Original Article

# Mortality Associated with Isolated Pathogens in Neonatal Sepsis at Izzat Ali Shah Hospital, Wah Cantt

Pathogens in Neonatal Sepsis

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## ABSTRACT

**Objective**: To analyse the mortality associated with isolated pathogens in neonatal sepsis in neonatal intensive care unit (NICU) at Izzat Ali Shah Hospital (IASH)

**Study Design**: A retrospective cohort study.

**Place and Duration of Study**: The study was conducted in NICU of IASH, Wah Cantt from 1st September 2016 to 31st December 2017.

**Material and Methods:** We analysed medical records of all the neonates admitted at Neonatal unit, IASH during study period. Records of patients with isolated pathogens on blood culture were included in study cohort. Outcome variable was mortality associated with isolated pathogens. Data including the gender, gestational age, place and mode of delivery, weight at birth and blood culture results were recorded against the outcome in the form of discharged home, died and transferred to other hospitals. Data was analysed by using SPSS version 19.

**Results:** Case records of 49 neonates were enrolled in the study, Overall mortality rate was 26%. Klebsiella (n=14) was the highest number of isolated pathogen followed by Acinetobacter and E-Coli. Mortality was highest with Methicilin resistant staphylococcus aureus (60%) followed by E-Coli (44.4%), Acinetobacter (23%) and Klebsiella (21%). Analysis of study cohort showed that 27 were males (55%) and 22 were females (45%) with mortality rate of 22% (15) and 31.8% (18) respectively. In study cohort 11 babies (22.4%) had gestational age<32 weeks with mortality rate of 45.5% (5) while in full term babies mortality reduced to 17.9%. Mortality in home delivered babies was 38.5%. Baby with vaginal delivery were 24 (42%) with 25% mortality. Among 25 neonates who were born by Caesarean section mortality rate was 28%. Two (66%) out of 3 neonates of less than 1000 gm died while 5 (25%) out of 22 babies of more than 2500 gm died during the admission.

**Conclusion:** The study concluded that mortality rate was higher in extreme preterm and very low birth weight babies with neonatal sepsis. Klebsiella has become the most common pathogen causing neonatal sepsis followed by Acinetobacter and E Coli. Highest mortality rate was observed with MRSA.

**Key Words:** Pathogens, Blood culture, Neonatal Sepsis

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## INTRODUCTION

Sepsis is the major cause of neonatal morbidity and mortality. It contributes to nearly 40% of deaths under 5 year of age[1]. Neonatal sepsis if left untreated causes long term neuro disability. In underdeveloped countries, almost 1 million deaths every year are attributed to neonatal sepsis, meningitis and encephalitis[2].

Neonatal sepsis is defined as a clinical syndrome in an infant of life 28 days or younger, manifested by systemic signs of infection and isolation of bacterial pathogen from the blood stream.[3]

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Diagnosis of neonatal sepsis is always a challenge for the neonatologists. Neonatal sepsis is suspected in a neonate with variety of presentations. NICE guideline has illustrated all the probable rick factors and clinical indicators for early onset neonatal sepsis[4]. The guideline describes the necessary investigations to be performed and treatment required in cases of neonatal sepsis.

The spectrum of implicated pathogens varies from region to region and also changes over time at the same place[5,6]. The pattern of organisms varies from nursery to nursery. It also depends, how strict is the infection control in maternity and nursery[7]. The causative organisms are usually Gram positive and Gram negative bacteria and Candida.

The aim of the study is to identify the causative organisms of neonatal sepsis in NICU, IASH and also see its impact on neonatal mortality. It is very important to know the organisms causing neonatal sepsis in any NICU and their sensitivity patterns for treatment of neonatal sepsis. In Pakistan, previous studies showed Gram negative organisms up to 47% followed by gram positive organism (38%) and candida (23%) in both

early and late onset sepsis[8,9]. However there is no study available which quantify the pathogens in terms of mortality.

# MATERIALS AND METHODS

This retrospective cohort study was conducted at neonatal unit in Izzat Ali Shah Hospital (IASH). This is level 2 neonatal unit with some facilities of level 3. Unit received admissions from its own maternity unit and from outside as well. Primary outcome was to see the relation of mortality with identified organisms and secondary outcome was to analyse the relation of other variables with mortality.

