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A STUDY OF BLOOD STREAM INFECTION IN NEONATES

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ABSTRACT

To study the prevalence of neonatal sepsis in new born babies in SRM Hospital. The present study is aimed to isolate and identify the microbial isolates(bacteria & fungi) responsible for neonatal sepsis by conventional blood culture methods. The prospective study was conducted in 84 neonates, fulfilling the inclusion and Exclusion criteria subjected to sepsis screening. Blood Culture and sepsis screening was carried out in 84 neonates. Out of 84 neonates with clinical features of sepsis, 7 had positive blood culture and 77 had negative blood culture. Sepsis screening was carried out with total leucocytes count, absolute neutrophils count, CRP and 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 features 45% of neonates had poor feeding and 31% had a birth weight less than 2.5kg. In this study, Out of 84 clinical neonatal sepsis 7(8.3%) were culture positive. Blood Culture and sepsis screen should be carried out in neonates suspected of sepsis. However culture report is available only after 5-7 days. 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 morbitity and mortality. Present research explains the prevalence of neonatal sepsis in NICU and the causative various etiological agents were characterized.

KEYWORDS: ***Neonates, Risk factors, PROM, CRP, EOS, LOS, Clinical signs and symptoms.***

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INTRODUCTION

Blood Stream Infection (BSI) is one of the most common causes of nosocomial infection in neonatal intensive care units(NICU).The present study was to determine bacterial agents and their susceptibility patterns to antibiotics and to investigate the risk factors associated with BSI. Bacterial infections account for a huge proportion of neonatal deaths worldwide [1-5]. The problem of antibiotic resistance among common bacterial pathogens mainly the gram negative bacteria is emerging globally which is of more serious concern in developing countries[6-11]. Septicemia is a serious blood stream infection. Septicemia occurs when a bacterial infection elsewhere in the body, such as in the lungs or skin, enters the blood stream[12-15].Septicemia can quickly become life-threatening. It must be treated in tertiary care hospital. Sepsis is a serious complication in newborn which endangers the newborn life. Sepsis can cause disseminated intra vascular coagulation and reduce the oxygen to reach vital organs, resulting in organ failure. When the inflammation occurs with extremely low blood pressure that is called septic shock which is fatal in many cases. In neonates which are hospitalized, the bacteria that trigger sepsis can enter the body through IV lines, surgical incisions, urinary catheters, and bed sores [16-18]. Many newborns undergo diagnostic studies and the initiation of treatment before the diagnosis has been determined[19,20]. The definitive diagnosis of septicemia is made by a positive blood culture.

MATERIALS & METHODS

The study design and accordingly the 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 the 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 study over a period from Jan 2016 to Aug 2017. Neonates who have fulfilled the inclusion and exclusion criteria were subjected to sepsis screening like CRP, total count, platelet count 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. 84 neonates have been included with suspected sepsis within the study period. Sample for blood culture was sent before starting antibiotics. An area of approximately 5 cm over the venipuncture site was disinfected with 70% alcohol, 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. About1ml of blood was drawn using a sterile syringe, which was inoculated aseptically into a culture bottle containing 5 to 10 ml of culture media. Our hospital Microbiology laboratory with availability of BACTEC and BACT/ALERT blood culture system. After the 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/Bactec automated systems for 24 hours to 7days and bacterial identification was performed with standard bacteriological techniques. The growth was identified by colony characteristics, Gram's staining and standard biochemical tests described in Mackie and McCartney, Practical Medical Microbiology and Bailey and Scott's Diagnostic Microbiology. Culture which did not yield any growth following three subcultures were reported negative at the end of 7days.Antimicrobials sensitivity was performed by modified Kirby Bauer's Disk Diffusion Method[13].

Inclusion criteria

All Neonates with risk factors and clinical features of sepsis.

Exclusion criteria

Neonates with obvious malformation/congenital anomaly, Received antibiotics already.

