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# Study of bacteriological profile and antibiotic susceptibility pattern in patients with neonatal sepsis at a tertiary care teaching hospital in Solapur, Maharashtra

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**Abstract**
**Introduction:** Neonatal septicemia refers to bacterial infection in first four week of life which can be confirmed by growth on blood culture. It is responsible for high rates of Neonatal mortality. Aim of the study is to know the bacteriological profile and antibiotic sensitivity pattern among neonates clinically suspected for sepsis.
**Material & Method:** Blood sample received for culture and sensitivity from NICU were incubated for 14 days and subcultures were done every alternate day. In case of growth, organisms were identified using standard protocols and antibiotic susceptibility testing was done by Kirby bauer disc diffusion method as per CLSI guidelines.
**Results:** Total samples received between August 2017 to September 2018 from NICU were 303 out of which 102 (33.66%) were culture positive. Among 102 samples majority of isolates were gram negative bacteria (n=52) out of which *Acinetobacter baumannii* 20 (38.46%) followed by *Klebsiella pneumoniae* 18 (34.61%) were most common. Among Gram positive bacteria *Staphylococcus aureus* (n=44) 43% were most commonly isolated, out of which MRCONS were 30 (38%), MRSA 12 (27%) and MSSA were 02 (4.54%), *Enterococcus faecalis* 06 (5.8%) were also isolated. Among Gram positive bacteria maximum sensitivity was seen for vancomycin 100% followed by Gentamicin 31%, Piperacillin tazobactam 33.3% Linezolid 33.3%. Among Gram negative bacteria maximum sensitivity was seen for colistin 100% followed by piperacillin tazobactam 42%, Impienem 30%, Amikacin and Ciprofloxacin 28% respectively. Maximum resistance was seen for ampicillin 77% and cefotaxime 75%.

**Keywords:** MRSA (methicillin resistant *Staphylococcus aureus*), MSSA (methicillin sensitive *Staphylococcus aureus*), MSCONS (methicillin sensitive coagulase negative *Staphylococcus aureus*)

## 1. Introduction
Septicemia in neonates refers to generalized bacterial infection documented by positive blood culture in first four weeks of life [1]. Neonatal septicemia is one of most common cause of neonatal mortality and morbidity in India [2].
It is estimated that globally 4 million new born die annually and one third of deaths are caused by neonatal sepsis [3]. Micro-organisms present in circulating blood, whether continuously, intermittently or transiently are threat to every organ in the body this may lead to serious consequences like shock, multi organs failure, DIC [4]. Neonates are particularly vulnerable to infections because of their weak immune status and several other risk factors have been identified both in neonates and children which makes them prone to infections [5].
Neonatal mortality is one of the indicators for measuring the health status of a nation [6]. Neonatal sepsis is broadly divided into 2 types according to age of onset. Early onset sepsis (< 72 hours) and late onset sepsis (> 72 hours – 28 days). Periodic evaluation of organism is essential for appropriate management of neonates therefore objective of this study is to determine the bacteriological profile and antibiotic susceptibility pattern of aerobic bacteria from blood culture of neonates admitted in tertiary care teaching hospital in Solapur, Maharashtra.

## 2. Material & Method
Study was conducted for a period of 1 year from August 2017 to September 2018. All neonates admitted to NICU which were suspected of sepsis were included in the study. Blood samples of such patient were sent for culture and sensitivity to the microbiology department. Blood cultures were incubated at 37ºC for 14 days and subcultures were done every alternate day on blood agar and Mac Conkey agar. If growth was seen it was telephonically conveyed to treating physician at urgent basis and growth was identified using standard protocols and antibiotic susceptibility testing was done by Kirby bauer disc diffusion method as per CLSI guidelines [7].

