WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 10, Issue 10, 178-185. Review Article ISSN 2277– 7105

REVIEW ON NEONATAL SEPSIS

Arunima Sudhan[1]*, Prasobh G. R.[2] and Julia J. J.[3]

[1]2nd Year Pharm D, PB Student, Sree Krishna College of Pharmacy and Research Centre Parassala, Trivandrum, Kerala, India.

[2]Principal, Head of the Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research, Centre, Trivandrum, Kerala, India

[3]Associate Professor, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre Parassala, Trivandrum, Kerala, India.

Article Received on
09 June 2021,

Revised on 29 June 2021,
Accepted on 19 July 2021

DOI: 10.20959/wjpr202110-21148

***Corresponding Author**
Arunima Sudhan
2nd Year Pharm D, PB Student, Sree Krishna College of Pharmacy and Research Centre Parassala, Trivandrum, Kerala, India.

ABSTRACT

Neonatal sepsis is defined as the blood infection that occurs in infants who are younger than 90 days of age. Neonatal sepsis is a systemic condition of bacterial, viral, or fungal origin which is associated with haemodynamic changes and other clinical manifestations that result in substantial morbidity and mortality. According to Who (2001) In the developing countries, neonatal mortality (deaths in the first 28 days of life per 1000 live births) from all causes is about 34. There are mainly two categories of neonatal sepsis, Early onset sepsis and Late onset/ acquired sepsis.

INTRODUCTION

Neonatal infections cause nearly 1.6 million deaths annually in the developing countries. Sepsis and meningitis are mainly responsible for these deaths. Resistance to commonly used antibiotics is emerging and constitutes an important problems all over the world. To reduce the global neonatal mortality, strategies of proven efficacy, such as hand washing, barrier nursing, restriction of use of antibiotics, and rationalisation of admission to neonatal units, need to be implemented.

According to World Health Organisation (Who) estimates, there are about 5 million neonatal deaths a year, 98% Occurring in developing countries. Infections, premature birth, and birth asphyxia are the main causes.

Definition and Epidemiology of neonatal sepsis

Definition: The term neonatal sepsis is defined as the blood infection that occurs in infants who are younger than 90 days of age. Neonatal sepsis is a systemic condition of bacterial, viral, or fungal origin which is associated with haemodynamic changes and other clinical manifestations that result in substantial morbidity and mortality. Traditional definition of sepsis includes the isolation of a pathogen from a normally sterile body fluid that is blood or cerebrospinal fluid (CSF). As the clinical features of sepsis are often induced by potent pro-inflammatory cytokines, the term systemic inflammatory response syndrome (SIRS) has also been used when describing neonatal sepsis.

Neonatal sepsis is mainly classified as early-onset or late-onset depending on the age of onset and timing of the sepsis episode .Clinical features or the signs of early onset of early onset occurs mainly within first 72 hours of life. Some of the clinicians define early-onset infections, especially due to group B Streptococcus (GBS), as infections occurring at less than 7 days of age.

Early-onset infections are affected before or during delivery and represent vertical mother-to-infant transmission. Late-onset infections presents after the delivery, or after 3 to 7 days of age, and are mainly due to organisms acquired from interaction with the hospital environment or the community. In some situations, organisms responsible to late-onset sepsis might be affected at parturition, but with clinical manifestation of infection after 72 h of life.

Epidemiology

According to WHO(2001) In the developing countries, neonatal mortality(deaths in the first 28 days of life per 1000 live births) from all causes is about 34, and most of the Deaths occur mainly in the first week of life, most of them on the first day. On the other hand, neonatal mortality for developed countries are in the region of five. Neonatal mortality in Asia is about 34, in Africa 42, and in Latin America and the Caribbean its 17, there are wide variations between different countries in these regions as well as within the countries. For example, neonatal mortality for different African countries are from 68 in Liberia to 11 in South Africa .Differences will be due to under-reporting: in some countries, babies, in particular those born preterm and little for dates, aren't registered, due to registration fees, ignorance, or logistical difficulties. In some traditions, babies do not become part of the family until they are a few days or weeks old, therefore early deaths are not reported.

It is generally assumed that neonatal mortality in developing countries is under-reported at least by 20%.

Burden of neonatal sepsis

Accurate estimate of neonatal sepsis burden may vary by setting, with different estimates of burden between different countries with different income levels. Defining the rate of neonatal sepsis has been complicated due to the variations in the denominators that is used. When comparing the rates of the occurrence is important to analyse whether the denominator is comprised of number of hospital admissions and that total number of live births. It's also important to consider the population based and hospital based rates of sepsis have been reported. Full time female infants have a lower incidence of neonatal sepsis than full time male infants, even though this association have not been seen in the preterm infants.

The overall rate of early onset sepsis is defined as the positive blood or CSF bacterial culture which is less than 72 hours of age of the Infants.

A 2.5 million hospital admissions related to sepsis have been reported from 1988 to 2006 in infants who are less than 3 months of age.

