

Neonatal Sepsis - its Determinants & Outcome among Newborns admitted in Neonatal Intensive Care Unit (NICU), Liaquat University Hospital Hyderabad

1. Muhammad Siddique 2. Khalida Naz Memon 3. Muhammad Anwar Sulehri

1. Senior Lecturer Community Medicine, Isra University, Hyderabad 2. Asstt. Prof. of Community Medicine, Liaquat University of Health Sciences, Jamshoro 3. Assoc. Prof. of Community Medicine, Sharif Medical & Dental College, Sharif Medical City Jati Umrah, Lahore

ABSTRACT

Background: Neonatal sepsis is a life threatening emergency and is one of the commonest causes of neonatal mortality in developing countries. It is very difficult to diagnose because of multiple risk factors & non specific clinical signs.

Objectives: To assess frequency of neonatal sepsis & to identify its determinants & outcomes among newborns.

Study Design: Hospital based descriptive cross sectional study

Place and Duration of Study: This study was conducted at Neonatal Intensive Care Unit, Liaquat University Hospital Hyderabad from 1st July 2011-31st October 2011.

Materials and Methods: The data was collected through questionnaire based interviews from duty doctors regarding health status of neonates along with laboratory investigation reports. The criteria for the case diagnosis was maternal history, newborns' clinical findings & laboratory diagnostic work up including blood culture, blood cell counts & C-reactive proteins.

The results were analyzed by using SPSS version 16 for various socio-demographic variables & for the outcome of the disease.

Results: Among total 236 newborns admitted in NICU, 115 neonates (48.7%) were diagnosed as neonatal sepsis. Gender of new borne was not related with occurrence of neonatal sepsis, but males were at greater risk of developing sepsis from nosocomial infection. ($p=0.04$). Strong association was also seen for neonates who were low birth weight ($p=0.01$), had maternal peripartum history ($p=0.01$), & family's poor socio-economic background ($p=0.02$).

Conclusions: Neonatal sepsis was frequent presentation of the new borne admitted in NICU; it was associated with wide variety of risk factors.

Key Words: Neonatal sepsis, Determinants, Outcomes.

INTRODUCTION

Neonatal sepsis is most common cause of mortality and morbidity among neonates. It is defined as a systemic inflammatory response resulting from a proven infection occurring in the first 28 days of life¹. Common risk factors for it are prematurity, low birth weight, early rupture of membranes, maternal peripartum fever or illness, amniotic fluid problems, resuscitation at birth, multiple gestations & invasive procedures. In low income countries it results from nosocomial infections in intensive care units, nursery and delivery room. The incidence of neonatal sepsis ranges from 13-27/1000 live births in the developing countries & even more in unhygienic circumstances². It is a life threatening emergency and has always been the most common complication affecting newborns³. Neonatal sepsis is categorized into two classes⁴:

1. **Early Onset Neonatal Sepsis** occurs within 72 hours of life. It results from vertical transmission of infection from mother to newborn during labor and

delivery. The pathogens pass from maternal genital flora through ruptured or intact amniotic membrane to the fetus⁴.

2. **Late Onset Neonatal Sepsis** occurs between 3-28 days of life. Its most common cause is nosocomial infection of intensive care units. Majority of neonates affected are either premature or low birth weight⁵.

Neonatal sepsis is very difficult to diagnose because clinical signs are nonspecific. Delay of even a few hours in starting the treatment can considerably increase the morbidity and mortality⁶. About half of the neonates admitted in hospital with sepsis die or undergo complications. According to World Health Organization, neonatal deaths in Pakistan are roughly ten times higher as compared to developed countries. Neonatal deaths occurring in first 28 days of life now account for more than 40% of deaths in children aged less than five years. 75% of these deaths occur in the first week of life. Pakistan is ranked as 7th in neonatal mortality (42/1000

live births) & neonatal sepsis is one of the determinants of such early deaths⁷.

