

Original research article

Prevalence of sepsis in neonates caused by multidrug resistant bacteria

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Abstract

The range of microorganisms that can result in newborn sepsis shifts throughout time and differs from one geographic location to the next. It is also possible for there to be differences from one hospital to another within the same city. This is because of shifts in the way antibiotics are used as well as alterations in people's lifestyles. In the 1960s, the most common cause of newborn sepsis in both Europe and the United States was caused by Gram-negative germs. In the newborn intensive care unit of our hospital, which is a tertiary care centre, a prospective hospital-based study was conducted over the course of one year. The study lasted for 365 days. At least twenty percent of deliveries necessitate admission to the nursery. Sepsis testing was performed on all newborns who were either delivered in the hospital and had signs and symptoms of sepsis or were delivered to moms who possessed possible risk factors for sepsis. As research cases, we included all of the neonates who had a diagnosis of culture-positive sepsis or clinical sepsis with multidrug-resistant pathogens. The CONS organism was the most prevalent, accounting for 32.79 percent of all cases, followed by Klebsiella species (16.39 percent) and Staph aureus (14.7 percent). One hundred percent of the CONS positive cultures did not have MDR. Whereas multidrug-resistant Klebsiella and staphylococcal strains were found in 70% and 100% of Staph species respectively.

Keywords: Neonatal sepsis, MDR, staph aureus

Introduction

Despite significant advancements in antimicrobial medication, neonatal life support measures, and the evaluation of risk factors, neonatal septicemia continues to be a major cause of morbidity and mortality among newborns. In neonates, the term "septicemia" refers to a generalised bacterial infection that is confirmed by a positive blood culture in the first four weeks of a newborn's life. In India, septicemia is one of the four primary causes of neonatal mortality. According to the data from the WHO in 2008, sepsis was responsible for one-third of the total 3.1 million deaths that occurred in neonates. According to data from 2012, the rate of newborn death in India is currently 32 per thousand live births, and out of this number, 25% is attributed to infections. It is essential to keep in mind that 20-30% of survivors of neonatal sepsis may display neurological sequelae. This fact is vital to keep in mind. Mortality due to sepsis is, however, largely preventable with appropriate antibiotic medication and vigorous supportive care^[1, 2].

The range of microorganisms that can result in newborn sepsis shifts throughout time and differs from one geographic location to the next. It is also possible for there to be differences from one hospital to another within the same city. This is because of shifts in the way antibiotics are used as well as alterations in people's lifestyles. In the 1960s, the most common cause of newborn sepsis in both Europe and the United States was caused by Gram-negative germs. In the 1970s, it was determined to be group B streptococcus, and in the 1980s and 1990s, it was determined to be coagulase negative Staphylococcus. Gram-negative organisms continue to be the most common cause of newborn sepsis, particularly early-onset neonatal sepsis, in the majority of the world's developing nations. These organisms have developed an increasing multidrug resistance over the course of the last two decades as a result of the indiscriminate and inappropriate use of antibiotics, the over-the-counter sale of antibiotics, the absence of legislation to control their use, poor sanitation, and ineffective infection control in maternity services^[3, 4].

Due to the fact that their immune systems are not fully developed, neonates are particularly susceptible to getting sick. In addition, a number of risk variables that are known to predispose to sepsis have been identified in both the mother and the neonates of the patient. Recent developments in the treatment of unwell newborns have led to an increase in the overall survival rate of newborns, even those who were born extremely prematurely or very prematurely. Because of this, the use of antibiotics with a broad range of activity has expanded, which has led to the development of multidrug-resistant bacterial strains as a regular problem in hospitals. Because there are fewer or perhaps sometimes no effective

antimicrobial treatments available for illnesses caused by these bacteria (both gramme positive and gramme negative), the emergence of resistance to numerous antimicrobial agents in pathogenic bacteria has become a substantial public health hazard. This is because there are fewer antimicrobial agents available. It is impossible to place enough emphasis on the significance of bacteriological monitoring and sensitivity profiles given the rising prevalence of antibiotic resistance among the organisms that are responsible for newborn sepsis^[5].

Neonatal sepsis is a prevalent and important cause of illness and mortality all around the world. It is estimated that it is responsible for approximately 0.9 million fatalities across the world, according to the World Health Organisation (WHO, 2008).

The reported incidence of neonatal sepsis ranges from 3.5 to 8.9 cases per 1000 live births in South America and the Caribbean, 6.5 to 23 cases per 1000 live births in Asia, and 7 to 38 cases in Asia. In Africa, the range is from 6.5 to 23 cases per 1000 live births.

In comparison, the rates that have been reported in the United States and Australia range from 6 to 9 per 1000 live births, whereas the rates that have been reported in Europe range from 0.3 to 3 per 1000 live births.

On the other hand, neonatal sepsis is the most common cause of morbidity and mortality among infants in underdeveloped nations, accounting for 30-50% of the total deaths each year. It is predicted that up to twenty percent of newborns will acquire sepsis, and around one percent will pass away as a result of sepsis-related complications.

