Nobel Medical College Teaching Hospital (P) LTD. affiliated to Kathmandu University

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Brief summary

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Too little too late; low blood culture yields of neonatal sepsis in a tertiary hospital in Nepal

Key Messages

- In Nobel Medical College and Teaching Hospital (NMCTH), infection with Gram-negative bacteria were found to be the most common cause of neonatal sepsis. Most of these bacteria do not respond to empiric treatment with broad-spectrum antibiotics, and pose a severe health risk for neonates.
- Effective treatment for babies suspected of sepsis requires a blood culture and sensitivity testing to identify effective antibiotic treatment. Continuous use and combination of broad-spectrum antibiotics (empirical treatment), however, leads to low yield of blood cultures, extends the duration of antibiotic therapy, and increases the risks of antimicrobial resistance and mortality.
- Testing a newborn's blood sample for antibiotic sensitivity at NMCTH takes three or more days for results to return, and additional time passes until physicians change to a specific antibiotic regimen. This delay directly endangers the lives of newborns, and favours ineffective empirical treatments known to increase antimicrobial resistance.
- Improved testing procedures including susceptibility and rapid testing, reduced use of empirical therapies, and strict adherence to infection prevention and control protocols in all hospital procedures will contribute to saving newborns' lives and reduce antibiotic resistance in prevalent bacteria.

What is the problem and why is it important?

Neonatal sepsis is a life-threating illness and a major cause of neonatal morbidity and mortality worldwide. In Nepal, neonatal infection is the third most common cause of neonatal mortality (17%; 3.6 per 1,000 live births), after preterm birth complications (33%) and intrapartum-related events (23%). Due to the non-specific presentation of septic newborns, most cases are clinically diagnosed, and treated with empirical broad-spectrum antibiotics. Moreover, these antibiotics cure only half of all infections across Nepali hospitals. This treatment practice has both negative effects on patient outcomes and promotes antimicrobial resistance (AMR), a major global health threat.

Reference: Yadav, S. K., Agrawal, S. K., Singh, S. K., Giri, A., Singh, G. K., Ghimire, R., ... & Moses, F. L. (2021). Antimicrobial resistance in neonates with suspected sepsis in a tertiary hospital in Nepal. Public Health Action, 0(0), 000-000.
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17%

of culture positive septic cases were resistant to at least one of the most common antibiotics

29.3%

of pathogens were isolated from blood culture, a very low yield of culture positive samples

3 - 6 days

is the average turnaround time for blood culture samples and changes to treatment regimes

How did we measure it?

We enrolled all neonates admitted with suspected sepsis to the NMCTH NICU, Biratnagar, Nepal from January to December 2019 from hospital records and identified cases of suspected sepsis using criteria adapted from the All India Institute of Medical Sciences Protocols in Neonatology. Blood samples from 177 neonates with suspected sepsis were examined for specific bacteria causing blood infections using a standard biochemical tests and antimicrobial susceptibility testing according to the CLSI guideline.

What did we find?

- Of 200 neonates, sepsis was clinically suspected in 177 (88.5%). More than two thirds of them presented with early onset sepsis within 48 hours after birth, and most babies with suspected sepsis had been delivered at the NMCTH maternity.
- *Pseudomonas* were the predominant bacteria isolated (*n* = 40; 78%) in neonatal blood samples, followed by coagulase negative *staphylococcus* (*n* = 12, 23%).
- Comorbidities such as meconium aspiration syndrome or bowel obstruction significantly reduce the chance to successfully isolate and identify bacteria causing sepsis in neonatal blood samples, likely linked to the early use of broad-spectrum antibiotics, leading to sterile cultures.
- Overall, 9 (17.0%) culture-positive newborns with sepsis were resistant to at least one of the most common antibiotics.
- The median time to change empirical therapy after a positive culture and sensitivity report was three days (range 3.0–6.0).

Implications

- To save newborns' lives and reduce the risk of increased antimicrobial resistance, the turnaround time for neonatal blood culture and sensitivity testing has to be reduced. This also promises to reduce the ineffective use of empirical antibiotics.
- Treatment of comorbidities with broad-spectrum antibiotics bear a major risk of treatment complications for septic neonates, impeding the diagnosis and treatment of bacteria causing sepsis.
- Prevention of neonatal sepsis can be improved by enforcing infection prevention and control measures such as hand-washing and safe treatment practices and continuing professional education to all healthcare providers across all hospital departments and the NICU and maternity wards in particular.
- Heightened AMR surveillance of antibiotic sensitivity patterns at hospital level and revision of empirical antibiotic regimen would further support effective treatment and reduced AMR.