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# CLINICAL PROFILE AND RISK FACTORS IN NEONATAL SEPTICEMIA

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## ABSTRACT

Aim of the study to find out the correlation clinical profile and risk factors for neonatal sepsis with culture proven cases. The present study was intended to know the incidence and mortality rate of neonatal sepsis among Hospital admission. Neonatal sepsis is single most important cause of Neonatal death globally. The incidence of neonatal sepsis in india is 30/1000 live birth. The prospective study was conducted on 32 neonates on consecutive birth, fulfilling the inclusion and Exclusion criteria subjected to sepsis screening. Blood Culture and sepsis screen was carried out 32 neonates. Out of 32 neonates with clinical features of sepsis 3 where blood culture breathlessness and Temperature instability were significant positive. Sepsis screen was carried out with total leucocytes count, absolute neutrophils count, CRP, Thromphocyte estimation. The identification of Causative organism was carried out by standard identification test.Among the risk factors breathlessness and temperature instability were significant. Among the clinical feature 70% neonates with grunting and temperature instability were proven sepsis. In this study, Out of 32 clinical neonatal sepsis 3(9.38%) where culture positive among isolates 2 gram negative bacilli and one is MR CONS.Blood Culture and sepsis screen should be carried out in neonates suspected of sepsis. However culture report is available only after 5-7 days. Neonatal sepsis is common in new born with non specific symptamatology Causing difficulty in diagnosis early and prompt detection and appropriate treatment in neonatal sepsis can significantly reduce morbidity and mortality.

**KEY WORDS:** ***Septicemia, Neonatal, C reactive protein (CRP), Thromphocyte, Bacterimiae, PROM ,Risk factors, clinical signs and symptoms***

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## INTRODUCTION

The present study was carried out to identify the risk factors and clinical profile of neonatal sepsis in the neonatal unit. The aim of the study is to find the correlation of clinical profile and risk factors of neonatal sepsis with the culture proven cases. Sepsis neonatorum is used to describe the systemic response to infection in newborn infants. It continues to be the major cause of morbidity and mortality in the newborn[1]. Neonatal sepsis occurs in 1 to 8 cases of all live birth[2]. The incidence of neonatal sepsis according to the data from national Neonatal Perinatal Database (NNPD, 2002-03) is 30 per 1,000 live births. The early signs of sepsis in the newborn are nonspecific. Therefore, many newborns undergo diagnostic studies and the initiation of treatment before the diagnosis has been determined[3].The definitive diagnosis of septicemia is made by a positive blood culture. The present pilot study was to find out this risk factors involved with clinical features with many ultimate outcome of the neonatal sepsis. And also it gives an idea to rapid diagnosis of sepsis and outcome of disease. Blood Culture and sepsis screen should be carried out in neonates suspected of sepsis. However culture report is available only after 5-7 days. Neonatal sepsis is common in new born with non specific symptamatology Causing difficulty in diagnosis early and prompt detection and appropriate treatment in neonatal sepsis can significantly reduce morbidity and mortality.

## MATERIALS & METHODS

Informed consent was taken from the parent of the subject included in the study. And the disease process and importance of treatment was explained to them. The study was designed and accordingly study subject underwent detailed history, clinical examination and laboratory investigation. Maternal history was elucidated and risk factor noted in the proforma, Birth details were recorded as per case sheet. Birth weight was recorded using electronic weighing scale at birth.Clinical signs and symptoms were observed and documented by the treating doctor. The study was carried out in NICU of SRM Medical College Hospital and Research Centre, SRM University, Kattankulathur, Kancheepuram District. It is a prospective Hospital based clinical pilot study over a period of 3 months from February 2016 to April 2016. All consequent neonates fulfilling the inclusion and exclusion criteria are subjected to sepsis screening like CRP, total count, leucopoenia and blood culture before starting treatment with antibiotics. Repeat sepsis screen and culture were done if there was a fresh clinical signs after the first blood culture. 32 neonates with suspected sepsis with in the study period. Sample for blood culture was sent. An area of approximately 5 cm over the venipuncture site was disinfected with 70% alcohol, rubbing vigorously and allowed to dry. This was followed by application of povidone iodine in concentric circles over the site and allowed to dry for at least 1 minute. About3-4ml of blood was drawn using a sterile syringe, out of which 1 ml of the blood sample was inoculated aseptically into a culture bottle containing 5 to 10 ml of culture media. Our hospital Microbiology laboratory is available with BACTEC AND BACT/ALERT blood culture system[4]. After collection of blood it is inoculated into a blood culture bottle containing 10ml of Brain Heart Infusion broth, thus making a dilution of 1 in 10 to nullify the natural bacteriostatic/bactericidal activity of blood. After inoculation, the blood culture bottles were incubated at 37$^{o}$C under aerobic conditions in the incubator for 7days.The inoculated plates were incubated aerobically in the incubator at 37$^{o}$C for 24 hours, and the plates were observed for growth, The growth was identified by colony characteristics, Gram's staining and standard biochemical tests.[7]. Blood Culture which did not yield any growth following three subcultures from the broth to solid media, were reported negative at the end of 7days. Antimicrobials sensitivity was performed by modified Kirby Bauer's Disk Diffusion Method.