Clinical signs & symptoms

1.Temperature instability,2.Fever and Chills , 3.Lethargy ,4.Apnea.5.Hypotonia 6.Breathlessness, 7.Poor cry ,8.Irritability, 9.Poor feeding, 10.Grunting, 11.Vomiting, 12.Loose stool, 13.Mottling, 14.Sclerema

Major risk factors

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

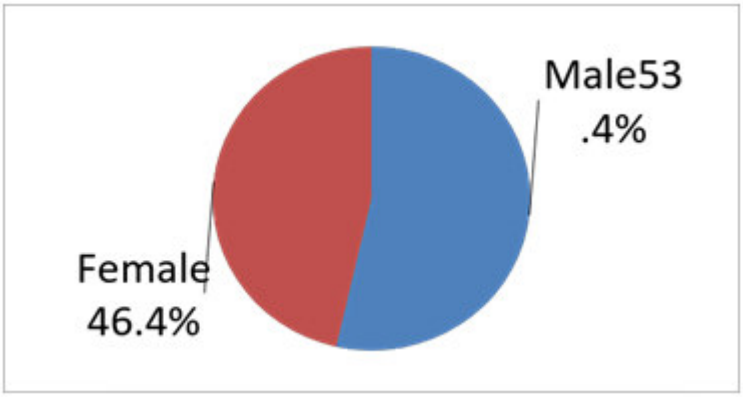
Minor risk factors

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

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 vital signs of the babies were recorded 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.

Analysis and interpretation of Data

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



Male –45(53.4%)
Female -39(46.4%)

Figure 1
Distribution of sex from 84 samples

Table 1
Presenting clinical signs (n=84)

Presenting feature	Frequency of occurrence	Percentage
Temperature instability	30	35.7
Respiratory distress	20	23.8
Lethargy	29	34.5
Apnea	4	4.7
Breathlessness	16	19
Poor cry	8	9.5
Irritability	4	4.7
Poor feeding	38	45
Grunting	8	9.5
Vomiting	8	9.5
Sclerema	3	3.5
Hypotonia	10	11.9
Loose stool	9	10.7
Mottling	8	9.5

Table 2
Day of occurrence of Symptomatic Events (n=84)

Onset (days)	Frequency of occurrence	Percentage
1-3	21	25
4-7	42	50
8-14	14	16.6
15-21	5	5.9
22-28	2	2.3
TOTAL	**84**	

Table 3
Distribution of Variable

SEX	Neonates	N=84	Percentage
	Male	45	53.5
	Female	39	46.4
Gestation	Preterm (24M/23F)	47	55.9
	Term (20M/15F)	37	44
	Late Preterm	0	0
Type of Delivery	NVD(8M/4F)	12	14.2
	LSCS	58	69
	Spontaneous (7M/6F)	13	15.4
	Forceps (1M)	1	1.1
Birth weight	LBW	26	30.9
	Normal	58	69

Table 4
Distribution of risk factors in Mother's

Risk factors	N=84	Percentage
PROM(Premature rupture of membranes)	13	15.4
IUGR (Intrauterine-growth retardation)	7	8.3
UTI (urinary tract infection)	21	25
MF(maternal fever)	10	11.9
FSL(foul smelling liquor)	10	11.9
Anemia	13	15.4
Hypothyroid	10	11.9

Table 5
Blood culture results

Organism grown in Blood Culture	No. Of Organisms	Percentage
Klebsiella Species	3	50
E.Coli	1	16.6
MR CoNS	1	16.6
Citrobacter species	1	16.6
Pseudomonas	1	16.6

