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Perinatal risk factors in neonatal sepsis in a tertiary care hospital

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***Abstract: Objective** : The study was intended to evaluate various perinatal risk factors involved in neonatal sepsis. **Methods** : The study was conducted upon inborn neonates of < 7 days with clinical sepsis,there were 100 cases and 100 controls who were evaluated for various maternal and neonatal risk factors. **Results**: We found low birth weight ,prematurity(<35 weeks),maternal fever,leaking pv >18 hours ,meconium stained liquor,≥3 per vaginal examinations,mixed feeding , raised maternal TLCs were common risk factors for development of neonatal sepsis.Blood culture was positive in 30% (n =30) cases. Klebsiella pneumonie (33.3%),CONS(30%),Staphylococcus aureus (16.6%), were common isolated organisms. **Conclusion**: Neonates who are unwell must be considered at risk of sepsis.Neonates with maternal risk factors should be evaluated thoroughly as they have significant risk of neonatal sepsis.*

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I. Introduction

Neonatal period is considered the most important age group at all times as newborns are most vulnerable to disease and death. Historically the probability of death during neonatal period was so high that many traditional practices were postponed until after first week of life, ensuring the probability of child's survival. Also the quality of life and health as the child grows to adult life is partly determined at this stage**.** Advances in neonatal intensive care have led to improved survival of neonates, but neonatal sepsis continues to be an important cause of morbidity and mortality.

Etiology of neonatal sepsis is multifactorial, but the principal sources of newborn infection are mother and nursery environment. During fetal life, the sources of infection are transplacental and ascending intrauterine infection. Because sepsis can have devastating consequences for full-term, normal birth weight infants as well, early diagnosis and treatment remain crucial.

II. Materials and Methods

The present study was a case control study, done in NICU of Mata Chanan Devi Hospital,tertiary care hospital in New Delhi, India for 3 years from 2013-2016 after taking ethical committee approval.Total 100 inborn neonates with age range from 0 to 7 days having clinical signs and symptoms of sepsis as per IMNCI guidelines(1) and positive sepsis screen (2) were taken as cases, whereas total 100 neonates with age ranging from 0-7 days with no symptoms and without evidence of neonatal sepsis were taken as controls.Outborn and babies with gross congenital anomalies were excluded from the study.

Any 2 of the following parameters were considered as positive sepsis screen count (TLC) <5000/mm3, immature/total neutrophils ratio ≥0.2, ANC <1800, and positive CRP (CRP >10 mg/dL)(2).For all babies included in study blood culture and antibiotic sensitivity using 9050 BACTEC machine were done and read at 48 hours.Other relevant investigations as per requirement were done.

Maternal data of mode of delivery, fever within 2 weeks before delivery, PROM, pervagnial leaking >18 hrs,meconium stained liquor,foul smelling liquor,burning micturition,number of pervaginal examinations,prior antibiotic, any other significant history were collected in a prestructured performa.Following investigations were done in mothers of neonates enrolled in study- total leucocyte count, urine routine; high vaginal swab culture, urine culture and blood culture-sensitivity.

Following data were also collected from Nursery to assess risk factors in new born- birth asphyxia,peripheral intravenous catheter,umbilical vein catheter,central line,requirement of ventilation,type of feed,parenteral nutrition,surgical interventions and any other significant details.

All the data were collected in Microsoft windows 10 and excel 10, analyzed using statistical package for the social science system version SPSS 17.0.

III. Results:

We studied various risk factors in total 100 cases and 100 controls. The risk factors evaluated for early onset sepsis (EOS) were peripartum maternal fever, per vaginal leaking, foul smelling liquor, meconium stained liquor, burning micturition and number of pervaginal examinations. In this study no significant association was

found in causing EOS by foul smelling liquor and burning micturition, where as maternal fever (p 0.02),leaking pv >18 hours(p<.001), meconium stained liquor (p <0.01) were found associated .

Parameters	Variables	Cases(n=100)	Controls (n=100)	P value,OR
Sex	Male Female	43 57	57 43	-
Gestation weeks	>37 35-37 <35	32 46 22	51 48 1	0.426 0.187 <0.001
Birth weight	>2500 g 1500-2499 g <1500 g	54 34 12	77 23 0	0.4 <0.01 0.24
Mode	LSCS NVD	81 19	77 23	0.487
Maternal Fever	No Yes	86 14	96 4	0.024,3.90
Leaking PV > 18 hours	No Yes	66 34	97 3	<0.001,16.65
No. of pv done	<3 ≥3	7 93	15 85	0.071,2.34
Foul smelling Liquor	No Yes	97 3	99 1	0.621,3.06
Meconium stained liquor	No Yes	75 25	96 4	<0.001,8
Burning micturition	No Yes	93 7	97 3	0.331
Prior antibiotics	No Yes	7 93	12 88	0.228

Table 1: Study of various risk factors

In our study only 4% septic neonates were given exclusive breastfeeding, rest 96% were given mixed feeding in the form of spoon and nasogastric feeds. However 89% of control babies were exclusively breastfed. Mixed feeding was found to be significantly associated with sepsis (p value<0.001).
Among all cases of neonatal sepsis 30% babies had blood culture positive sepsis. Klebsiella was the most common bacteria isolated in our study followed by coagulase negative staphylococcus (CONS). There were no fungal isolate obtained in our study which is seen commonly in LOS.