The purpose of current study was to effectively identify the frequency of neonatal sepsis and its outcome so that more effective and preventable measures can be applied to reduce the neonatal mortality.

MATERIALS AND METHODS

Study design & Study setting: It was a descriptive cross sectional study of four months duration (from 1st July 2011-31st October 2011) carried out in the neonatal intensive care units (NICU) of Liaquat University Hospital Hyderabad. LUH is a tertiary care teaching hospital situated in Hyderabad, provided with 1300 beds. It caters a huge population of almost whole of Sindh except Karachi.

Sample size: As the prevalence of neonatal sepsis in Pakistan is estimated as 19%, therefore the sample size was calculated to be 236. Non-probability type of sampling technique was adopted for data collection & all the neonates fulfilling the inclusion criteria were registered for the study.

Inclusion Criteria: All Neonates admitted in Neonatal Intensive Care Units up to 28 days of age.

Exclusion Criteria:

1. The cases that died soon after admission.
2. All cases of congenital malformation.
3. All cases of birth traumas.

Criteria for Diagnosis of septicemia in newborn:

1. Maternal history suggesting neonatal sepsis (peripartum fever, early rupture of membranes).
2. Positive culture and sensitivity of blood.
3. Raised TLC ($>16000/\text{ml}$).
4. Decreased platelets ($<1, 50,000/\text{mm}^3$).
5. Positive CRP.
6. Raised ESR.
7. Raised heart rate ($>160/\text{min}$).
8. Fast respiratory rate (<40 or >60 breaths/min).

Outcome was recorded in term of:

1. Improved clinically: Negative C/S of blood, TLC and platelets within normal range, ESR below 20, C – reactive protein negative, heart rate and respiratory rate became normal.
2. Death.
3. Early discharge on request of parents.

Methods for data collection: Data was collected after taking informed verbal and written consent on a pre-designed structured questionnaire containing antenatal, natal and immediate postnatal history of mother. Data was also collected from duty doctors regarding neonates' health status along with laboratory investigations specified above.

Ethical considerations: Written consent was taken from care takers/parents of newborn admitted in pediatric ward of LUH Hyderabad. Prior consent was also taken from incharge pediatrics ward, LUH Hyderabad.

Data analysis: The data was analyzed by using SPSS version 16. The qualitative variables were analyzed by applying Chi-squared test. The association of quantitative variables was analyzed by applying student t-test.

RESULTS

1. The total numbers of subjects enrolled for this study were 236. There were 115 (48.7%) cases diagnosed as septic based on clinical as well as laboratory investigations; the remaining 121 new borne (51.3%) were diagnosed as not suffering from neonatal sepsis.
2. There were 73 males (63.5%) who were diagnosed as septicemic; in contrast to it 42 females (36.5%) were enrolled as cases of septicemia. There was no statistically significant association observed between gender & occurrence of neonatal sepsis ($p=0.31$).
3. Out of 115 diagnosed cases of neonatal sepsis, 57 subjects (49.6%) were belonging to upper & middle socioeconomic class, and those belonging to lower class were 58 (50.4%); there was an association of socio-economic status to occurrence of neonatal sepsis, ($p=0.02$).
4. Among septicemic new borne, total number of mothers having history of peripartum fever /other signs suggestive of sepsis was 33 (28.7%). There was an association between prior maternal history & subsequent development of sepsis in the new borne ($p=0.01$).
5. Among neonatal septic subjects, 44 (38.3%) mothers gave history of delivery at home by trained birth attendants; while 71 (61.7%) gave birth in hospital setting ($p=0.50$).
6. The rural urban distribution of the affected new borne was almost equal ie 58 rural against 57 urban. The results did not reveal statistical significance for this variable ($p=0.16$).
7. Regarding frequency of mothers experiencing complications during pregnancy, the study reveals 96 mothers among total 115 presented with one or other complications during pregnancy or delivery. ($p=0.02$).
8. Sixty neonates among total 115 septicemic neonates were low birth weight (52.1%); while remaining 55 were of normal birth weight. ($p=0.01$).
9. Sepsis was strongly associated with disturbance in cardiopulmonary status in newborn ie tachypnea, respiratory distress, apnea, tachycardia or hypotension ($p=0.00$).
10. Umbilical cord infections were not common in admitted cases (25.2%) but all cases with cord infection were found septicemic ($p=0.00$).

