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Findings of CSF Examination in Lethargic Neonates

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Original Article

Summary

There is no specific criteria could be identified to predict which newborn having meningitis or sepsis ,so CSF examination and blood culture are mandatory and crucial tests for lethargic neonate. This study aimed to predict the incidence of meningitis and sepsis in newborn baby who have clinically letharginess and to define the risk factors such as gestational age ,onset and duration of rupture membrane and other maternal risk factors. This study was carried out in the National Center for Children's Development, Albania during 6 months (January-June 2019) included (40) patients aged ≤ 28 days who were admitted during this period to NICU with letharginess, (21) patients were full-term and (19) patients were preterm, male neonates were 22. Out of the 40 neonates, (32) aged 1-7 days and (8) neonates aged 8-28 days , (10) of them delivered by C/S and (30) by NVD . Mothers' history of leaking liqour for more than 18 hours before the onset of labour reported in 22 cases while it was for less than 18 hours in the remaining 18 cases. CSF and blood culture were performed for all neonates as a part of infectious screen. Two neonates (5%), diagnosed as having meningitis according to the abnormal CSF findings and positive culture and 16 patients (40%) diagnosed as neonatal sepsis according to the positive blood culture. The remaining 22 patients(55%) showed Negative CSF and blood cultures which indicated that lethargy is common evidence of many other neonatal diseases. In conclusion, incidence of neonatal infections are common in premature newborn and in newborn with maternal risk factors. The incidence of neonatal sepsis most common than neonatal meningitis the ratio was 8:1.

Keywords: *Lethargy, Sepsis, Meningitis, CSF examination , Risk factors*

1. INTRODUCTION

Lethargy in newborns is a significant problem in neonatal intensive care (NICU), but they can also occur after discharge from the hospital. Rapid recognition of symptoms and understanding of possible differential diagnoses are important for early evaluation and treatment . A bored child generally has difficulty feeding, has a weak sucking reflex, hypotension and has difficulty waking up (1,2). The differential diagnosis of lethargy includes hypoxia, ischemic encephalopathy , infection / sepsis, asphyxia, congenital metabolic defects, intra-ventricular hemorrhage (IVH), and hyperbilirubinemia (3,4). Hypoxic ischemic encephalopathy occurs when there is decreased blood flow to the brain and hypoxemia, which can be caused by factors before, during, or after delivery, although intrauterine events are the most common cause (5,6).

Neonatal sepsis is a clinical syndrome resulting from pathophysiological effect of local or systemic infection in the 1st month of life ,the incidence of neonatal sepsis as well as the causative agent vary with time and geographic distribution. The mode of transmission either or vertical during process of delivery . Sepsis occurs in about 1-5 per 1000 live births and is more common in low birth weight children. Poor nutrition and lethargy, although not a fever, are the first symptoms that require immediate physical and laboratory examination. Intrauterine asphyxia indicates lethargy shortly after birth, when ischemic damage is significant (7–11).

Incidence of meningitis in newborn infant is (0.5-l)per 1000 live birth in developed countries , and it is higher in preterm infant, by almost 3-10 fold compared with term infant (12–14) Bacterial meningitis occur more frequently during 1st month of life than any other time during individual life ,meningitis has nonspecific and poorly defined signs of infection in general, diagnosis of meningitis required a full evaluation of the CSF with isolation of infectious agent and the result of CSF should be matched with a normal CSF values(12–17). Mild hypoxia may initially indicate irritability and / or lethargy, which can lead to seizures. In contrast, lethargy secondary to IMD usually occurs after a period of normal neurological function. Laboratory abnormalities such as hyperammonemia, hypoglycemia, hypocalcaemia and lactic acidosis may occur. Severe HCV may show symptoms of hypotension and lethargy at an early stage.

Lethargy appearing after the 2nd day should in particular suggest infection, while lethargy

with emesis suggest increase intracranial pressure or an inborn error of metabolism. Infections are a frequent and important cause of morbidity and mortality of the neonatal period (18,19).

As with shortness of breath, a child's appearance can vary greatly depending on the degree of bleeding. Finally, significant hyperbilirubinemia can lead to encephalopathy, and the baby becomes lethargic and has difficulty feeding (18,19).

2. PATIENTS and METHODS

This was a cross-sectional study conducted during 2018 including 40 patients who were admitted to pediatric department during a period of 6 months and were admitted to NICU , age of neonates was 28 days or less with a clinical lethargy.