Organism isolated	Total number	Percentage
Klebsiella	10	33.3
CONS	9	30
Staph aureus	5	16.6
E coli	3	10
Pseudomonas	3	10

Table 2: Blood culture yield

Mothers of septic neonates had high total leukocyte count as compared to control group. Maternal total leukocyte counts (TLCs) - in our study we found mothers of septic neonates had high total leukocyte count (median 9719) as compared to control group (median 6937), raised maternal TLC was found significantly associated with neonatal sepsis (p<0.001). Among other investigations maternal blood culture, raised pus cells in urine routine microscopy, growth in maternal urine culture had no association with neonatal sepsis (p values 0.2, 0.5 and 0.423 respectively).

IV. Discussion:

In our study it was observed that the occurrence of septicemia was much higher in VLBW and LBW group i.e, 100% and 59.6% respectively in comparison to normal birth weight newborns (41.6%).VLBW and LBW was found to be very well correlated with sepsis(p value<0.01 and 0.024 respectively) . These findings were similar to Schrag et al (3) and Jajoo M et Al (4) (68% LBW neonates) where they found higher incidence of sepsis among LBW neonates. Chakraborty A et al (5) observed that the occurrence of septicaemia was much higher in ELBW, VLBW and LBW groups, i.e, 75%. 71.42% and 40.84% respectively in comparison to normal birth weight newborns (21.62%). Significant association was seen between sepsis and babies born before 35 weeks gestation(p value <0.001),babies born at term were least affected.Jajoo M et al (4) in their study found prematurity in 46% babies with sepsis. Puopolo K et al (6) in their study found similar results where gestational age of 34-36 weeks and post term delivery were found to be associated with sepsis.

In present study no significant association was found in causing EOS by foul smelling liquor(p 0.621) and burning micturition (p 0.331) ,where as maternal fever (p 0.02,OR 3.9),leaking pv >18 hours(p<.001,OR16.65) ,meconium stained liquor (p <0.01,OR 8),≥3 per vaginal examinations (p 0.011,OR 2.34) were found to be statistically significant.

We were not able to make any correlation about intrapartum antibiotics and associated decreased risk of sepsis due to insufficient sample size in our study. Puopolo K M. et al(6), reported that premature rupture of membranes, maternal fever, duration of rupture of membrane to be associated with sepsis while any form of intrapartum antibiotics given more than 4 hours before delivery was associated with decreased risk.

Only 4% septic neonates were given exclusive breastfeeding, rest 96% were given mixed feeding in the form of spoon and nasogastric feeds. However 89% of control babies were exclusively breastfed. Mixed feeding was found to be significantly associated with sepsis (p value<0.001)

Blood culture was sent in all 100 cases. The blood culture yield by using the Bactec system in the current study was 30 %. This was similar to the 28.8% reported by Bhat R et al (7), whereas NNPD reported 54.4% culture positive rates (8). Low culture yield in our study may be due to prior antibiotic therapy and lack of improvised microbiological techniques. We found Klebsiella and CONS as most common blood culture isolates. This finding agreed with the reports of Khan SN et al (9),Vishwanathan et al (10). NNPD 2003 (8) reported Klebsiella pneumoniae and Staphylococcus as the most frequent causative organisms for neonatal sepsis in India.

Maternal total leukocyte counts (TLCs) - in our study we found mothers of septic neonates had high total leukocyte count (median 9719) as compared to control group (median 6937), raised maternal TLCs were found significantly associated with neonatal sepsis (p<0.001). In a similar study by Mayuga et al (11) found raised maternal total leukocyte count was significantly correlated with neonatal sepsis. We didn't find statistically significant association of maternal blood culture, raised pus cells in urine routine microscopy and growth in maternal urine culture with neonatal sepsis

Most common organism obtained from maternal genitals in our study was E. coli (15%) followed by Klebsiella (8%) and CONS (8%). We could not be able to correlate this with neonatal sepsis.

The results were comparable to study done by Kerur B et al (12),where they found E. coli most common organism isolated from maternal genital tract however in their study correlation between maternal genitilia bacteria and baby's blood culture was not significant.

V. Conclusion:

Maternal risk factors such as per vaginal leaking > 18 hours, maternal fever, meconium stained liquor, ≥3 per vaginal examinations are found to be significantly associated with early onset sepsis. Neonates who are unwell must be considered at risk of sepsis. There is need of development of a simple algorithm that combines clinical signs and risk factors to diagnose neonatal infections. It will be useful in settings where lab facilities are not available. Avoid mixed feeding, mainly in neonates with low birth weight. Breast feeding and donor breast milk should be promoted.

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