International Journal of Medicine Research
ISSN: 2455-7404
www.medicinesjournal.com
Volume 3; Issue 1; January 2018; Page No. 72-74

A prospective study of risk factors of mortality in neonatal sepsis patients

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Abstract
Background: Infants (<28 days) are often suffered from neonatal sepsis. Neonatal sepsis is an important cause of morbidity and mortality in newborns.
Aims and Objectives: To evaluate incidence and risk factors for mortality of newborns with sepsis admitted in NICU.
Materials and Methods: Hundred neonates were studied in the Department of Pediatrics, People's College of Medical Sciences and Research Centre, Bhopal admitted with probable sepsis. Maternal conditions, neonatal physical condition, investigations and follow up till patient was either discharged or die were collected. Complete blood count (CBC), CRP and Blood C/S, Bed side RBS, LP, X-ray chest, serum electrolytes, ABG etc. were done and compared with patients outcome. P value of <0.05 was considered as significant.
Results: Female preponderance was observed (70%) with mortality rate of 16%. Patients who were died most of them were having, needed chest compression (76%) (p=0.021), birth weight <1000 gms (37.5%) (p<=0.002), TLC <5000 (56.2%) (p=0.021), platelet count <50000 (75%) (p=0.003), toxic granules were present (75%) (p=0.028) and needed SIMV (100%) (p=0.001) as compared to patients who had survived.
Conclusion: Mortality rate was high in neonatal sepsis patients. EOS, patients requiring resuscitation at birth, pre-maturity, LBW patients, Leucopenia (TLC < 5000), thrombocytopenia, hypothermia, hypokalemia and SIMV support were the main risk factors associated with mortality.

Keywords: low birth weight, neonatal mortality, neonatal sepsis

Introduction

Among infections, neonatal sepsis is one of the leading causes of neonatal morbidity and mortality in developing countries [1]. Neonatal sepsis accounts for half of the mortality rate in low-income and middle-income countries infection out of 1.44 million (36%) deaths [2].

In Indian population also for neonatal mortality sepsis is the common cause. Incidence of neonatal sepsis reported by National Neonatal Perinatal Database reported is 30 per 1000 live births [3].

Clinical presentation of neonatal sepsis can vary which include fever, difficulty in breathing, tachycardia, difficult in feeding and lethargy [4]. It is therefore important to carry out investigation to confirm neonatal sepsis.

Sepsis related mortality is largely preventable with prevention of sepsis itself, timely recognition, rational antimicrobial therapy and aggressive supportive care. This present study was planned to identify the risk factors of mortality in neonatal sepsis.

Materials and Methods

A prospective observational study was performed on 100 neonates (< 28 days) admitted in intramural or extramural NICU in the Department of Pediatrics, People's College of Medical Sciences and Research Centre, Bhopal during study period of one and a half year with probable sepsis on the basis of clinical presentation.

Institutional Ethics Committee approval was obtained before starting the study and a written informed consent was also obtained from each patient's parents after discussing the details of study.

All neonates < 28 days admitted in intramural or extramural NICU with diagnosis of probable sepsis on the basis of clinical presentation were included. Patients with severe perinatal asphyxia, major congenital malformations or surgical conditions other than necrotizing enterocolitis (which could be due to neonatal sepsis), babies whose parents did not given consent were excluded.

All the details related to maternal conditions, neonatal physical condition (sign and symptoms), investigations and follow up till patient was either discharged or die were collected in pre-formed proforma.

On admission, blood samples were collected for septic screen which included complete blood count (CBC), CRP and Blood C/S. Bed side RBS was done using Glucometer. Further investigations like LP, X-ray chest, serum electrolytes, ABG etc. were done as and when required.

Interpretation for CBC was done for leucocytopenia (<5000), leukocytosis (> 20,000), neutropenia (< 2000) and I: T ratio (>0.3) [5]. C-reactive protein (CRP) test suggest acute infection or inflammation. Although it is not diagnostic of any condition, but it is helpful if interpreted together with other signs, symptoms and other laboratory tests to evaluate any acute or chronic inflammatory condition. CRP if 0.6 mg/dl or more

(1:1 dilution) was positive. A glucose level less than 40 mg/dl at any time in any newborn is labeled as hypoglycemia [6].

