

Original Research Article

<https://doi.org/10.20546/ijcmas.2022.1110.010>

Septicemia in Hospital Born Neonates and Antibiotic Sensitivity Pattern with Role of WBC Count Parameters

Shailaja Amur^{1*}, Umeshwar R. Hallikeri², Rajeshwari Surpur¹ and Mahalaxmi¹

¹Department of Microbiology, ²Department of Pathology, Navoday Medical College, Raichur, Karnataka, India

*Corresponding author

ABSTRACT

Keywords

Neonatal septicemia, BACTEC, Antibiotic susceptibility, CBC

Article Info

Received:
05 September 2022
Accepted:
30 September 2022
Available Online:
10 October 2022

Positive blood cultures are the gold standard for the neonatal sepsis. Most infections in the neonates are caused by bacteria and a few by viruses. As the baby passes through the birth canal of the mother during delivery the child swallows or breathes the birth canal fluid, bacteria or virus enter into their blood or lungs. This study was done to identify the aerobic bacteria causing sepsis in neonates and their susceptibility patterns along with CBC parameters in Navodaya Medical College Hospital, Raichur. All the blood cultures obtained from the neonatal ward during the period of one year [from 30th July 2021 to 30th July 2022] were analysed their antibiotic susceptibility was recorded. CBC was done in the Department of Pathology using cell counter and smear study. The positivity of blood cultures was 42% [84/200] Most bacteremic episodes were caused by one type of organism and polymicrobial growth was noticed in 8.4 % [10/ 84]. 64.2 % infections [54/84] were found to be due to Staphylococci and 27.4 % [23 /200] isolates showed Gram negative infections. Gram negative isolates showed lesser degree of susceptibility to the antibiotics. The TLC were found to be significantly lower than the normal babies.

Introduction

Blood stream infections are very common in neonates. The incidence of neonatal sepsis is increasing all over the world leading to high degree of morbidity and mortality. Kavitha *et al.*, (2010) The early symptoms of sepsis in neonates are nonspecific and the outlook is considered to be the worst in babies in whom the appropriate antibiotics are started late. Detecting the bacteria causing sepsis

in neonates has become an essential step which in turns helps the clinician for the appropriate selection of antimicrobials. Improvement in outcome and successful treatment depends on early initiation of appropriate antibiotic therapy. Srinivasa *et al.*, (2014). Thus the objective of this study was to detect the bacteria causing sepsis in neonates and also to establish an antibiogram pattern in and around the Navodaya Medical college Hospital, Raichur.

Materials and Methods

Navodaya Medical College Hospital and research centre has a capacity of 1110 beds and is a centre with well trained professional staff. It is equipped with modern facilities and the most contemporary medical equipment. Microbiology lab is equipped with BACTEC blood culture system.

In this study we used BACTEC PEDS PLUS vials [yellow top – paediatric aerobic] from the neonates suspected of septicemia from neonatal ward. We analysed a total number of 700 blood cultures collected during 30th July 2021 to 30th July 2022] after approval of the Hospital ethical committee.

Blood was collected with all aseptic precautions after disinfecting the venepuncture site. About 1.0 ml blood was drawn and placed in a paediatric aerobic bottle which was sent to Microbiology laboratory for further processing.

BD BACTEC 9050 System was used for incubation in the Microbiology laboratory. BACTEC 9050 is an automated blood culture system containing a sensor that responds to the concentration of Carbon dioxide produced during the microbial growth after the consumption of oxygen required for the growth. Increased CO₂ or decreased O₂ is monitored every 15 min for an increase in its fluorescence.

BACTEC 9050 bottles that indicated growth were seeded on Blood agar and MacConkey Agar media and were incubated at 35± 2 degree celsius. Colonies were stained by Gram's method. The positive growth was further processed by routine biochemical reactions. Antibiotic sensitivity testing was done by modified Kirby Bauer's method. (Lalitha, 2004) CLSI guidelines were followed for interpretation of results. (Collins *et al.*, 1995; Forbes *et al.*, 2002; Evans *et al.*, 1996; WHO, 1980)

BACTEC 9050 bottles that showed growth were plated onto sheep BA and MacConkey Agar and

further incubated at 35± 2 0 C. Growths were stained by Gram's method [3]. The positive growth was further processed by routine biochemical reactions and Antibiotic Susceptibility was put up by modified Kirby Bauer's method (Lalitha, 2004). CLSI guidelines were followed for interpretation of results (Collins *et al.*, 1995; Forbes *et al.*, 2002; Evans *et al.*, 1996; WHO, 1980).