Data collected using a pre-constructed data collection form including the following information of the neonate, age ,sex , birth weight, maturity (full-term or preterm), mode of delivery (NVD or cesarean), duration of illness ,age of neonate at onset of presentation (0 -7 days or 8 -28 days) and signs of other CNS manifestation , additionally we included the followings as maternal risk factors for infections like history of fever of mother 1 week before the onset of labour and history of rupture of membrane or leaking liquor more than 18 hours before the onset of labour.

Lumbar puncture and blood culture were done on admission to all patient with letharginess under good sterilization aseptic technique for area of aspiration with povidone iodine solution Bp 10% w/v. Bloody or traumatic CSF were excluded from the study .

The blood and CSF were cultured on aerobic media (blood agar, macconkey agar , chocolate agar media) and also were cultured on anaerobic media. CSF examination considered abnormal if isolation of special pathogen on culture only or abnormal CSF findings as elevated protein more than normal value , reduce glucose lower than normal value and elevated cells count more than normal value (more than 60% neutrophils)

The normal value of CSF examination are shown below (20)

Parameter	Full term	Preterm
Protein mg/dL	90 (20 - 170)	115 (65 - 150)
Glucose mg/dl	52 (34-119)	50(24-63)
Leukocyte cells/ml	7 (0-32) 60% neutrophil	8(0-29) 60% neutrophil

Statistical analysis:

Data were analyzed using the statistical package for social sciences version 22. Appropriate statistical tests were applied according to the type of variables, Descriptive statistics presented as mean , standard deviation (SD), frequencies and percentages, all statistical tests were applied at level of significance of 0.05.

3. RESULTS

Out of the 40 neonates included in this study, 22 (55%) were male and 18 patients (45%) were female , 21 patients (52.5%) were full-term and 19 patients(47.5%) were preterm. Age ranged 1-7 days in 32 patients (80%) and 8-28 days in 8 patients (20%). Ten neonates (25%) delivered by cesarean section (C/S) and 30 patients (75%) by NVD , Mothers of 22 patients (55%) gave history of leaking liquor for more than 18 hours before the onset of labor and 18 patients (45%) there was a history of leaking liquor less than 18 hours before the onset of labor.

Only 2 patients (5%) who were preterm newborn diagnosed as meningitis based on abnormal CSF findings and positive CSF culture revealing E-coli. Sixteen patients(40%) diagnosed as neonatal sepsis based on positive blood culture mostly with klebsiella growth, growth (Figure 1).

Blood culture was positive in 16 patients ; 10 (62.5%) males an 6 (37.5%) females (Table 1)

Positive blood culture was mostly occur in preterm newborn where 11 preterm newborn (68.75%) compared to only 5 full-term newborn (31.25%) had positive blood culture (Table 2)

The blood culture was positive in 12 patients (75%) who delivered by NVD and only 4 patients(25%) delivered by C\S (Table 3)

Positive blood culture most frequent in patients aged 1-7 days than those aged 8-28 days, 87.5% and 12.5%, respectively, (Table 4).

Blood culture was positive in 12 patients (75%) whose mothers gave history of leaking liquor for more than 18 hours before the onset of labor while in 4 patients (25%) the mothers gave history of leaking liquor for less than 18 hours before the onset of labor (Table 5)

Table 1. Baseline characteristics of the studied group

Variable		No.	%
Age (days)	1 - 7	32	80.0
	8 - 28	8	20.0
Sex	Male	22	55.0
	Female	18	45.0
Maturity	Preterm	19	47.5
	Full term	21	52.5
Mode of delivery	NVD	30	75.0
	Cesarean section	10	25.0
history of leaking liquor	≥ 18 hours	22	55.0
	< 18 hours	18	45.0