Neonatal network of early onset sepsis is defined as the bacterial isolate from culture of blood or CSF obtained from infants in the first 72 hours of life, and has revealed the early onset of neonatal sepsis at the rate of 6.8 per 1000 admissions, from the year 2003 -2005& 6.2 per 1000 cases in the year 2006-2008.

Pathophisiology

There are mainly two categories of neonatal sepsis

*Early onset sepsis

*Late onset/ acquired sepsis

Early onset neonatal sepsis

It usually occur in the utero from a trans placental or more commonly from ascending bacteria entering the uterus from the vaginal area, that may leads to membrane rupture.

In addition to that the new born may become infected if exposed to bacteria, viruses or fungi during its passage through the birth canal.

Intra amniotic infection, choriamnionitis is referred as an acute inflammation of the foetal membrane, mainly due to the bacterial infection. It may also result from microbial invasion of the amniotic fluid. That may lead to the prolonged rupture of the chorioamniotic membrane. Sings of the disease includes both maternal and fetal signs. That includes fever, leucocytosis, cloudy or odorous discharge (maternal signs) tachycardia (fetal signs). The disease may also present without any symptoms in the laboratory reports supporting the syndrome. Ureaplasma parvum and Ureaplasma urealyticum, are both genital mycoplasmas, which are the most common bacteria that is isolated from placentas with histological chorioamnionitis and from amniotic fluid. Ureaplasma spp colonisation in the respiratory tract of preterm infants is associated with bronchopulmonary dysplasia. The understanding of the association between maternal chorioamnionitis and neonatal outcomes is an area of active investigation by maternal and neonatal research team.

Late onset or acquired sepsis

In the first 3 months of age, the innate immune system that includes the phagocytes, antigen presenting cells, natural killer cells, and the complement system will provide the defence against all the pathogens. Low concentrations of immunoglobin and decreased functions of neutrophils may increase the preterm infants' susceptibility to invasive infection.

Hand contamination is the most common source of postnatal infections in infants who are admitted In the hospital, that shows importance of hand hygiene. As infants they may have been exposed to environmental organisms that may be infectious and pathogenic to those with an immature immune system, others include contact with family members, hospital personnel, nutritional sources and contaminated equipment, all are responsible for pathogenic exposure.

Late onset blood stream infections may occur in neonates with central venous access who are older and most infections are attributed to gram positive organisms, including staphylococci and streptococci.

Causes of neonatal sepsis

The most common cause of neonatal sepsis can be a result of infectious with bacterial, viral or fungal microorganisms. The pathogens implicated in neonatal sepsis in developing countries may vary with that of the developed countries. In most, gram negative organisms

are mainly responsible that includes, Klebsiella, Escherichia coli, Pseudomonas, and Salmonella species.

Gram positive organisms, Staphylococcus aureus, coagulase negative staphylococci (CONS), 29 Streptococcus pneumonia, and Streptococcus pyrogenes are also most commonly isolated. Group B streptococcus (GBS) is usually rare or not seen in the least although maternal rectovaginal carriage rates of GBS could also be almost like those recorded in developed countries.

Neonatal surveillance in developed countries generally identifies GBS and E coli because the dominant EOS pathogens and CONS the dominant LOS pathogen followed by GBS and Staph aureus. Surveillance may have been initiated because of outbreak of a specific pathogen and may not be representative.

Risk factors

Infant risk factors

Most important neonatal risk factors include the low birth weight or prematurity. When compared with the full term normal birth weight infants, preterm low birth weight infants have a high risk and incidence of infection. Preterm infants often require prolonged intravenous access, endotracheal intubation, or other invasive procedures that provide a portal of entry or impair barrier and clearance mechanisms, placing them at increased risk for hospital-acquired infections.

Maternal risk factors

Maternal history provides an important information about the bacterial colonisation, exposure to any infectious diseases, immunity, obstetric risk factors. Rate of attack of neonatal sepsis increases in low birth weight children due to the presence of maternal chorioamniotics.in addition to that maternal GBS bacteriuria, heavy burden of GBS colonisation accounts for neonatal GBS infection.

Diagnosis

Signs and Symptoms

Patients with neonatal sepsis may show due to bacterial infections ,may show non-specific signs and symptoms or focal signs of infections that includes; hypotension, poor perfusion with pallor, metabolic acidosis, tachycardia or bradycardia, apnoea, respiratory distress,

lethargy, seizures, feeding intolerance, purpuria and bleeding. Initial symptoms will be few and include apnoea alone or tachypnoea with retractions, nasal flaring, grunting, or tachycardia.

Later on symptoms include sepsis that may involve respiratory failure, renal failure, liver dysfunction, bone marrow dysfunction etc. Non-infectious presentations of organ failure may shows the clinical presentation of neonatal sepsis. In addition to that, infectious and non-infectious causes may coexist in the same host. Example includes clinical observations have shown that respiratory distress syndrome which is secondary to surfactant deficiency might be present with bacterial pneumonia also.

