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NEONATAL SEPSIS IN PRETERM NEONATES, ALMADINA ALMUNAWARA, SAUDI ARABIA, BACKGROUND, ETIOLOGY

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ABSTRACT

Background: Sepsis in neonates (NS) is a global issue that possesses a challenge for management by pediatric health care providers. Objective: Study the clinical and bacteriological profile of 80 preterm neonates. This was a case controlled study conducted at Almadina Almunawara, Saudi Arabia on 80 preterm neonates. Patients and Methods: The included neonates were divided into 2 equal groups, the first groups included 40 preterm neonates directed to neonatal intensive care unit (NICU) with diagnosis of sepsis that proved was with clinical and laboratory investigations and the second group included 40 healthy preterm neonates. Results: The gestational age and Apgar score were lower in neonatal sepsis group than normal group with a significant difference. The respiration rate was significantly increased in neonatal sepsis group than normal group. A significantly higher count of neutrophil and IT were found in the neonatal sepsis group in comparison with normal group. However, platelets count was lower in NS group than normal group. The most prevalent culture isolate among neonatal sepsis group were gram positive bacteria as CONS (27.5%) and staph aureus (20%). The gram negative bacteria were klebsiella Pneumonia (20.8%) followed by E coli (15%) then Acenobacter (10%) and pseudomonas (10%). Conclusion: Preterm pregnancy and CS delivery is associated with higher risk for neonatal sepsis. Gram positive bacteria were the most prevalent type of isolates in our hospital including CONS and staph aureus. The gram negative bacteria were klebsiella Pneumonia followed by E coli then Acenobacter and pseudomonas (10%).

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Introduction

Sepsis is defined as a systemic reaction to bacterial, fungal and protozoal infection [1]. Neonatal sepsis (NS) is a serious cause of diseases in about 1-10 per 1000 live births also it results in 15-50% of neonates particularly in preterm infants [2, 3]. Another definition of NS is a systemic response of inflammation to an infection. The diagnosis of NS can be based on positive results of sterile body fluid and/or blood culture but always takes a long time (48 to 72 hr)[4]. The diagnosis of NS based on early clinical signs can be misdiagnosed with other diseases including respiratory distress syndrome, pneumonia and intracranial hemorrhages that has common nonspecific symptoms tachycardia, fever, and drowsiness [5]. The risk factors that result in increasing the likelihood of neonatal sepsis include low socioeconomic conditions, low birth weight and prematurity [6]. Additionally, a study conducted in neonates with early onset neonatal sepsis revealed that premature rupture of membrane (PROM), meconium stained amniotic fluid, and foul smelling liquor were statistically related to the development of NS[7]. Several studies have reported that low birth weight as well as prematurity are correlated with increased risk of mortality in patients with sepsis[8-10]. Thus, there is a need for reliable biomarkers to diagnose early neonatal sepsis to avoid the late onset and risks of mortality [11, 12]. This study aimed to assess clinical and bacteriological profile of sepsis in preterm neonates.

Patients and Methods

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Ethical approval was signed from ethical committee of pediatric department with a written approval from the parents of neonates enrolled in the study. Eighty (80) preterm neonates were divided into 2 equal groups, the first groups included 40 preterm neonates admitted to NICU with sepsis proved with clinical and laboratory investigations and the second group included 40 healthy preterm newly born. Neonates born with a gestational age more than 37 weeks, neonates of mothers with history of prenatal infection and autoimmune diseases, neonates with congenital anomalies were excluded. All included patients were subjected to full detailed history as well as clinical and bacteriological investigations. The sepsis diagnosis was based on CBC with differential count. Acute phase reactants: CRP and blood culture. The data were analyzed using SPSS (version 15.0; Chicago, Illinois, USA). The mean, SD, and range were used for quantitative variables. Also, the Chi Square test was used for comparing the qualitative variables among groups. The t-test compared the quantitative variables in parametric data.

Results

Table. 1 indicated that the Apgar score at admission and at 5 min. was statistically lower in the neonatal sepsis group when compared with the normal group. Also, the gestational age was statistically lower in neonatal sepsis group in comparison with control group (p value = 0.03). The female ratio was higher than males but with no statistically significant difference. CS delivery was statistically higher in the neonatal sepsis group than the normal preterm group (p value < 0.001).

Table 1: History of included neonates:

		Group					P value	
		Neonatal sepsis (N=40)			Normal (N=40)			
		Rang e	Mean	SD	Rang e	Mea n		SD
APGAR at admission		5-7	5.88	0.95	8-9	8.00	0.70	<0.001
APGAR at 5 min.		5-8	6.33	0.76	8-10	8.67	0.70	<0.001
Gestational age		31-36	34.08	1.47	34-36	34.88	0.80	0.03
Sex	Male	17	42.5		18	45		0.25
	Female	23	57.5		22	55		
		N	%		N	%		
Mode of delivery	Vaginal delivery	15	37.5		30	75.0		<0.001
	CS	25	62.5		10	25.0		

- Examination of neonatal sepsis:

A higher significant respiration rate was found in neonatal sepsis group when compared with normal group (p value = 0.01). The heart rate, temperature, and birth weight did not significantly differ between the studied groups. The incidence of cap. refill time >2, apnea, respiratory distress, absence of suckling reflex and absence of moro reflex were significantly higher in case of neonatal sepsis than the normal group (Table. 2).