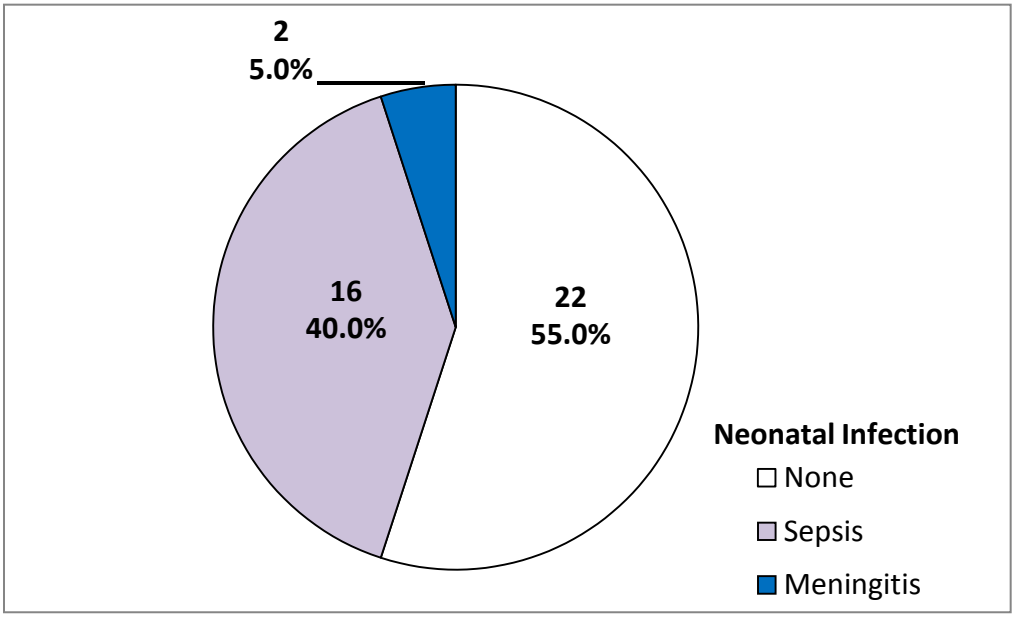

Figure 1. Distribution of Sepsis and Meningitis in neonates

Table 2. Blood culture results according to the sex of neonate

Sex	Blood culture				Total
	Positive		Negative		
	No.	%	No.	%	
Male	10	62.5	12	50.0	22
Female	6	37.5	12	50.0	18
Total	16	100.0	24	100.0	40

Table 2. Blood culture results according to the maturity of lethargic neonates

Maturity	Blood culture				Total
	Positive		negative		
	No.	%	No.	%	
Preterm	11	68.8	8	33.3	19
Full term	5	31.3	16	66.7	21
Total	16	100.0	24	100.0	40

Table 3. Blood culture results according to Mode of delivery

Mode of delivery	Blood culture				Total
	Positive		Negative		
	No.	%	No.	%	
NVD	12	75.0	18	75.0	30
Cesarean section	4	25.0	6	25.0	10
Total	16	100.0	24	100.0	40

Table 4. Blood culture results according to Age of neonate

Age of neonate	Blood culture				Total
	Positive		Negative		
	No.	%	No.	%	
1 – 7	14	87.5	18	75.0	30
8 - 28	2	12.5	6	25.0	10
Total	16	100.0	24	100.0	40

Table 5. Blood culture results according to history of leaking liquor

leaking liquor	Blood culture				Total
	Positive		Negative		
	No.	%	No.	%	
≥ 18 hours	12	75.0	10	41.7	30
< 18 hours	4	25.0	14	58.3	10
Total	16	100.0	24	100.0	40

4. DISCUSSION

The evaluation of neonate with suspected sepsis is one of the most common demanding and most important tasks of pediatrician or neonatologist.

In present study the most common clinical presentation is the nonspecific signs like lethargy, irritability or reluctant to feeding. Convulsion was higher in patient with meningitis, it is well documented that seizures are more common in neonates with meningitis as shown by study Batra et al. (21) and Baud et al. (22) studies.

In present study 16 patients (40%) were diagnosed as neonatal sepsis with positive blood culture mostly with klebsiella growth, these findings agreed that reported in previous studies where clinical suspicion of sepsis found to be associated with positive blood culture of klebsiella as being the most common pathogen (23,24)

In the present study there is only 2 patients (5%) diagnosed as having meningitis based on abnormal C.S.F findings and positive C.S.F with E . coli growth, similarly de Blauw et al.

(25) in 2019 found that 5% of neonates had positive culture for E . coli growth in lethargic neonates presented with meningitis

There is a significant increase in the risk of neonatal sepsis with premature delivery, a similar results were obtained by Xiao et al. in 2017 (26) , Ocviyanti and Whono 2018 (27) , Adatara et al. 2019 (28)and Murthy et al. in 2019 (28) .

The maternal risk factors such as history of leaking liquor more than 18 hours and fever before the onset of labour were found a high risk factors for neonatal infections, the same results obtained in previous studies from other countries (29–32)

5. CONCLUSIONS

Cerebrospinal fluid (CSF) examination and blood culture remains the most important diagnostic tools of neonatal sepsis and meningitis and should be a part of routine screening tests in lethargic neonate. Higher neonatal meningitis and sepsis rates were mostly associated with prematurity of newborn and maternal risk factors. Incidence of neonatal sepsis was much higher than meningitis.

Ethical Clearance: Ethical clearance and approval of the study are ascertained by the authors. All ethical issues and data collection were in accordance with the World Medical Association Declaration of Helsinki 2013 for ethical principles for medical research involving human subjects. Data and privacy of patients were kept confidentially.

Conflict of interest: Authors declared none

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