All neonate who were admitted in the unit from 1st September 2016 to 31st December 2017 and suspected to have neonatal sepsis at any stage proven with their blood culture results were included in the study. Suspicion of neonatal sepsis was based on clinical history, examination and laboratory data. Data of all the neonates were collected from case records. Total of 127 blood culture reports were identified and 49 showed isolated pathogens, so blood cultures with no growth were excluded from the study. Data included gender, gestational age, place and mode of delivery, weight at birth and blood culture result. Outcome in the form of discharged home, died and transferred to another hospital was recorded in the pre designed proforma. Neonates with incomplete data and other complex co morbid conditions were excluded from the study.

Neonate is defined as baby up to 28 days of life. Gestational age was divided under 3 categories of <32 weeks, 33 to 36 weeks and >37 weeks. Place of delivery was in IASH, other hospital or at home. Mode of delivery was vaginal, caesarean or others. Weight in grams was divided in four categories (<1000, 1000 to 1500, 1500 to 2000 and >2500). All blood cultures were sent under aseptic condition in BD BACTEC culture media to the renowned laboratory. The blood cultures results were recorded on the proforma. All data was analysed on SPSS version 19.

Chi-square test of association determined no significant association/relationship between the outcome and all the other variables.

# RESULTS

Case records of 49 out of 127 neonates were enrolled in the study, so blood culture yield was 39%,

Highest number of isolated pathogen was Klebsiella (n=14) followed by Acinetobacter and E-Coli. Highest mortality rate was observed with MRSA (60%) followed by E-Coli (44%), Acinetobacter (23%) and Klebsiella (21%).

Pseudomonas, Xanthomonas maltophilia, Coagulase negative Staphylococcus aureus (CONS) and Candida were among the less common organism isolated.

Analysis of study cohort showed that 27 were males (55%) and 22 were females (45%). Nineteen (70.4%) of male babies went home while 6 (22%) died. In females, 15 (68%) went home while 7 (31.8%) died (Table). Overall mortality rate was 26%.

Out of 11 neonates who were <32 weeks gestational age, 6 (54%) were sent home and 5 (45%) died. Six (60%) out of 10 babies of gestation age 33 to 36 weeks were discharged and 3 (30%) died. Twenty two (78.6%) neonates of gestational age >37 weeks discharged home while 5 (17.9%) babies died.

Twenty eight neonates were born in IASH with death rate of 25%. Mortality rate was higher for the babies born at home (37.5%).

Twenty four neonates were born by vaginal delivery and 18 (75%) of them got better while 6 (25%) died during the admission. Among 25 neonates who were born by Caesarean section 16 (64%) were discharged home and 7 (28%) died.

Only 2 babies were transferred to other hospital and both showed growth of Klebsiella.

**Table No.1: Demographic factors and pathogens affecting neonatal mortality**

| | n | Home | Died | Transferred to other hospital |
|---|---|---|---|---|
| **Gender:** Male | 27 | 19(70.4%) | 6(22.2%) | 2(7.4%) |
| female | 22 | 15(68.2%) | 7(31.8%) | 0(0.0%) |
| **Gestational age:** | | | | |
| <32 weeks | 11 | 6(54.5%) | 5(45.5%) | 0(0.0%) |
| 33-36 weeks | 10 | 6(60.0%) | 3(30.0%) | 1(10.0%) |
| >37 weeks | 28 | 22(78.6%) | 5(17.9%) | 1(3.6%) |
| **Place of delivery:** IASH | 28 | 19(67.9%) | 7(25.0%) | 2(7.1%) |
| Other Hospital | 13 | 10(76.9%) | 3(23.1%) | 0(0.0%) |
| Home | 08 | 5(62.5%) | 3(37.5%) | 0(0.0%) |
| **Mode of delivery:** Vaginal | 24 | 18(75.0%) | 6(25.0%) | 0(0.0%) |
| Caesarean section | 25 | 16(64.0%) | 7(28.0%) | 2(8.0%) |
| **Weight at birth:** <1000 | 3 | 2(66.7%) | 1(33.3%) | 0(0.0%) |
| 1001-1500 | 3 | 1(33.3%) | 2(66.7%) | 0(0.0%) |
| 1501-2500 | 23 | 17(73.9%) | 5(21.7%) | 1(4.3%) |
| >2500 | 20 | 14(70.0%) | 5(25.0%) | 1(5.0%) |
| **Blood culture:** | | | | |
| Acinetobacter | 13 | 10(76.9%) | 3(23.1%) | 0(0.0%) |
| E Coli | 09 | 5(55.6%) | 4(44.4%) | 0(0.0%) |
| Klebsiella | 14 | 9(64.3%) | 3(21.4%) | 2(14.3%) |
| MRSA | 05 | 2(40.0%) | 3(60.0%) | 0(0.0%) |
| Pseudomonas Auroginosa | 03 | 3(100.0%) | 0(0.0%) | 0(0.0%) |
| Xanthomonas Maltophilia | 01 | 1(100.0%) | 0(0.0%) | 0(0.0%) |
| Staphlococcus aureus | 03 | 3(100.0%) | 0(0.0%) | 0(0.0%) |
| Candida | 01 | 1(100.0%) | 0(0.0%) | 0(0.0%) |