11. The total leucocytes count was a common laboratory investigation done in neonatal intensive care units. Neonates with total leucocytes count favoring septicemia were 86 (74.8%) ($p=0.05$). Neonates having normal platelets count were 23 (20%), with decreased platelets counts favoring septicemia were 85 (73.9%) and remaining 7 (6.08%) infants were not investigated for platelets count. Only 44 (38.2%) neonates were diagnosed on the basis of positive results for C – reactive proteins while remaining ie 71 were not investigated for C – reactive proteins.
12. Among 115 diagnosed cases of neonatal sepsis, those who recovered fully, were forty nine (42.6%), the number of septic cases who died during their treatment was 62 (53.9%); remaining four cases were missed as they left without medical advice.

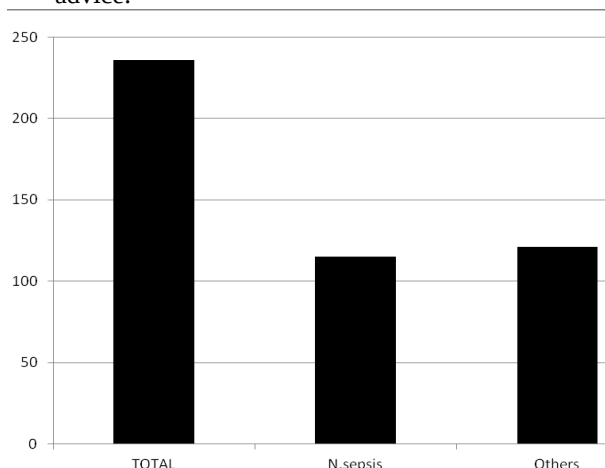


Figure No.1: Distribution of neonatal sepsis among total new borne admitted at NICU

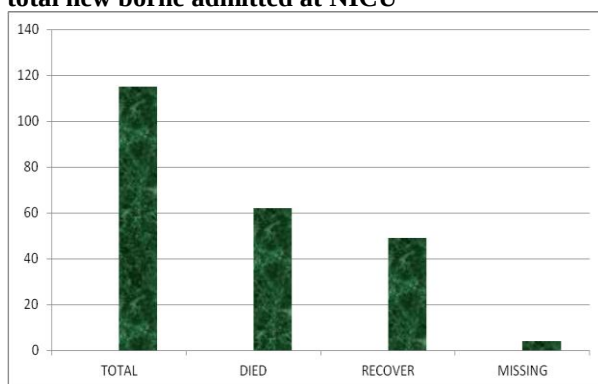


Figure No. 2: Outcome of the neonatal sepsis

DISCUSSION

Neonatal sepsis is a life threatening emergency and is the most commonly associated morbidity and mortality among newborns especially in developing countries. More than one-third of the estimated four million neonatal deaths around the world each year are caused by severe infections, among them one million deaths

are occurring due to neonatal sepsis or pneumonia alone⁸.

The incidence of neonatal sepsis is 13 to 27/1000 live births in developing countries⁹. The frequency of neonatal sepsis in our study comes out to be 48.7%. In a study conducted at National Institute of Child Health for period of one year, the prevalence of neonatal sepsis was found to be 30.64% along with additional 4.73% cases of meningitis¹⁰. This figure doesn't seem too much differing from our study; the reason of slightly high prevalence in our study could be that many patients might had been wrongly diagnosed as septic or over reporting. Bang AT et al also cite that 20% of all neonates develop sepsis and approximately 1% die because of sepsis or sepsis related causes¹¹.