***Inclusion criteria***

All Neonates with risk factors and clinical features of sepsis.

***Major risk factors***

1. PROM>18hours
2. Foul smelling liquor
3. Foetal distress

***Minor risk factors***

1. VLBW <1500gms
2. Preterm< 34weeks
3. Birth asphyxia
4. Apgar<5

***Clinical signs & symptoms***

*Sclerema
*Lethargy
*Apnoea
*Hypotonia
*Breathlessness
*Poor cry
*Irritability
*Poor feeding
*Grunting
*Vomiting
*Loose stool
*Temperature instability
*Mottling

***Exclusion criteria***

Neonates with obvious malformation/congenital anomalies.

***Out born babies***

Written and valid informed consent was taken from the parent of the subject included in the study. Disease process and importance of treatment was explained to them. The study design and proforma was approved by the institutional ethical committee (IEC).The patient declined to give consent were excluded from the study. Gestational assessment was done using modified Ballard's assessment scale. At admission babies vital signs were record followed by systemic clinical examination and the findings were recorded in the proforma. The data obtained from the study is entered in the master chart. Data was analysed according to the

statistical methods chi-square test used to study the significations of study parameters between the groups.

***Analysis and interpretation of Data***

The data was analysed and interpreted by employing discriptive statistics software used is SPSS20.Value of significance for the present study was taken as P < 0.05.

**Table 1**
***Day of Occurrence of Symptomatic Events (n=32)***

| Onset(days) | Frequency of occurrence(events) | Percentage (%) |
|---|---|---|
| 4-7 | 15 | 46.87% |
| 8-14 | 8 | 25% |
| 15-21 | 7 | 21.87% |
| 22-28 | 2 | 6.25% |
| **Total** | **32** | **100%** |

**Table 2**
***Presenting clinical signs***

| Presenting feature | Frequency of occurrence (n=32) | Percentage % | Sepsis | No sepsis |
|---|---|---|---|---|
| *Sclerema | 3 | 9.38 % | 1 | 2 |
| *Lethargy | 12 | 37.5 % | | |
| *Apnoea | 2 | 6.25 % | 1 | |
| *Hypotonia | 5 | 15.63 % | | |
| *Breathlessness | 6 | 18.75 % | | |
| *Poor cry | 4 | 12.5 % | | |
| *Irritability | 2 | 6.25 % | | |
| *Poor feeding | 13 | 40.63 % | | |
| *Grunting | 4 | 12.5 % | 1 | |
| *Vomiting | 4 | 12.5 % | | |
| *Loose stool | 2 | 6.25 % | | |
| *Temperature instability | 15 | 46.88 % | | |
| *Mottling | 4 | 12.5 % | | |

***Among the 32 neonates, there was no statistical significance in comparison between sex and gestational age, type of delivery and birth weight.***

**Table:3**
***Distribution of variables***

| Variables | | N=32 | Percentage(%) | Proven sepsis | P value |
|---|---|---|---|---|---|
| Sex | Male | 13 | 40.6 | - | - |
| | Female | 19 | 59.4 | 3 | 3 |
| Gestation | Preterm | 13 | 40.6 | 2 | 2 |
| | Term | 19 | 59.4 | 1 | 1 |
| Type of delivery | LSCS | 24 | 75 | 3 | 3 |
| | Normal vaginal Delivery | 8 | 25 | - | - |
| Birth weight | LBW | 13 | 40.6 | 2 | 2 |
| | Normal | 19 | 59.4 | 1 | 1 |

**Table 4**
***Distribution of risk factors***

| Risk factors | % | N=32 |
|---|---|---|
| PROM | 9.38% | 3 |
| Maternal fever | 6.25% | 2 |
| Foul smelling liquor | 15.63% | 5 |
| Foetal distress | 21.87% | 7 |
| LBW | 53.13% | 17 |
| Preterm | 46.88% | 15 |
| Birth asphyxia | 6.25% | 2 |
| Maccrunium stain liquor | 9.38% | 3 |