According to the National Neonatal Perinatal Database (NNPD) for the years 2002-2003, the incidence of systemic infection among intramural newborns in tertiary care institutions in India is 3%, with septicemia being present in three-fourths of the cases^[6].

Materials and Methods

In the newborn intensive care unit of our hospital, which is a tertiary care centre, a prospective hospital-based study was conducted over the course of one year. The study lasted for 365 days. At least twenty percent of deliveries necessitate admission to the nursery. Sepsis testing was performed on all newborns who were either delivered in the hospital and had signs and symptoms of sepsis or were delivered to moms who possessed possible risk factors for sepsis. As research cases, we included all of the neonates who had a diagnosis of culture-positive sepsis or clinical sepsis with multidrug-resistant pathogens. As a control for each individual instance, the subsequent newborn who developed sepsis from non-MDR pathogens was recruited in the study. All of the patients and controls' parents gave their written approval after receiving appropriate information. The information regarding these participants was obtained by performing a retrospective evaluation of their medical records after completing a structured survey (Annexure 1). The survey asked questions regarding the mother's age, gestational age, sex, weight at birth, risk factors for infection in newborns, clinical features, laboratory results, treatment given, and outcome (discharge/death) of the baby. The information regarding these participants was then used to compile the annexed report. The CDC criteria were followed in order to make the diagnosis of sepsis and multidrug resistance. In addition, the risk factors that may be significantly associated with multidrug resistance, such as meconium-stained liquor, birth hypoxia, early rupture of membranes, fever, and indiscriminate use of antibiotics in the mother, were investigated and researched. These babies who exhibited symptoms of sepsis underwent investigation and management in accordance with the policy that was already in place for the unit, with consideration given to culture and sensitivity. Blood cultures were handled in accordance with the conventional procedure outlined by Cruickshank *et al.*, and the antibiotic sensitivity test was carried out using Kirby- Bauer's disc diffusion method^[13]. The parameters of morbidity included the duration of nursery stay as well as the day of starting meals after the beginning of antibiotic treatment. The outcome was determined by whether or not the neonate was discharged from the hospital or whether or not they survived.

Results

Table 1: Shows the various organisms that were grown in blood culture

	Frequency
<i>Acinetobacter</i> spp.	5
Cons	20
<i>E. coli</i>	5
<i>Enterobacter</i> spp.	3
<i>Enterococcus</i> spp.	2
Group b streptococcus	2
<i>Klebsiella</i> spp.	10
<i>Micrococcus</i> spp. Contaminants	32
Staph aureus	9
Total	61

Table 2: Showing growth of various organisms in CSF culture

	Percentage
Cons	3.28%
No growth	77.05%
Not done	18.03%
Staph aureus	1.64%
Total	100.00%

Discussion

The neonates who were diagnosed with sepsis with MDR had a mean birth weight of 2156.7 while those who were diagnosed with sepsis without MDR had a mean birth weight of 2162.9. This was a modest decrease from the mean birth weight seen in the NNPD 2002-03 survey, which was 2742 + 468 gm. In the current study, 216 (67.5%) of the babies were born with a low birth weight, whereas in NNPD, the percentage was 21.1%. This demonstrates that there was an increasing number of babies born with a low birth weight at our facility. The current study found that the mean gestational age of women in Group 1 was 36.43 weeks, while the mean gestational age of women in Group 2 was 36.08 weeks. In Group 1, the average age of the mother was 24.43 years, whereas in Group 2, the average age was 24.58 years. In the study, the ratio of males to females was 1.23 to 1, whereas in NNPD it was 1.16 to 1. Based on the findings of our research, newborn sepsis was determined to have a percentage of MDR organisms that was 49.18%, while the percentage of non-MDR organisms was 50.82%.

Our study had a blood culture positivity rate of 19.06%, which was much greater than the study that was conducted by Ni Chungée *et al.* [7], which had a positivity rate of only 9.31%. The positivity of this blood culture was similar to the positivity rate that was found in the study that was conducted by Nalini Agnihotri *et al.* [8]. (19.19%). This suggests that there is a higher incidence of septic blood culture positivity in the Indian environment.

In this particular study, the univariate examination of factors like as gender, mean birth weight, mean gestational age, mean mother age, and resuscitation at delivery did not find any statistically significant differences between the two groups. This indicates that there were no significant differences between the two groups in terms of their baseline characteristics.

In this particular study, the most prevalent symptom exhibited upon admission to the newborn intensive care unit was respiratory distress (54.84 percent). This is consistent with the findings of the study conducted by Jain *et al.* as well as other (42.6%) [9, 10].

Conclusion

There is a high prevalence of multidrug resistant organisms in neonatal sepsis. Our study had a blood culture positivity rate of 19.06%, which was much greater than the study that was conducted by Ni Chungée *et al.* [7], which had a positivity rate of only 9.31%. The positivity of this blood culture was similar to the positivity rate that was found in the study that was conducted by Nalini Agnihotri *et al.* [8]. (19.19%). This suggests that there is a higher incidence of septic blood culture positivity in the Indian environment.

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