Sepsis is a common complication in intensive care units where situation is drastically unhealthy. Deliveries conducted by untrained birth attendants, delay in identifying the risks, reaching health facilities & receiving appropriate treatment are the contributing factors leading to high mortality and morbidity in neonates.

Neonatal sepsis revealed association with socioeconomic status of family ($p=0.02$). Edward G. et al study conducted in Ohio on the same subject revealed neonatal mortality in high income areas as 4.1/1000 live births as compared to low income areas where it was recorded as 11.5/1000 live births¹². Onyedibe KI et al cite that the socioeconomic factors have a significant impact on neonatal sepsis. An improved standard of living, education and empowerment of women and increased provision of basic social amenities go a long way in reducing the morbidity and mortality of neonatal sepsis in our environment¹³.

The burden of neonatal mortality is high in rural areas as compared to urban areas because of lack of availability of basic health facilities. Dialo AH et al conducted a prospective study on neonatal mortality and its predictors in a rural area in Burkina Faso and found that among 864 live births followed to 28th day, there were only 40 neonatal deaths¹⁴.

Obstetric complications during labor & ante natal symptoms were directly associated with neonatal infections. In this study it was found that among total seventy one mothers complaining of peripartum fever, the new borne of 36 such mothers actually developed sepsis at birth. Our study therefore concludes that peripartum fever or other symptoms end up as neonatal sepsis. Gill CJ, et al conducted a cohort study regarding nosocomial infections in neonatal intensive care unit (NICU) of a tertiary care hospital of India and found that male infants were more commonly affected as compared to female infants¹⁵. The data of our study also strongly suggested that although gender of new borne

was not related with occurrence of neonatal sepsis but if we simply compare the association between male or female neonates with acquiring nosocomial infection followed by development of sepsis, then males were at greater risk of developing sepsis ($p=0.04$). In contrast to it, another study at Bangladesh revealed female preponderance (15.2% vs 10%)¹⁶.

Laboratory investigations always play a key role in the diagnosis of neonatal sepsis. Total leucocytes count is a common laboratory investigation done in neonatal intensive care units. In our study, there were 86 new borne (74.8%) in whom the total leucocytes count was favoring septicemia. Hornik CP cite that low white blood cell counts, low absolute neutrophil counts and high immature-to-total neutrophil ratios were associated with increasing odds of infection (highest odds ratios: 5.38, 6.84 and 7.97, respectively)¹⁷. 73.9% neonates were having decreased platelets counts thus favoring septicemia. Similarly C-reactive proteins (CRP) & low platelet counts were also commonly performed laboratory investigations in neonatal intensive care units for the rapid identification of septicemia. But in contrast to it, only 44 (38.2%) neonates enrolled in our study were diagnosed as cases of sepsis on the basis of positive results for C-reactive proteins. Póvoa P et al also endorsed daily measurement of CRP to be useful in the detection of sepsis and it was quoted as more sensitive than the currently used markers, such as bleeding time & leukocyte count¹⁸. The same findings were also observed in study conducted by Chauhan S et al,¹⁹. Total leukocyte count was also found to be a confirmatory test in other researches on neonatal sepsis²⁰.

CONCLUSION

The study concludes that neonatal sepsis is the most common presentation of the new borne admitted in NICU; it is associated with a wide variety of risk factors. The male gender, socio economic status of the family and maternal peripartum history gives a clue about imminence of this condition & mortality arising there from. The need is to rapidly do the necessary laboratory investigations in order to avoid major complications in the new borne & hence to reduce neonatal mortality.

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Address for Corresponding Author:**Dr. Khalida Naz Memon**

11-A Mohammadi Town

Wadhoo Wah Road, Hyderabad.

Cell No. 022-2650530; 03063572147

e-mail: memonk63@yahoo.com