**Table 5**
***No of affected subjects***

| CULTURE | | Total | p Value |
|---|---|---|---|
| Positive | Negative | | |
| 3 | 29 | 32 | 3 |

**Table 6**
***Etiological agent of sepsis***

| Organism | No. of organisms | (%) |
|---|---|---|
| *Klebsiella pneumonia* | 1 | 3.1 |
| *Methicillin Resistant Coagulase Negative Staphylococcus* | 1 | 3.1 |
| *Citrobacter sepsis* | 1 | 3.1 |

**Table 7**
***Outcome of the study***

| Total no. babies studied | Total no. babies improved | Total no of Death |
|---|---|---|
| 32 | 29 | 3 |

**Table 8**
***Infection risk score***

| Perinatal factor | Risk score |
|---|---|
| Foul smelling liquor | 2 |
| Under clean vaginal examination done before delivery | 2 |
| Duration of labour exceeding 24 hours | 2 |
| One minute apgar score of 0-6 | 2 |
| Duration of rupture of membrane before delivery >24 hours | 1 |
| Birth weight 2 kg or less and/or gestation less than 37 wks | 1 |
| **Total** | **10** |

**Table 9**
***Risk score and risk group categories with suggested intervention:-***

| Total sepsis score | Risk group | Intervention suggested |
|---|---|---|
| (0-3) | Low risk | withhold antibiotics |
| (4-5) | Moderate risk | Investigate for presence of infection; give antibiotics if circumstantial evidence of infection is present |
| (6-10) | High risk | Start antibiotics immediately. |

**Table 10**
***Distribution of risk factor in relation proven sepsis***

| Risk Factor | N=32 | Proven sepsis |
|---|---|---|
| PROM | 18 | 2 |
| Maternal fever | 7 | - |
| Foul smell liquor | 2 | - |
| LBW | 13 | 3 |

**Table 11**
***Distribution of clinical feature relation to proven sepsis***

| Clinical Features | N=32 | Proven sepsis |
|---|---|---|
| Breathlessness | 14 | 1 |
| Lethargy | 9 | - |
| Poor Feeding | 5 | - |
| Temperature instability | 9 | 2 |

**Table 12**
***Distribution based on diagnosis***

| Diagnosis | Frequency | Percentage |
|---|---|---|
| Proven sepsis | 3 | 9.375 |
| Suspected sepsis | 29 | 90.625 |

**Table 13**
***Weight Distribution***

| Weight(kg) | No. of babies | % |
|---|---|---|
| 1.0-1.5 | 6 | 18.8 |
| 1.6-2.0 | 7 | 21.9 |
| 2.1-2.5 | 7 | 21.9 |
| 2.6-3.0 | 5 | 15.6 |
| 3.1-3.5 | 4 | 12.5 |
| >3.5 | 3 | 9.4 |
| Total | 32 | 100 |

**Table 14**
***Sex wise weight distribution***

| Sex | N | Mean | Std. Deviation | Student independent t-test |
|---|---|---|---|---|
| Male | 13 | 2.65 | 0.89 | t=1.95 P=0.06 not significant |
| Female | 19 | 2.08 | 0.77 | |

**Table 15**
***Weight (kg)***

| | |
|---|---|
| N | 32 |
| Mean weight | 2.400 |
| Std. Deviation | 0.86 |
| Range | 3.18 |
| Minimum | 1.01 |
| Maximum | 4.19 |

**Table 16**
***Mother's Education status***

| **Mother Education** | **No. of mothers** | **%** |
|---|---|---|
| Non formal | 11 | 34.4% |
| Primary | 2 | 6.3% |
| Middle | 2 | 6.3% |
| High school | 3 | 9.4% |
| HSC | 7 | 21.9% |
| UG | 5 | 15.6% |
| PG | 2 | 6.3% |
| Total | 32 | 100.0 |

**Table 17**
***Mother's occupation status***

| | **No. of babies** | **%** |
|---|---|---|
| House wife | 31 | 96.9% |
| Teacher | 1 | 3.1% |
| Total | 32 | 100.0% |

**Table 18**
***Death/ improved***

| | **No. of babies** | **%** |
|---|---|---|
| **Improved** | **29** | **90.6%** |
| **Death** | **3** | **9.4%** |
| Total | **32** | **100.0%** |

