



## Study on the trends of blood stream infections among pediatric patients and their antibiotic susceptibility pattern in a tertiary care teaching hospital in Solapur, Maharashtra

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### Abstract

**Background:** Blood stream infection causes significant morbidity and mortality in all age group and it results in increase health care expenditure Blood culture remains main stay for laboratory diagnosis of blood stream infections Aim of the study is to know the bacteriological profile and antibiotic susceptibility pattern of bacteria causing blood stream infections in pediatric age group.

**Material & Method:** Present study has been conducted between August 2017 to September 2018, all blood samples received for culture & sensitivity from pediatric ward suspected of having sepsis were included in the study .Blood samples were collected using aseptic precautions. Both blood culture bottles were incubated at 37<sup>0</sup> C for 10 days and subcultures were done on alternate day on blood agar and Mac Conkey medium. In case of growth, organisms were identified using standard protocols and antibiotic sensitivity testing was done using Kirby bauer disc diffusion method.

**Results:** Total blood samples received between August 2017 to September 2018 were 1604 out of which 395 samples were from Pediatric age group. Growth was seen in 146 (35%) samples. Most common organism isolated from blood cultures from grow positive bacteria spectrum were *Staphylococcus aureus* were 72 (49.3%) followed by *Enterococcus faecalis* 6 (5.5%) and *Streptococcus pneumoniae* 2 (5%). Antibiotic sensitivity pattern showed 100% sensitivity to Vancomycin, Linezolid, and highest resistance was noted for penicillin and tetracycline. Among gram negative isolates most commonly isolated was *Klebsiella pneumoniae* 20 (13%), followed by *Acinetobacter baumannii* 20 (13%), *Pseudomonas aeruginosa* 14 (9.58%), *E coli* 8 (5.5%) *Enterobacter aerogenes* 4 (2.73%). Overall antibiotic sensitivity pattern shows 100% sensitivity to Colistin followed by 60% for Imipenem, Ciprofloxacin 56%, Piperacillin Tazobactam 50%, Amikacin 46%, Ampicillin 30% and Cefotaxime 26%, Males 84(57%) more commonly affected then females 62 (42%). Most common age group affected was less than 1 year (66/146) 45% in both sexes followed by equal number of cases in age group 2-6 years and 7-12 years in both males and females 40 (30%) respectively.

**Keywords:** Pediatric patients, blood, tertiary

### Introduction

Blood stream infections (BSI's) are defined as presence of microorganisms in blood stream causing clinical illness [3]. They are major cause of morbidity and mortality for patients of all age group [3]. A relative number of bacterial species causes bacteremia in normal children. *Streptococcus pneumoniae*, *Haemophilus influenzae type-B* and *Neisseria meningitidis* are most commonly isolated and cause severe sepsis [4].

Presence of foreign material such as catheter or central line enhances risk of bacteremia with both gram positive as well as grave negative bacteria [5]. Recovery of microorganism from blood depends upon various other factors like collection time, volume, method of blood collection. Blood culture remains one of the most important investigations in Microbiology. It is essential to know the bacteriological profile and antibiotic sensitivity pattern in various age groups which will help in strengthening hospital based antibiotic policy for effective treatment of such infections.

### Material and Method

All blood samples received from Pediatric ward for culture and sensitivity between august 2017 to September 2018 were included in the study. Blood samples were collected from each patient using aseptic precautions prior to antibiotic administration in two sets of culture bottle. Blood culture bottles were incubated for 14 days and were sub-cultured on alternate day on blood agar and Mac convey medium. In case of growth, reports were conveyed immediately telephonically to the treating physician. Growth was identified using standard biochemical tests using appropriate ATCC positive and negative controls and antibiotic susceptibility testing was done using Kirby Bauer disc diffusion method as per CLSI guidelines.

### Results

Total blood samples received in Microbiology department between August 2017 to September 2018 were 1604 out of which 395 samples were from Pediatric age group. Growth

was seen in 146 (35%) samples received from Pediatric ward. Among the culture positive samples gram positive spectrum includes *Staphylococcus aureus* 72 (49 %) out of which MRSA were 47%, MRCONS were 44% MSSA were 8.3%. *Enterococcus faecalis* 6 (5.5%) and *Streptococcus pneumoniae* 2 (1.36%) Among Gram negative organism most commonly isolated was *Klebsiella pneumoniae* 20 (13%), *Acinetobacter baumannii* 20% (13%) *Pseudomonas aeruginosa* 14 (9.58%), *E. Coli* 8 (5.5%) and *Enterobacter aerogens* 4 (2.73%). Most commonly BSI were seen in males 84(57%) as compared to females 62 (42%).