OBSERVATION & RESULTS

During the study period of 20 months total number of babies born were 740 in our Hospital. Out of 740, 84 babies were admitted to NICU for various symptoms like temperature instability , lethargy, apnea, hypotonia, breathlessness, poor cry, irritability, poor feeding, grunting, vomiting, loose stools, mottling and sclerema. Out of 84, suspected sepsis were 45 (53.5%) presented within a week life. Birth weight of this babies were 1.020 kg - 3.780 kg with a mean birth weight of 2.400 kg.In the present study 30.9% were the birth weight less than 2.5kg Total mortality rate was 3.5% of the 84 babies, (37 term babies, 47 preterm babies) of which there were 2 sets of twins. During the study period from Jan 2016 to Aug 2017, out of 84 babies, 39 female neonates were clinically diagnosed with sepsis,26 babies were diagnosed with LBW and 58 neonates were above 2.5kg (Table-3).The weight observed in this study is minimum 1.1 kg to maximum of 4.1 kg with the mean weight 2,31kg with SD 0.86. Reason for admission was breathlessness -16(out of 84 babies), lethargy -29(out of 84 babies), poor feeding -38(out of 84 babies) and Temperature instability 30(out of 84 babies)(Table-1).The mothers age varied from 22 to 35 with a mean age of 26 with SD 2.896. Below 25 years of age 33 babies were born and from25 to 35 years of age 51 babies were born. Babies Hospital Stay: Within 3 days-21 babies stayed in NICU;4 to 7 days - 42 babies stayed in NICU; 8 to 14 days- 14 babies stayed in NICU and 7 babies stayed in NICU for more than 14 days(Table-2).Out of 84 babies, 7 were proved sepsis and 77 babies were not proved sepsis. Death occurred in 3 babies among which one is sepsis proved and other two has not proved to be sepsis. Babies were stayed in the hospital for 13 to17 days of life with average of 15 days due to respiratory distress .Risk factors in Mothers:13 Mothers had PROM (Premature rupture of membranes)and UTI (Urinary tract infection) in 21 Mothers, IUGR (Intrauterine-growth retardation) in 7 Mothers, 10 Mothers had MF(maternal fever), FSL(foul smelling liquor) , 13 mothers had Anemia and 10 Mothers had Hypothyroid.(Table-4). Mothers Educational Status : 27 were postgraduate (PG) and 15 were undergraduate (UG). 12 mothers studied up to +2 and 30 had completed formal education. Regarding occupation status :47 were house wives ,9 were working as teachers and 28 of them were manual workers. In twins, 2nd born baby has shown growth with MRCONS . Among 84 babies,58 babies were delivered by LSCS, 12 babies were delivered by Natural Vaginal Delivery (NVD), Spontaneous delivery were 13 and by Forceps was 1(Table-3). The sepsis screen-CRP more than 1mg was seen in 27 cases, leucopenia in 5 cases and Thrombocytopenia was seen in15 cases. Among the risk factors, breathlessness and temperature instability were significant. The clinical feature of neonates with grunting was 9.5% and temperature instability was 35.7%. In this study, out of 84 clinical neonatal sepsis 7 (8.3%) were culture positive cases in which 3*KlebsiellaSp*, 1*Ecoli,* 1*MRCoNS*, *1Citrobacter Sp*, 1*Pseudomonas* were isolated (Table-5). *E.coli* were susceptible to Amikacin, Ertapenem, Imipenem, Ofloxacin, Meropenem, Piperacillin / Tazobactum, Cefoperazone / Sulbactum. Among the 7 isolates Cefalosporins, and Imipenem were found to be resistant[13].

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 84cases,7 were culture positive and 77 were culture negative. The proportion of culture positive septicemia cases where higher among the low birth weight 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 45 neonates (53.5 %) have developed clinical sepsis within a week . The preterm neonates developed clinical sepsis was found to be 40(47.6%). Anderson–Berry *et al* in their study in 2008 in Carolina USA observed that sepsis is more common in Preterm neonates [4].The results of our study where almost comparable with Raghaven *et al* and Tallur *et al* [5,6]. In our study term 35 babies were (41.6%) diagnosed as probable sepsis when compare to the preterm neonates. Our study probably reflects the difference in population, characteristics and the occurrence of the predisposing factors among them. In the present study 30.9% has the birth weight less than 2.5kg.In our study PROM was 15.4% which was lower when compared to 26% in *Karuvilla et al*[7].

CONCLUSION

The LBW and preterm babies developed sepsis commonly. Blood culture is the gold standard for diagnosing neonatal sepsis but required 5 to7 days. Neonatal sepsis is a common disease in newborns with nonspecific Symptomatology causing difficulty in the diagnosis earlier and prompt detection to treat the neonatal sepsis which would significantly reduce the morbidity and mortality. Hence I suggest that the provision of rapid diagnosis test (PCR) may help to decrease mortality. Among the risk factors PROM was commonly presented in neonates with suspected sepsis. Among the clinical features respiratory distress and grunting were the common symptoms. Blood culture is the gold standard for diagnosis neonatal sepsis, but it requires about 48 to72 hours. Out of 84 babies, 3 babies were died. In twins, both were preterm with weight of 1kg and they died due to clinical sepsis. In conclusion, present research explains the prevalence of neonatal sepsis in NICU and the causative various etiological agent were characterized. The 16S rRNA rapid PCR is the most important diagnostic tool to be considered in Rapid diagnosis of neonatal sepsis. Maldi-Tof and colorimetric rapid card test will also help to reduce the mortality rate from two digits to single digit. This the main aim of the Government to be achieved in the year 2020.

CONFLICT OF INTEREST

Conflict of interest declared none

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