

REVIEW OF NEONATAL INFECTIONS IN UNIVERSITY OF MAIDUGURI TEACHING HOSPITAL: COMMON BACTERIAL PATHOGENS SEEN.

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ABSTRACT

Background: Bacterial infections are important causes of morbidity in the neonatal period. Therefore identification of infecting organisms and the risk factors for possible bacterial infection in the newborn is of great importance. Institution early appropriate therapy is an important step in combating morbidity and mortality in this age group.

Methods: Medical records of patients admitted into the Special Care Baby Unit (SCBU) of the University of Maiduguri Teaching Hospital (UMTH) were reviewed over a 5-year period (1995-1999)

Results: Of the 1,304 newborn admissions over the study period, 813 (62.3%) had risk factors for neonatal infections. *Staphylococcus aureus* (46.2%) was the predominant organism isolated from blood culture, followed by *Klebsiella* spp (24.8%). *Streptococcus pneumoniae* and *Pseudomonas* are the least encountered in this series. *Haemophilus influenzae*, *Klebsiella pneumoniae* and *Streptococcus pneumoniae* were the predominant pathogens in pyogenic meningitis. Most of the delivery occurred outside the teaching hospital, even those that delivered in the hospital, some come in during labour.

Conclusion: Neonatal bacterial infections are still a cause of high morbidity and mortality of the newborn in our setting. To reduce the morbidity and mortality from neonatal bacterial infections, mothers need to attend antenatal clinic, so that those who at risk can be taken care off immediately.

Key words: Neonatal infection, Bacterial pathogens, Special care baby unit

(Accepted 27 June 2006)

INTRODUCTION

Infections in the newborn and young infant are a significant cause of mortality and long-term morbidity, especially in the developing countries.¹⁻³ The diagnosis of bacterial infection in the Newborn infant is often a perplexing and frustrating experience for the paediatrician^{3,4} where by identifying may be a major problem in the infant, especially those with risk factor for sepsis but not affected. Thus left with the important task of identifying the non-infected infant. It is desirable to administer appropriate therapy as early as possible to the infected infant, and to avoid such therapy in the other.⁴ Certain maternal factors predispose the fetus and infant to infection: these include intrapartum pyrexia,^{5,6} prolonged rupture of the foetal membranes prior to the onset of labour^{4,6,7} and foetal anoxia^{3,5,7} Mothers of low socioeconomic status, the very young, the married, and the promiscuous are more likely to harbor potentially infecting organism in their genitourinary tract and on the perineum.^{7,8}

It has been reported that Staphylococci are the predominant Gram-positive agents in neonatal sepsis,^{7,9} in most of the developing countries in Asia, the Middle East and West Africa. This is in Contrast with reports from western countries where group B Streptococcus is the predominant Gram-positive agent.⁶ In the various newborn unit of the country, different pathogens have been reported as leading cause of neonatal sepsis, with the most important agents being *Staphylococcus aureus*, *Klebsiella* species and *Escherichia coli*.^{2,7,8,10} The purpose of this study was to review the neonatal bacterial infection, risk factors involved in these newborns seen in our Special Baby care Unit of the University of Maiduguri Teaching Hospital, and to document the common bacterial infections in our setting.

MATERIAL AND METHODS

A review of neonates admitted into the Special Care Baby Unit (SCBU) of the University of Maiduguri Teaching Hospital (UMTH), from 1995 January to 1999 December, was carried out. Any baby suspected on clinical grounds, of having sepsis, who had certain risk factors for sepsis such as,³⁻⁸ prolonged rupture of membrane (PROM) or rupture of membranes before

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the onset of labour, intrapartum pyrexia, choriomniotitis, preterm delivery were included. Sepsis screening such as lumbar puncture, blood culture, urine microscopy and culture were done when possible. Radiological investigation was done also in cases with indications.

Other information extracted included are sex, age of onset of illness, birth weight, presenting problem(s), gestational age by date or Dubowitz, place of delivery, any maternal problem such as PROM and intrapartum pyrexia. The symptoms such as fever, respiratory distress and physical findings on admission were also noted. Result of blood culture, urine microscopy and culture, CSF analysis were extracted from the case notes if done. Duration of hospital stay and outcome were also abstracted. All information was analyzed using EPINFO version 6. Mean, frequency, and chi square analysis were done. With the p value < 0.05 considered significant when comparison was done.

RESULTS

Total admission into SCBU for the period of January 1995 to December 1999, was 1,304. Those admitted with risk factors for bacterial infections were 813 (62.3%), males 487 (59.9%) and females 326 (40.1%), giving a ration of male: female 1:1.5, there was no differences on the out come in the sex.