**Table 19**
***Results of chi-square test***

| | | Diagnosis | | | | Total | Chi square test |
|---|---|---|---|---|---|---|---|
| | | Not proven | | Proven | | | |
| | | n | Row % | n | Row % | | |
| Sex | Male | 13 | 100.0% | | | 13 | $\chi$2=2.26 P=0.13 NS |
| | Female | 16 | 84.2% | 3 | 15.8% | 19 | |
| LBW | LBW | 11 | 84.6% | 2 | 15.4% | 13 | $\chi$2=0.93 P=0.34 NS |
| | Normal | 18 | 94.7% | 1 | 5.3% | 19 | |
| Mother age | 20 -25 years | 16 | 84.2% | 3 | 15.8% | 19 | $\chi$2=2.26 P=0.32 NS |
| | 26 -30 years | 11 | 100.0% | | | 11 | |
| | 31 -35 years | 2 | 100.0% | | | 2 | |
| Gestation Age | LPT | 2 | 100.0% | | | 2 | $\chi$2=1.58 P=0.45 NS |
| | PT | 9 | 81.8% | 2 | 18.2% | 9 | |
| | Term | 18 | 94.7% | 1 | 5.3% | 18 | |
| Mother Education | Non formal | 10 | 90.9% | 1 | 9.1% | 11 | $\chi$2=0.10 P=0.74NS |
| | Primary | 19 | 90.5% | 2 | 9.5% | 21 | |
| Mother occupation | House wife | 28 | 90.3% | 3 | 9.7% | 31 | $\chi$2=0.20 P=0.65 NS |
| | Teacher | 1 | 100.0% | | | 1 | |
| Discharge date / hospital stay | < 3days | 5 | 100.0% | | | 5 | $\chi$2=5.62 P=0.13 NS |
| | 4 -7 days | 18 | 94.7% | 1 | 5.3% | 19 | |
| | 8 -14 days | 5 | 83.3% | 1 | 16.7% | 6 | |
| | > 14 days | 1 | 50.0% | 1 | 50.0% | 2 | |
| Death/Imp | Improved | 27 | 93.1% | 2 | 6.9% | 29 | $\chi$2=2.23 P=0.14 NS |
| | Death | 2 | 66.7% | 1 | 33.3% | 3 | |
| Mode of delivery | LSCS | 21 | 87.5% | 3 | 12.5% | 24 | $\chi$2=1.10 P=0.57 NS |
| | Spontaneous | 7 | 100.0% | | | 7 | |
| | Vacuum | 1 | 100.0% | | | 1 | |

## OBSERVATION & RESULTS

During the study period of 3 months total number of babies born is 112 in our Hospital. Out of this 112, 32 babies where admitted to NICU for various symptoms like sclerema, lethargy, apnoea, hypotonia, breathlessness, poor cry, irritability, poor feeding, grunting, vomiting, loose stools, temperature instability, mottling. Out of 32 suspected sepsis 15 (46.8%) presented with in a week life. Birth weight of this babies 1.020 kg - 3.780 kg with a mean birth weight of 2.400 kg. The male to female ratio was 7:9 all mortality was female. Total mortality was 4% of the 32 babies study 30 babies singletons other 2 where twins both death after 13days and 17days of stay in NICU. 19 term babies, 13 preterm babies of which there were 2 set of twins. During the study period from Feb to April 2016, 32 babies clinically diagnosis sepsis female were 19 only. 20 babies were LBW and 12 were above 2.5kg. The minimum 1.1 kg maximum of 4.1 kg with the mean weight 2,31kg with SD 0.86. Reason for admission was breathlessness 14, lethargy 4, poor feeding 5 and Temperature instability 9. The mothers age varied from 22 to 35 with a mean age of 26 with SD 2.896. Below 25 years of age 19 babies bore after 25 to 35 years of age 13 babies born. Babies Hospital Stay: less than 3 days : 5 babies, 4 to 7 days : 19 babies, 8 to 14 days : 6 babies, More than 14 days : 2 babies. Out of 32 babies, 3were proved sepsis and 29 babies were not proven sepsis. Death in one sepsis proven case. One female baby LBW admitted for respiratory problem by LSCS a term baby stay in 14 days. Other 2 babies were twins both were female, both 1 kg. Babies were stayed in the hospital 13 to17 days of life with mean 15 days due to respiratory distress syndrome. Mothers Education Status : 2 were postgraduate (PG) and 5 were undergraduate (UG). 12 were school and 13 formal education regarding occupation status 31 were house wife and 1 is working as a teacher. The twins II showed also MRCONS also need mechanical ventilation support. 24babies where delivered by LSCS, 7 delivered by Natural Vaginal Delivery (NVD) and Vacuum 1. The sepsis screened for CRP which resulted more than 1mg was seen 23 cases, leucopoenia in 5 cases, Thrombocytopenia was seen 10 cases. Among the risk factors breathlessness and temperature instability were significant. Among the clinical feature 70% neonates with grunting and temperature instability were proven sepsis. In this study, out of 32 clinical neonatal sepsis 3 (9.38%) where culture positive among isolates 2 Gram negative bacilli and one is MR CONS.