**Table 1:** Age & Gender-wise distribution of BSI among Pediatric age group

Age group	Males	Percentage %	Females	Percentage %
Less than 1 year	40	47%	26	41%
2 – 6 years	22	26%	18	29%
7-12 years	22	26%	18	29%
Total (N=146)	84	57%	62	42%

**Table 2:** Antibiotic susceptibility pattern of *Staphylococcus aureus* (n= 72)

Drugs	Number of sensitive isolates	Percentage of sensitive isolates %
Cefoxitin 30 µg	06	8%
Erythromycin 15µg	36	50%
Clindamycin 2µg	42	58%
Vancomycin 30µg	72	100%
Gentamicin 10µg	40	50%
Ciprofloxacin 5µg	54	75%

Among *Streptococcus pneumoniae* n=2, both the isolates were sensitive to vancomycin, Linezolid and ciprofloxacin. Both isolates were resistant for penicillin and tetracycline.

In *Enterococcus faecalis* (n=6), all isolates were sensitive for vancomycin, linezolid ciprofloxacin showed 50% sensitivity, while maximum resistance was noted for penicillin and tetracycline 4 (66%) respectively.

In case of Gram negative organisms n=66, 100% sensitivity was seen for colistin followed by 60% sensitivity shown by Impinem, ciprofloxacin 56% Piperacillin–tazobactam 50%, Amikacin 46%, Ampicillin 30%, cefotaxim 26%.

## Discussion

Blood stream infection remains a challenge for physicians due to changing bacterial etiology and rapid emergence of antimicrobial resistance. Early detection and antibiotic sensitivity pattern will help clinicians to choose appropriate empirical therapy. In the present study overall culture positive rate is (35%). Study done by Harsha Lochan *et al* [1] showed culture positive rate 35.8% which is similar to our studies. Studies done by Devendra Kumar Tiwar *et al* [4] showed 25% of culture positivity rate however study done by Hilmar Wisplengheff *et al* [7] showed very low culture positivity rate of 7.8% the difference in culture positivity rate may be attributed to various factors like time, volume of blood collection, method of blood collection and antibiotic administration to the patient before collection of blood sample for culture & sensitivity. The variation in culture positivity rate may be different between developed and developing countries which may be due to population and geographical

constraints and availability of resources for rapid diagnosis and treatment.

In the present study males 84 (57%) were more commonly affected by BSI than females 62 (42%), most common age group affected was less than 1 year of age. Study done by Devendra Kumar Tiwar *et al* [4] also showed Male to female ratio of 1.28:1. In study done by Narayan Prasad Parajule *et al* [3] more cases were reported from children less than one as compared to adults, there has been variation in results pertaining to gender and age wise distribution, which may be attributed to population under study, local shift in microbiological spectrum from time to time, immune status of the study sample.

In the present study among gram positive bacteria *Staphylococcus aureus* (n=72) (49%) were predominantly isolated from blood cultures followed by *Enterococcus faecalis* 6(5.5%) and *Streptococcus pneumoniae* 2 (1.36%). Among gram negative bacteria most commonly isolated were *Klebsiella pneumoniae* 20 (13%) *Acinetobacter baumannii* 20(13%), *Pseudomonas aeruginosa* 14 (9.58%), *E Coli* 8 (5.5%), *Enterobacter aerogens* 4 (2.73%) In studies done by Narayan Prasad Parajule *et al* [3] gram negative bacteria (78.7%) were predominantly isolated from blood culture as compared to gram positive organism 54.4%. Studies done by Devendra Kumar Tiwari *et al* [4] showed gram negative bacteria (*Klebsiella pneumoniae*) 43.8% were most commonly isolated followed by *Staphylococcus aureus* (18.75%). Studies by Harsha Lockan *et al* [1] show gram negative organism were more common cause of BSI as compared to gram positive organism. Our studies shows variation which may be due to variation in population under study, geographical variation as this is an institution based study we cannot generalize our findings but it is important to make note about changing trends in the bacteriological profile in our area as compared to studies done by other workers.

Antibiotic susceptibility pattern among gram positive isolates showed 100% sensitivity to vancomycin and Linezolid however maximum resistance was noted for penicillin and tetracycline. Among gram negative isolates 100% sensitivity was shown by colistin followed by Imipenem 60% ciprofloxacin 56%, piperacillin-tazobactam 50%, Amikacin 46%, Ampicillin 30%, cefotaxime 26%. Various workers have noted difference in the antibiotic susceptible pattern among isolates it may be due to local antibiotic prescribing habits, practice of injudicious use of antibiotics and availability of over the counter drugs, also variation among countries, states, cities, variation may be seen even between different institution based on population under study. We have done present study to note antibiotic susceptibility pattern in order to formulate antibiotic policy keeping in mind Pediatric age group which will be helpful to physician for starting empirical therapy.

## Conclusion

Blood culture still remains gold standard for diagnosis of BSI. Microbiology laboratory plays important role in guiding physician in administration of empirical treatment. Early detection and prompt treatment affects mortality rate significantly. The present study provides insights on local trends and bacterial etiology of BSI among Pediatric patients admitted in our Hospital.

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