicrobial therapy for BSI’s is critical in decreasing morbidity and mortality among patients of BSI’s due to bacteria. To reduce the infection mortality and morbidity length of stay in hospitals and cost, we have to insist the prevention and control measures, which Consist of microbiology results interpretation and feed back to ICU team regarding antimicrobial resistance audit and policy implication, rational utilization of diagnostic therapeutic and infection prevention and control resources. Surveillance study to know the epidemiological pattern and to formulate antibiotic policy as well as infection control measures against these infections are to be taken care of.

**Acknowledgement**

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**Conflict of interest**

Authors declare that there is no conflict of interest to reveal.

**References**