Results and Discussion

Our study included the neonatal blood samples collected during a period of 1 year i.e. 30th July 2021 to 30th July 2022. A total of 200 samples were received of which 84 samples were positive for aerobic bacterial growth. Out of 84 samples 54 samples yielded Gram positive cocci (CONS - 34, *S. aureus* 18, *Enterococcus* - 02). 30 samples yielded Gram Negative Bacilli. (*Klebsiella* species - 16, *E. coli* - 10, *Enterobacter* - 02, *Pseudomonas* species – 02.) Most of the blood cultures showed growth within 72 hrs of incubation which agrees with the original research paper published by Shilpa Pradhan *et al.*, (2017).

Antibiotic Sensitivity

Most of the Gram negative bacteria showed sensitivity to Amikacin, Piperacillin + Tazobactam, Imipenem, Amoxicillin + Clavulanic acid and Ceftriaxone.

Gram positive isolates were found to be susceptible to Imipenem, Piperacillin + Tazobactam, Amikacin and Vancomycin.

Intermediately sensitive organisms were considered as resistant for the study purpose. Neonatal sepsis is a blood infection that occurs in an infant younger than 90 days old. Early onset of sepsis is seen in the first week of life. Late onset occurs after 1 week through 3 months of age. This systemic bacterial infection is documented by positive blood cultures in first few weeks of life.

Table.1 Antibiotics used in the Study

S.No.	Antibiotic	Potency	Abbreviations
1	Ampicillin	10 mcg	AMP
2	Amoxicillin + clavulinic acid	50+10 mcg	AMC
3	Amikacin	30 mcg	AK
4	Piperacillin+Tazobactam	100/10 mcg	PIT
5	Ceftriaxone	30 mcg	CTR
6	Ofloxacin	5 mcg	OF
7	Imipenem	10 mcg	IPM
8	Vancomycin	30 mcg	VA

Table.2 Organisms and their Percentage of Growth

Isolates	Number	Percentage
<i>Klebsiella species</i>	34	40.5
<i>E.coli</i>	18	21.4
<i>Pseudomonas species</i>	06	7.1
CONS	16	19.0
<i>S. aureus</i>	10	11.9

Table.3 Percentage of Bacteria Sensitive to Various Antibiotics

ISOLATES	AMP	AMC	AK	PT	CTR	OF	IPM	VA
<i>Klebsiella species</i>	43	66.5	87	92	78.2	64.4	99	61.2
<i>E.coli</i>	54.5	59.5	92	98.5	75.5	71	100	59.5
<i>Pseudomonas species</i>	35	52.8	91.5	97	76.6	58.6	98.5	28.5
CONS	85	91	100	100	98	78.8	100	100
<i>S. aureus</i>	62	75.5	95.5	98	90.5	77	100	100

The diagnosis is aided by blood cell counts. It is the major cause of mortality and morbidity accounting for about 30 to 50 % neonatal deaths in developing countries (Shilpa Pradhan *et al.*, 2017).

Blood culture is one of the most important diagnostic methods for septicemia cases, especially in neonates as the symptoms vary from asymptomatic to varied manifestations like meningitis, osteomyelitis, pneumonia etc.

In the present study Gram Negative organisms were most commonly isolated organisms followed by Gram Positive cocci. WHO has recommended the use of penicillin or Ampicillin plus aminoglycoside

for the neonates. In the present study showed Imipenem, Tazobactam +Piperacillin, Amikacin as more effective drugs for Gram Negative organisms.

Amikacin, Tazobactam + Piperacillin, Imipenem and Vancomycin were found to be effective against Gram Positive bacteria. CONS were found to be sensitive to Ceftriaxone and Amoxicillin + Clavulinic acid also.

WBC counts - The relative value of WBC helps in evaluating the diagnosis. The count of these leucocytes may be increased or decreased or even may remain normal in cases of sepsis. In the current study leucopenia was noticed in 76 cases which

showed the total WBC count ranging from 1000 to 3900. Normal WBC count considered here was 4000 to 11000 /cmm of blood. In these cases platelet count was also found to be on lower side in 50 cases. Platelet count of less than 1.4 lakhs/cmm were considered as thrombocytopenia. In only four cases WBC count was on higher side which ranged from 12000 to 25000 cells/cmm. Five samples showed normal WBC count.

Looking at the above observations we can conclude that WBC count has a poor specificity and its usefulness as a biomarker of sepsis is limited.

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How to cite this article:

Shailaja Amur, Umeshwar R. Hallikeri, Rajeshwari Surpur and Mahalaxmi. 2022. Septicemia in Hospital Born Neonates and Antibiotic Sensitivity Pattern with Role of WBC Count Parameters. *Int.J.Curr.Microbiol.App.Sci.* 11(10): 85-88. doi: <https://doi.org/10.20546/ijcmas.2022.1110.010>