Conventional diagnostics

Traditionally the laboratory confirmed neonatal sepsis is mainly diagnosed by isolation of the causative agent from the sterile body sites that includes; blood, CSF, urine, pleural joints etc. to optimize the diagnosis the specimens of adequate volumes which is obtained asceptically are essential.

A minimum of 0·5–1 mL of blood should be obtained, preferably from two different venepunctures from two separate sites for blood cultures. Urinary tract infections usually do not occur in the first 72 hours of age, and therefore, suprapubic bladder aspiration or urinary catheterisation is not done as part of the assessment for diagnosis early-onset neonatal sepsis. For both acute and chronic intra uterine infections, examination of placenta with attention can be done.

Culture-independent diagnostics

Since PCR is highly sensitive and a rapid technique its widely applied to body fluids directly without the need of first culture causative agents.

Quantitative real-time amplification systems (qPCR) are based on bacterial 16S ribosomal DNA have a very high negative predictive value and results are usually available in a timely manner.

Disadvantages of qPCR are the inability in doing susceptibility testing and high sensitivity that does not differentiate the active infection and recent infections that have occurred and resolved. The possibility of detecting contaminants is also high, and therefore clinical correlation with results is mandatory.

Management

New born infant are vulnerable to nosocomial infections as their intrinsic susceptibility to infection and invasive procedures. This mainly affects those who are born prematurely and those with low body weight during birth.

Preventive measures have to be implemented. Health personnels require education, remanding them continuously and the feedback compliance to be maintained. Minimizing the invas1ive procedure has significantly shown an 1impact in reduction of the nosocomial infection. Skin preparations b1efo1re any procedures has been effective.

Possible advantages 1from ch1anges in neonatal unit practice such as1 implemen1tation of strict antibiotic policy and restrictio1n of admissio1ns to neonatal units need to be inves1tigated along wi1th the usage of antiseptic solution to disinfect the birth canal also to be explored.

CONCLUSION

This review impac1ts on several features that are import1ant for neonatal sepsis in the developing world.

Its more common in developing countries when com1pared with the developing countries. The pathogen responsible includes the gram negative strain and is responsible for highest mortality rate. The possible strategies that needed to be considered include the intrspartum antibiotic prophylaxis, the use of antiseptic solution in order to disinfect the birth canal, and implementation of simple methods for infection control.

Neonatal infections at present cause about 1.6 lakhs of deaths per annum in the developing countries.

The implementation of proper and effective interventions can have a great potential to decrease the neonatal mortality rate.

REFERENCES

1. Neonatal sepsis: an international perspective; Child Fetal Neonatal Ed, 2005; 90: F220–F224.
2. Neonatal sepsis Andi L Shane, Pablo J Sánchez, Barbara J Stoll, 2017.
3. WHO. Perinatal mortality. Report No.: WHO/FRH/MSM/967. Geneva: WHO, 1996.

4. Stoll BJ. The global impact of neonatal infection. Clin Perinatol, 1997; 24: 1–21.
5. Bang AT, Bang RA, Baitule SB, et al. Effect of home-based neonatal care and management of sepsis on neonatal mortality: field trial in rural India. Lancet, 1999; 354: 1955–61.
6. Wynn JL, Wong HR, Shanley TP, Bizzarro MJ, Saiman L, Polin RA. Time for a neonatal-specific consensus definition for sepsis. Pediatr Crit Care Med, 2014; 15: 523–28.
7. Stoll BJ, Hansen NI, Sanchez PJ, et al. Early onset neonatal sepsis: the burden of group B Streptococcal and E. coli disease continues. Pediatrics, 2011; 127: 817–26.
8. Dong Y, Speer CP. The role of Staphylococcus epidermidis in neonatal sepsis: guarding angel or pathogenic devil? Int J Med Microbiol, 2014; 304: 513–20.
9. Kuruvilla KA, Thomas N, Jesudasan MV, et al. Neonatal group B streptococcal bacteraemia in India: ten years' experience. Acta Paediatr, 1999; 88: 1031–2.
10. Mulholland EK, Ogunlesi OO, Adegbola RA, et al. Etiology of serious infections in young Gambian infants. Pediatr Infect Dis J, 1999; 18(10): S35–41.
11. Chandra PN, Milind K. Lapses in measures recommended for preventing hospital-acquired infections. J Hosp Infect, 2001; 47: 218–22.
12. WHO. WHO guidelines on drawing blood: best practices in phlebotomy. 2010. http://apps.who.int/iris/ bitstream/10665/44294/1/9789241599221_eng.pdf (accessed April 18, 2017).
13. Higgins RD, Saade G, Polin RA, et al. Evaluation and management of women and newborns with a maternal diagnosis of chorioamnionitis: summary of a workshop. Obstet Gynecol, 2016; 127: 426–36.
14. Sullins AK, Abdel-Rahman SM. Pharmacokinetics of antibacterial agents in the CSF of children and adolescents. Paediatr Drugs, 2013; 15: 93–117.
15. Castagnola E, Dufour C. Role of G-CSF GM-CSF in the management of infections in preterm newborns: an update. Early Hum Dev, 2014; 90(2): S15–17.