All the data analysis was performed using IBM SPSS ver.20 software. Frequency distribution and cross tabulation was used to produce tables. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

Results

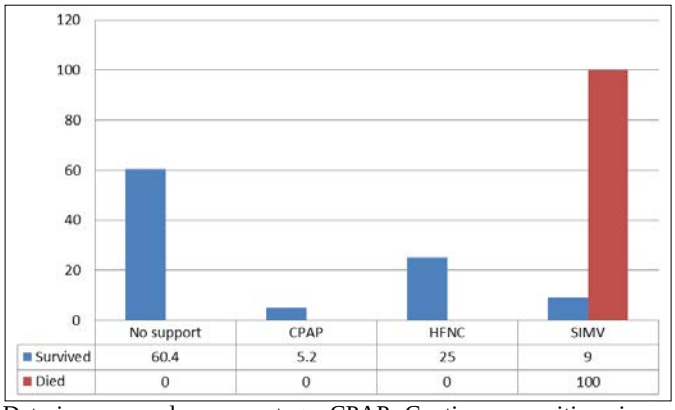
Most of the patients were female (70%) in present study with male: female ratio of 1:1.45. A total 100 patients with probable sepsis were studied. Out of 100 patients 35.34% went left against medical advice. A mortality rate in present study was 16%.

Early onset sepsis (88%) was more prevalent compared to late onset sepsis (12%). Most of the patents had hypothermia (51%) or hyperthermia (10%).

Table 1: Comparing different parameters with patients outcome in study cohort

Parameters		Outcome		P value
		Survived (n=84)	Died (n=16)	
Gender	Male	27.38	50	NS
	Female	72.61	50	
MOD	LSCS	60	38.5	NS
	NVD	40	61.5	
Need of resuscitation	No Resuscitation	69	6	0.021
	Initial Steps	15	0	
	Ventilation	9	0	
	Chest Compression	6	76	
	Emergency Drugs	1	18	
Birth weight	<1000	0	37.5	0.002
	1000-1500	2	31.2	
	1500-2500	39	18.8	
	>2500	59	12.5	
TLC	<5000	5.4	56.2	0.021
	5000-20000	89.6	43.8	
	>20000	6.2	0	
Platelet Count	<50000	4.2	25	0.003
	50000-1.5lac	20.8	37.5	
	>1.5 lac	75	37.5	
Toxic Granules	Absent	76	25	0.028
	Present	24	75	

Data is expressed as percentage, MOD; mode of deliveries, LSCS; lower section caesarean section, NVD; normal vaginal deliveries, TLC; total leukocyte count



Data is expressed as percentage, CPAP; Continuous positive airway pressure, HFNC; High-flow nasal cannula, SIMV; Synchronized intermittent mandatory ventilation

Fig 1: Showing ventilation Status among study cohort

Discussion

In the present study neonatal risk factors were assessed in patients with sepsis. Present study has revealed that various factors that predicted high morality were EOS, patients requiring resuscitation at birth, LBW patients, Leucopenia (TLC < 5000), Thrombocytopenia, hypothermia, and SIMV support.

In present study, patients with EOS were more which was also noticed by Stoll *et al* [7] (91.39%), Gupta *et al* [8] (67.5 %) 41 and Chacko *et al* [9] (55.4%). Contrary to this Kayange *et al* [4] and Lee *et al* [10] reported LOS as the most common.

In present study, ratio of female to male enrolled patients was 1.45:1 whereas the M: F ratio of patients who died was 1:1. Jumah *et al* found that out of 120 patients studied, 61.7% were males and 38.3% were females [11]. Ogunlesi *et al* in their study reported that among the babies who died, 60.3% were males and 39.7% were females with a M: F ratio of 1.5:1 [12].

Mortality rate in present study was 16%, this corroborate with studies done by Chacko *et al* [9] (19.4%) and Kayange *et al* [4] (19%). Ogunlesi *et al* [12] (32.2 %), Lee *et al* [10] (34.1%) and Vijai *et al* [13] (46.7%) reported higher mortality rates.

In Present study, EOS was found to be a risk factor of mortality as also reported by Klinger *et al*. In present study, patients who were premature and low birth weight had high mortality rate; the result in agreement with other studies also [11, 12, 13].

The significant neonatal risk factors identified in the current study included low birth weight and prematurity. Premature and low birth weight babies are relatively immune deficient, which predispose them to infections. Moreover, these babies

at birth are likely to be subjected to different interventional procedures leading to nosocomial infections. Similar was the observations of different workers, who reported significant risk in prematurity and low birth weight [14, 15, 16]. Birth asphyxia [15, 16]. assisted ventilation and umbilical catheterization.

We found leucopenia and thrombocytopenia as other predictors of mortality, also reported by Vijai *et al* (leucopenia) [13] and Jumah *et al* [11] thrombocytopenia) in their studies.

Jumah *et al* in their study found that the clinical signs that predict high mortality were sclerimic skin (94.2%), signs of dehydration (82.8%) and prolonged CRT > 3 seconds (68%) [11]. Kayange *et al* reported hypothermia, maternal fever, umbilical redness and jaundice as the predictors of mortality [4].

Conclusion

Present study observed the mortality rate of 16% in neonatal sepsis. EOS was more common. Various risk factors for mortality found were EOS, patients requiring resuscitation at birth, pre-maturity, LBW patients, Leucopenia (TLC < 5000), thrombocytopenia, hypothermia, hypokalemia and SIMV support.

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