# DISCUSSION

Neonatal sepsis is the most common problem in neonatal units. Blood culture is the gold standard in diagnosing the neonatal sepsis though it often shows growth of CONS which could be contaminated organism. Mortality is high in neonatal sepsis in under developed countries due to multiple factors. Perinatal infection and lack of strict hygienic measures during perinatal care and in NICU are the major factors

causing neonatal sepsis. In spite of availability of good antenatal care in some hospitals, overall perinatal infection rate is high in Pakistan. Neonatal sepsis is among the most common reason causing neonatal death. This study showed mortality of 26% which is better than other studies in similar settings in Egypt (45%) [10], Tanzania (39%) [11] and Cameroon (34.7%) [12].

This study found the highest mortality rate associated with babies who were born at home. As there is high risk of acquiring perinatal infections during delivery, by the time these babies arrive in neonatal unit, they are terminally unwell.

Our study does not show significant relation of mortality with mode of delivery. Similar findings are observed in others studies[13,14], even in very low birth weight infants[15]. Study in Brazil found negative association of neonatal mortality with Caesarean section[16].

Mortality associated with very low birth weight (VLBW) was as high as 60% in cases with suspected neonatal sepsis. Similar findings were observed in study in Cameroon with mortality rate being higher with weight on <2500 gm and gestation less than 37 weeks [17]. Horbar et al found the mortality associated with VLBW babies up to 39% which gradually improved over period of time [18].

Blood culture showed growth in 49 (38%) neonates which is comparable to other studies in Bangladesh (34.88%) [19], Uganda (37%) [20] and Nigeria (45.9%) [21]. In neonatal sepsis, pathogen may not be isolated due to multiple factors. Neonate may already have received doses of antibiotics, the amount of blood required in culture bottle may be insufficient or there may be viruses (cytomegalovirus, rubella etc) or parasite (Toxoplasma) involved in causing sepsis. In our study gram negative organism especially Klebsiella, Acinetobacter and E Coli being the commonest organism which is in contrast to other local and international studies where staphylococcus epidermidis (40%) was mostly isolated [9, 22,23]. Neonates usually acquire gram negative organisms during perinatal period. These can also be transferred as nosocomial infection if strict hygiene is not maintained in making intravenous fluids in the neonatal unit.

Mortality was most associated with MRSA followed by E Coli. Though MRSA was identified in only 5 patients, so its significance is questionable. Nosocomial infections are getting more prevalent and neonatal units have to follow strict infection control policy to prevent cross infection [24,25].

This study did not look at the resistance pattern of different isolates which has major impact on the neonatal mortality. With the increase in use of antibiotics, neonatal units are facing lot of multidrug resistance pattern in isolated pathogens. It is becoming difficult to treat them with usual antibiotics. Further studies are required to see the resistance pattern of these organisms.

# CONCLUSION

Neonatal sepsis in one of the commonest cause of mortality in under developed countries. Mortality is higher in extreme preterm and very low birth weight neonates. In our study its mortality rate is slightly higher in babies born vaginally. Blood culture yield is 39% in cases of suspected neonatal sepsis. Klebsiella, Acinetobacter and E Coli are the most common organisms isolated. Mortality was highest with MRSA followed by E Coli.

**Author's Contribution:**

| | |
|---|---|
| Concept & Design of Study: | Shahzad Haider, Sajid Nazir |
| Drafting: | Shahzad Haider |
| Data Analysis: | Shahzad Haider |
| Revisiting Critically: | Munazza Saleem |
| Final Approval of version: | Shahzad Haider, Sajid Nazir |

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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