The ages of the newborns admitted with risk factors for sepsis at presentation: 435 (53.5%) were less than 24 hours old, 291 (35.8%) were 1-7 days old, 62(7.6%) were 8-14 days and 35 (3.1%) were more than 14 days old.

Term infants were 606(74.5%), Preterm 203 (25.0%) and Post-term 4 (0.5%). Majority of them 434953.450 were delivered outside the Teaching Hospital (home, private clinics, and General Hospital) while 379(46.6%) were delivered in the Teaching Hospital. Five hundred (61.5%) were of birth weight = 2.3 kilogram (Kg), 236 (29.0%) had birth weight of 1.5 less than 2.5 Kg while 77 (9.5%) were of very low birth weight (VLBW) <1.5kg. Some of the risk factors present in some of the mothers before or during delivery were prolonged rupture of membrane and / or maternal pyrexia at delivery 273 (33.5%), while antepartum haemorrhage was 37 (4.6%). Some of the newborns had multiple risk factors, such as PROM and Birth Asphyxia.

At presentation, 462(56.8%) of the newborns had rectal temperature reading >37.8 °, while 323(39.9%) had a temperature reading of 36.5 ° less than 37.9 °, and 27 (3.3%) had a subnormal temperature < 36.5 °. Fever was a presenting

complain in 455 (56%), Jaundice in 287(35.3%), poor sucking in 172 (21.2%), irritable/ inconsolable cry 157(19.3%), abdominal distension in 107(12.4%), skin infection 85 (10.5%) and diarrhea/ vomiting 58(7.1%). Some of the neonate presented with more than one symptom.

Table 1 is showing additional diagnosis in some of the neonates. Of the 813 newborns only 358 had blood culture done and 455 did not have blood culture for various reasons (financial problems, disruption of services within the hospital). Of those who had blood culture, 117 (32.9%) were positive. Staphylococcus aureus 54 (46.2%), Klebsiella spp. 29(42.8), Proteus spp. 14(11.9%), Escherichia Coli 8(6.8%), Coliform 7(5.9%), Salmonella 3(2.6%) while 90.9% each grew Streptococcus Pneumonie and Pseudomonas. Of the 14 who had meningitis, the CSF of 6 (42.9%) grew some organism 93 Hemophilus influenzae, 2 Klebsiella, 1 Streptococcus Pneumoniie); there was no growth in 8 of the specimen. Of those with UTI, 7 grew some organism (4 Escherichia Coli, 2 Proteus, 1 Non-haemolytic Streptococcus) no growth in 1. Of all the 813 neonates, 576(70.8%) survived, 194(23.9%) died, while 43(5.3%) left against medical advice and were excluded from further analysis. Table II is showing the outcome and various conditions.

Table 1: **Other Presentation/ Diagnosis of Neonates with sepsis**

| Diagnosis | Number (%) |
|--------------------------------------|------------|
| Phemphigus Neonatorium | 85 (10.5) |
| Septic Umbilical stump | 80(9.8) |
| Neonatal Tetanus (NNT) | 35 (4.3) |
| Ophthalmia Neonatorium | 30 (3.7) |
| Meningitis | 14(1.7) |
| Infected traditional markings | 10(1.2) |
| Urinary tract infection (UTI) | 8 (1.0) |
| Neonatal Malaria | 6 (0.7) |
| Mastoiditis | 5(0.6) |
| Cellulitis | 5(0.6) |
| Septic arthritis / and osteomyelitis | 5(0.6) |