## DISCUSSION

Neonatal infection is one of the major problems in developing countries, including India. It is extremely important to make an early diagnosis of sepsis, because prompt institution of empirical antimicrobial therapy may be life saving. In this prospective study, out of 32cases, 3 were culture positive and 29 were culture negative. The proportion of culture positive septicemia cases where higher among the low birth-weight, premature, and preterm neonates as they were more susceptible to infections due to inherent deficiency of both humoral and cellular immunity during the first week of life. In this study 15 neonates (46.9%) develop sepsis within a week, 15 (46.9%) preterm neonates developed clinical feature of sepsis. Anderson–Berry *et al* in their study in 2008 in Carolina USA observed that sepsis is more common in preterm neonates. The results of our study where almost comparable with Raghaven *et al*[2] and Tallur *et al*[1]. In our study term babies 17 (53.1%) as probably sepsis when compare to the preterm neonates. In our study probably reflects difference in population characteristics and the occurrence of the predisposing factors among them. Preterm are more susceptible to infection due to inherent defensive mechanism. In the present study 53% where the birth weight less than

2.5kg.In our study PROM 9.38% which was lower compare to 26% in Karuvilla *et al*. Foul smelling liquor was 15.6%. The variation in the occurrence of intrapartum risk factor probably reflects difference the rates occurrence of the predisposition risk factors in various other studies. Other clinical features were Sclerema 3, lethargy 12, apnoea 2, hypotonia 5, breathlessness 6, poor cry 4, irritability 2, temperature instability 15 mottling 4. Based on gestational age, birth weight and sex distribution of the study group N=32. In this study age distribution was two preterm neonates and term had proven sepsis. Anderson-Berry *et al*[5]. In the study 2008 in Carolina USA observed the sepsis was common in preterm neonates. The result of over study almost comparable with Raghaven *et al* and Taller *et al.* The higher proportion of term neonates compare to preterm neonates in over study probably reflects difference in the proportion characteristics and concurrence of pre disposing factors among them. Preterm are susceptible to infection due to inherent defence mechanism. In this study female neonates were with proven sepsis. In the present study two neonates were with birth weight less than2.5kg and one was more than 2.5 kg. Based on risk factor in the study groups. Temperature instability 9 (28 )%, Respiratory distress 14 (43) % , Poor feeding 5 (15.6)%, Lethargy 4 (12.5) %[6]. Whereas in proven sepsis temperature instability was in 2 (6.5 )% neonates and 1 (3.1)% neonates breathlessness. Based on clinical features in the study group. Respiratory distress was seen in 14 neonates and 1 baby had proven sepsis. Poor feeding 5 was seen in 32 neonates but no neonates were diagnosis with proven sepsis[7]. The incidence of culture proven sepsis is approximately 2 in 1000 live births. Of the 7-13% of neonates who are evaluated for sepsis,only3to8% have culture proven sepsis. The mortality rate of untreated sepsis can be as high as50%.

## CONCLUSION

Among the risk factors LBW and preterm where common risk factors. Blood culture gold standard for diagnosing neonatal sepsis but required 5 to7 days. Neonatal sepsis common disease in newborn with nonspecific Symptomatology causing difficult in the diagnosis early and prompt detection treatment of neonatal sepsis can significantly reduce morbidity and mortality. Hence I suggest provision of rapid diagnosis test (PCR) may help to decrease mortality. Among the risk factors PROM was common presentation in neonates with suspected sepsis.Among the clinical features respiratory distress and grunting were common presentations. Blood culture is the gold standard for diagnosis of neonatal sepsis, But it requires 48 to72h.Out of 3 babies which died, two babies were twins, both were preterm with weight of 1kg and only suspected sepsis not a proven sepsis.

## CONFLICT OF INTEREST

Conflict of interest declared none.

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