## 3. Results
Out of 303 samples received from NICU during study period 102 (33.7%) samples showed growth while 201 (66.3%) samples were sterile. Among 102 positive blood culture 70 (68.62%) were males while 32 (31.37%) were female.
Among Gram positive bacteria (n=50) most common was *Staphylococcus aureus* 44 (43%) out of which MRSA 12 (27%), MR CONS 30 (68%), MSSA 02 (4.54%) and *Enterococcus faecalis* 06 (5.8%).
Among Gram negative bacteria (n=52) most common was *Acinetobacter baumannii* 20 (38.46%) followed by *Klebsiella pneumoniae* 18 (34.61%), *Pseudomonas aeruginosa* 06 (11.53%), *E.coli* 04 (7.09%), *Enterobacter aerogenes* 02 (3.8%), *Citrobacter Koseri* 02 (3.8%).
Antibiotic sensitivity pattern of *Staphylococcus aureus* (n=44) 43% showed 100% sensitivity to vancomycin and

linezolid, Gentamicin 81%, Erythromycin 40%, Clindamycin 31% Ciprofloxacin 8% and Cefoxitin 4.5%.In case of *Enterococcus faecalis* (n=6) 100% sensitivity was seen for vancomycin and linezolid, followed by piperacillin tazobactam 66.6%, Penicillin 33.3%, Tetracycline 33.3% and ciprofloxacin 33.3%.

In present study antibiotic susceptibility pattern of Gram negative bacteria (n=52) showed 100% sensitivity for Colistin followed by piperacillin-tazobactam 42%, Imipenem 30%, Amikacin 28%, ciprofloxacin 28%, Ampicillin 23% and cefotaxime 15%.

## 4. Discussion

Neonatal sepsis is major cause of death especially in developed countries. The emergence of antibiotic resistance has resulted in limited therapeutic options for treatment of patient.

In the present study culture positivity rate is 33.7%. Studies done by Nikita Singh *et al.* [8] reported culture positivity rate of 16.9%, study done by Mayuri Bhise *et al.* [9] showed culture positivity rate of 50% Studies done by Vrishali A. Muley *et al.* [10] showed culture positivity rate of 26.6%. Variation in positivity rate can be multifactorial which may depend on time of collection, volume of collection, number of blood culture and method of blood collection and collection of blood sample after antibiotic administration.

In the present study males 70 (68.62%) were more commonly affected then females 32 (31.37%) this can be attributed to the factors regulating synthesis of gamma globulins which are probably situated on X-chromosome and presence of one X chromosome in male confers less immunological protection as compared to females". Similar results have been reported by Nikita Singh *et al.* [8] and Mayuri Bhise *et al.* [9].

In the present study gram negative bacteria are most commonly isolated n=52 but almost equal number of gram positive bacteria are also isolated n=50 which is statistically insignificant present study shows that both gram positive bacteria and gram negative bacteria occur in almost similar frequency without any major difference in there isolation rate, the results of present study are partially similar to studies done by Mayuri Bhise *et al.* [9] and Nikita Singh *et al.* [8] were preponderance of gram negative bacilli is more but there is statistically significant difference between gram positive and gram negative bacteria isolated however in the present study the difference in isolation rate between gram positive bacteria and gram negative bacteria is statistically insignificant.

Antibiotic susceptibility pattern of gram positive bacteria shows 100% sensitivity to Vancomycin and linezolid, sensitivity to gentamicin was seen to be 81% and piperacillin-tazobactam was 66.6%. Higher resistance was reported for penicillin and tetracycline.

Among gram negative bacteria 100% sensitivity was seen for Colistin, but isolates showed higher resistance to other commonly used drugs. Sensitivity to piperacillin-tazobactam was 42% followed by Imipenem 30%, Amikacin 28%, ciprofloxacin, Ampicillin 23%, cefotaxime 15%. Various workers have noted difference in the antibiotic susceptibility 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 is widely seen among countries, states, cities. Variation may be seen even between different institutions. Present study is done to know bacteriological profile and antibiotic susceptibility pattern in patients with blood stream infection admitted in NICU of our hospital.

## 5. Conclusion

Present study concludes that empiric therapy for suspected neonatal septicemia should include both Gram negative bacilli and gram positive cocci. Present study shows higher sensitivity for piperacillin-tazobactam, Gentamicin, Amikacin. The present study also points out local bacteriological profile in case of neonatal sepsis and it has been noted that resistance is emerging to commonly used drugs and there is need for judicious use of antibiotics and regular surveillance of antibiotic susceptibility pattern and formation of effective antibiotic policy.

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