Neonatal septicemia: Blood culture bacterial isolates and their antimicrobial susceptibility pattern

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Abstract

Introduction: Neonatal septicemia is defined as “a clinical syndrome of bacteremia with systemic signs and symptoms of infection in the first four weeks of life”. Blood culture is the gold standard method for diagnosis of septicemia. Isolation of organism in blood culture and its antimicrobial sensitivity pattern carries a great role.

Aim: To provide prevalence and antimicrobial susceptibility pattern of bacteria isolated from suspected cases of neonatal septicemia at a tertiary care hospital, Valsad.

Materials and Methods: Retrospective study is conducted at a tertiary care hospital, Valsad from January 2017 to June 2018. Processing of blood culture samples, Isolation and identification of bacteria were done using standard microbiology techniques. Antimicrobial susceptibility testing was performed using modified Kirby-Bauer disk diffusion method as per Clinical laboratory Standard Institute guideline. ATCC E. coli 25922, ATCC S. aureus 25923, ATCC P. aeruginosa 27853 were used as standard strains.

Results: Out of 452 blood cultures, organisms were isolated in 127 (28.09%). Commonly isolated bacteria were Coagulase Negative Staphylococci (42.52%) followed by Klebsiella spp. (18.11%), Acinetobacter spp. (15.75%), Enterococcus spp. (9.45%) and others (Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa). Coagulase Negative Staphylococci strains have highest sensitivity to Vancomycin (100%), Linezolid (100%), Teicoplanin (100%), followed by Chloramphenicol (92.6%), Levofloxacin (90.7%), Cefotaxim (83.3%), and Tetracycline (77.8%). 16.7% isolates were Methicillin Resistant Staphylococci (MRS). Klebsiella spp. strain have highest sensitivity to Meropenem (73.9%), Imipenem (73.9%) and Amikacin (69.6%) followed by Chloramphenicol (92.6%), Levofloxacin (90.7%), Cefoxitin (85.0%) and Piperacillin Tazobactum (52.2%). 78.3% strains were Extended spectrum Beta-Lactamase (ESBL) producers.

Conclusion: Antimicrobial resistances are growing among bacteria and it differs according to different areas. So, proper surveillance system should be established to guide antimicrobial policy at local level.

Keywords: Neonatal septicemia, Blood culture, Antimicrobial susceptibility.
Results

**Fig. 1: Result of culture**

**Table 1: Frequency and percentage positivity of bacterial isolates**

| Organisms                      | Frequency (out of 127) | Percentage positivity (%) |
|--------------------------------|------------------------|---------------------------|
| Coagulase Negative Staphylococci | 54                     | 42.52                     |
| Enterococcus spp.              | 12                     | 9.45                      |
| Staphylococcus aureus          | 8                      | 6.3                       |
| Bacillus subtilis              | 2                      | 1.57                      |
| Klebsiella spp.                | 23                     | 18.11                     |
| Acinetobacter spp.             | 20                     | 15.75                     |
| E.coli                         | 5                      | 3.94                      |
| Pseudomonas aeruginosa         | 3                      | 2.36                      |

**Table 2: Age wise distribution of samples**

| Age            | Total | Positive | Percentage positivity (%) |
|----------------|-------|----------|---------------------------|
| <8 days        | 367   | 99       | 26.97%                    |
| 8 days or more | 85    | 28       | 32.94%                    |

(p value: 0.42 > 0.05, Difference is statistically not significant)

**Table 3: Sex wise distribution of samples**

| Sex  | Total | Positive | Percentage positivity |
|------|-------|----------|------------------------|
| Female | 185  | 51       | 27.56 %                |
| Male   | 267  | 76       | 28.46 %                |

(p value: 0.87 > 0.05, Difference is statistically not significant)

**Fig. 2: AST pattern of Coagulase Negative Staphylococci (n=54)**
Discusson

Result shows that the common blood culture bacterial isolates from NICU are Coagulase Negative Staphylococci and Klebsiella spp. with blood culture positivity rate of 28.09%.

Out of 452 blood cultures included in the study, organisms were isolated in 127(28.09%) as shown in Fig. 1. Frequency and percentage positivity of all isolated organisms is shown in Table: 1. Gram positive and Gram Negative bacterial isolates were 76(59.84%) and 51 (40.16%) respectively. Similar studies conducted by Hitesh J Assudani et al.10, Patel D et al.11 and Shah Manisha et al.12 in Gujarat shows positivity rate of 35.34%, 43.36% and 20% respectively with Klebsiella spp. and Coagulase Negative Staphylococci or Staphylococcus aureus as commonly isolated organism.

Positivity rate depend on many factors like non bacterial causes of septicemia, anaerobic bacterial infection, ongoing antibiotic therapy, less volume of blood etc.10 Klebsiella spp. and Coagulase Negative Staphylococci are commonly isolated organism in different studies14,18,19 may be because of their nature as saprophyte or commensals,22 environmental factors, low birth weight or prematurity which makes them more susceptible to surrounding infections.10,23 Some studies also found E.coli and Staphylococcus aureus as commonly isolate organisms16,17,20,21 may be because of different geographical area.10

Age and sex wise distribution is shown in Table: 2 and Table: 3. Difference is statistically not significant. (p value < 0.05).

Coagulase Negative Staphylococci strains have highest sensitivity to Vancomycin (100%), Linezolid (100%), Teicoplanin (100%), followed by Chloramphenicol (92.6%), Levofloxacin (90.7%), Cefoxitin (83.3%), and Tetracycline
Klebsiella spp. strains have highest sensitivity to Meropenem (73.9%), Imipenem (73.9%) and Amikacin (69.6%) followed by Chloramphenicol (65.2%), Tetracycline (60.9%) and Piperacillin Tazobactam (52.2%) as shown in Fig. 3. All strains shows higher resistance to Cephalosporins. 78.3% strains were Extended Spectrum Beta-Lactamase (ESBL) producers. Similar study conducted by Patel D et al.11 shows 33% prevalence of MRS strains. Klebsiella spp. strains show higher susceptibility of Penicillin group (77.8%) as shown in Fig. 2. 16.7% isolates were Methicillin Resistant Staphylococci (MRS). Similar study conducted by Patel D et al.11 shows 33% prevalence of MRS strains.

Acinetobacter spp. strains show highest sensitivity to Levofloxacin (100%) and Polymyxin B (100%) followed by Tetracycline (80%), Amikacin (70%), Piperacillin-Tazobactam (60%), Imipenem (60%) and Meropenem (60%). Different cephalosporins show sensitivity varying from 20-40%.

All strains of Staphylococcus aureus (n=8) were sensitive to Cefoxitin, Teicoplanin, Linezolid and Vancomycin along with fluoroquinolones. All strains of Enterococcus (n=12) were sensitive to Teicoplanin, Linezolid and Vancomycin.

Low prevalence of MRS strains and MDR organisms in our study suggest good hygienic practices among health care workers. Still lower susceptibility of Penicillin group and Cephalosporins among all bacteria create alarming sign for developing Anti Microbial resistance as they are commonly used drugs for Outpatient based treatment. Spread of these resistance strains leads to physical, financial and emotional burden to patients as well as community. There should be Antimicrobial usage guidelines based on local antimicrobial resistance data to reduce further development of resistance.

Conclusion
Klebsiella spp. and Coagulase Negative Staphylococci are common isolates in NICU. Resistance to frequently used Penicillin and Cephalosporin group is high among all bacterial isolates. Antimicrobial stewardship program should be implemented to make antibiotic policy at local level to deal the current scenario.

Conflicts of Interest: None.

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