* Some of the newborns had more than one diagnosis

Table II: Conditions contributing to outcome in the neonates

| Conditions | Survived | Dead | Total | X ² | Pvalue |
|----------------------------------|----------|------|-------|----------------|----------|
| Age at Presentation | | | | | |
| <24 hours | 198 | 113 | 311 | | |
| 1-7 days | 199 | 58 | 257 | | |
| 8-14 days | 91 | 13 | 104 | 42.08 | 0.0000** |
| >14days | 88 | 10 | 98 | | |
| Age at onset | | | | | |
| <24 hours | 270 | 141 | 411 | | |
| 1-7 days | 227 | 47 | 274 | | |
| 8-14 days | 56 | 4 | 60 | 42.36 | 0.0000** |
| >14days | 23 | 2 | 25 | | |
| Gestational age | | | | | |
| Preterm | 111 | 87 | 198 | | |
| Term | 462 | 106 | 568 | 49.77 | 0.0000** |
| Post-term | 3 | 1 | 4 | | |
| Birth weight | | | | | |
| <1.5 kg | 23 | 53 | 76 | | |
| 1.5 - <2.5 kg | 150 | 75 | 225 | 118.69 | 0.0000** |
| >2.5kg | 403 | 66 | 469 | | |
| Duration of Hospital stay | | | | | |
| <24 hours | 0 | 32 | 32 | | |
| 1-7 days | 262 | 127 | 389 | | |
| 8-14 days | 224 | 25 | 249 | 149.29 | 0.0000** |
| 14-28 days | 55 | 5 | 60 | | |
| >28days | 35 | 5 | 40 | | |
| PROM | 171 | 87 | 258 | 14.29 | 0.0002* |
| Birth Asphyxia | 147 | 78 | 225 | 14.43 | 0.0002* |
| Congenital Abnormality | | | | | |
| Anaemia | 49 | 45 | 94 | 27.86 | 0.0000** |
| Apnoea | 33 | 74 | 106 | 124.75 | 0.0000** |
| Abdominal Distension | 59 | 38 | 97 | 10.68 | 0.0001* |
| NNT | 8 | 19 | 27 | 27.87 | 0.0000** |
| Septicaemia | 98 | 17 | 115 | 7.14 | 0.0075* |
| DIC | 1 | 14 | 15 | 34.09 | 0.0000* |
| NNJ | 179 | 95 | 274 | 19.50 | 0.0000** |
| Respiratory Distress | 197 | 129 | 326 | 60.68 | 0.0000** |
| PIH | 43 | 31 | 74 | 11.15 | 0.0008* |

DISCUSSION

Neonatal bacterial infections in developing countries is an important cause of morbidity.^{3,5} With an overall mortality of 23.8% in our study, it compares favorably with a mortality of 20-25% of UCH Ibadan^{2,11,12} respectively. It is however lower than the 42% each reported in similar studies by Koutouby *et al*¹³ and Dawodu *et al*². Of the 813 newborns with risk factors for sepsis, only 353 had blood culture done. Of these only 117 (32.7%) had positive blood cultures. The incidence of

septicemia was 32.7% with the most common pathogens being staphylococcus aureus (46.2%) followed by Klebsiella spp (24.8%), Proteus spp (11.9%), E coli (6.8%), Coliforms (5.9%) and Salmonella spp (2.6%). Streptococcus Pneumoniae and Pseudomonas are the least encountered in this series (0.9% each). This finding strongly supports the work of Ako-nai *et al*⁷ in Ile-Ife and Mokuolo in Ilorin⁹ where they found a high predominance of Staphylococcus aureus with Pseudomonas aeruginosa accounting for lesser percentage of the

isolates. Contamination of neonates with the pathogens at birth is a possibility as most mothers come from a socio-economically depressed environment, with poor personal hygiene. Neonatal infections vary from one community to another and change from time to time within the same community or Institution.^{2,9} *Haemophilus Influenzae*, *Klebsiella pneumoniae* and *Streptococcus pneumoniae* in that order, were the pathogens isolated following meningitis in this study. This is in contrast with the findings of Ako-nai et al^{7,10} where Gram-negative organisms especially *Entero*bacteria were found to be the leading pathogens.

Like in other studies,^{2,4} the neonates presented with multiple forms of infections as seen in Table I and some of these conditions contributed highly to their outcome. (Table II) Despite the immunization campaign, we still see neonatal tetanus, which also contribute to the high mortality as seen in table II. This is not unexpected in a developing country like ours, where multiple infections are commonly encountered due to poor socio-economic status, lack of antenatal care and complicated labour among others. Survival rate was significantly better for late onset disease. Most of the births encountered in this study were out-born; and some of those who delivered in the hospital might have come in during labour, this may explain the reason behind the high incidence of septicaemia. There was no sex difference in the outcome in our study as compared to the study from UCH,² where it was significant among the male neonates. The fact that most of the infections were acquired from the mother in-utero or during the process of birth. Therefore there is the need for mothers' continuing health education and better utilization of Obstetric and antenatal facilities, whereby it has been shown that implementation of the CDC guidelines for maternal intrapartum antibiotic prophylaxis, culture-proved sepsis in the newborn has gone down.¹⁴ Neonatal bacterial infections are still a cause of high morbidity and mortality in our environment, with *Staphylococcus aureus*, *Klebsiella* leading pathogens in septicaemia. Premature or prolonged rupture of membrane and intrapartum pyrexia are the major risk factors for neonatal sepsis, these factors can be prevented or reduced.

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