Table 2: Examination of neonatal sepsis:

		Group				P value	
		Neonatal sepsis (N=40)		Normal (N=40)			
		Mean	SD	Mean	SD		
Respiratory Rate		59.33	8.29	53.21	7.16	0.01	
Heart Rate		138.46	15.64	137.42	10.24	0.79	
Temperature		37.21	0.53	37.08	.81	0.53	
Birth weight (gram)		2389	374.35	2548.3	355.56	0.14	
		N	%	N	%	P value	
Cap. refill time >2	No	15	37.5	40	100.0	<0.001	
	Yes	25	62.5	0	0.0		
Apnea	No	11	27.5	40	100.0	<0.001	
	Yes	29	72.5	0	0.0		
		No	11	27.5	40	100.0	<0.001

		Group				P value
		Neonatal sepsis (N=40)		Normal (N=40)		
		Mean	SD	Mean	SD	
Respiratory Rate		59.33	8.29	53.21	7.16	0.01
Respiratory distress	Yes	29	72.5	0	0.0	<0.001
	No	19	47.5	0	0.0	
Suckling reflex	Yes	0	0.0	40	100.0	
	Can't ass.	21	52.5	0	0.0	
	No	18	45	0	0.0	
Moro reflex	Yes	0	0.0	40	100.0	<0.001
	Can't ass.	22	55	0	0.0	
	No	0	0.0	40	100.0	

- Complete blood count and CRP:

The count of WBCs, RBCs and HB showed no statistical difference among the studied groups. The neutrophil, IT and platelets count showed a higher significant difference in the neonatal sepsis group compared with healthy group. Neonates with sepsis showed a statistically higher CRP levels than normal healthy preterm neonates (Table. 3).

Table 3: CBC levels in studied groups:

	Group						t*	P value
	Neonatal sepsis (N=40)			Normal (N=40)				
	Range	Mean	SD	Range	Mean	SD		
WBCs	2.80-24.7	9.78	6.74	6-15	10.28	2.43	0.34	0.74
Neutr	0.30-0.66	0.50	0.12	0.49-0.67	0.59	0.06	3.11	0.004
PLTs	110-334	230.88	60.32	200-317	99.13	95.94	5.70	<0.001
RBCs	2.87-5.82	3.96	0.81	3.15-5.12	4.17	0.58	1.03	0.31
HB	8.06-12	10.02	1.02	9.01-12.36	10.39	0.90	1.34	0.19
IT	0.32-0.47	0.39	0.05	0-0.15	0.04	0.04	26.00	<0.001
CRP	6.00-96	55.42	31.69	2-5	3.25	0.1	-	<0.001

- Blood culture results:

Table.4 showed that the most prevalent culture isolate among neonatal sepsis group were gram positive bacteria as CONS (27.5%) and staph aureus (20%). The gram negative bacteria were klebsiella Pneumonia (20.8%) followed by E coli (15%) then acenobacter (10%) and pseudomonas (10%).

Table 4: Blood culture results:

	N	%
Coagulase-negative Staphylococcus (CONS)	11	27.5
Staph aureus	8	20
Klebsiella Pneumonia	7	17.5
Acenobacter	4	10
Pseudomonas	4	10
E coli	6	15
Total	24	100.0

Discussion

The incidence of neonatal sepsis has been increased worldwide [2, 3], especially developing countries. Also, sepsis is a major risk factor neonatal mortality in more than third of all neonatal deaths annually and a significant risk for disease morbidity as well as the admission to the NICU [13, 14]. This case controlled study was conducted to study the clinical diagnosis and bacteriological profile of NS in Ohud general hospital in Almadina Almunawara. This study included 80 preterm neonates subdivided into 2 groups, the first groups included 40 preterm neonates admitted to NICU with sepsis proved with clinical and laboratory investigations and the second group included 40 healthy preterm neonates.

This present study showed that the gestational age was significantly lower in the NS group than normal group and this was inconsistent with other studies concluding that prematurity and very low gestational age (VLGA) was correlated with an increased hazard of neonatal sepsis than normal groups [7, 15-17].

The Apgar score at admission and at 5 min. was significantly lower in NS group than control group. In accordance, a recent study showed that the NS neonates were more vulnerable to be presented with low Apgar score in 1st minute and 5th minute in comparison to infants without sepsis [18]. The same idea of having lower APGAR scores in critically ill neonates with sepsis was supposed in another present study [19]. However, another study found that the Apgar score did not significantly differ between the control and the neonatal sepsis group [20].

Ohlin showed that the mode of CS delivery was significantly higher in the NS group than preterm control group which comes in agreement with the present results [21].

In correspondence with the present results regarding the respiratory rate, nosocomial infection groups were found to have higher rates of respiratory distress, tachypnea [22-24].

In this study, the heart rate, temperature and birth weight did not significantly differ between the studied groups. However, symptoms and signs of sepsis are nonspecific and consist of temperature instability (primarily fever), irritability, lethargy, poor feeding, tachycardia, poor perfusion, respiratory symptoms (eg, tachypnea, grunting, hypoxia), elevated temperature and hypotension [25].

The cap. refill time >2, apnea, respiratory distress, absence of suckling reflex and absence of moro reflex were statistically increased in case of NS than the normal group. In the same respect, the most common clinical finding among the infected group was weak suckling (92.3%), weak Moro reflex (77%), respiratory distress (69.2%), lethargy (69.2%), and feeding intolerance (65.9%)(24).

Basic hematological tests, such as CBC showed that the neutrophil and immature to total leukocyte ratio (IT) count were statistically higher in NS group in comparison with normal group. However, platelets count was significantly lower in NS group than normal group. Recent studies showed that the total count of neutrophils as well as the immature neutrophils were increased in the neonates group with sepsis [26]. Also, other studies found that thrombocytopenia is considered as an indicator of sepsis and the severity index [27, 28]. In addition, higher IT rates were found as a negative predictive value for neonatal sepsis [29].

The CRP levels were significantly increased in NS group than normal healthy preterm subjects. C-reactive protein (CRP) is increased several folds during infection and have been used in diagnosis of neonatal sepsis [30, 31].

This study showed that the causative agents were distributed as gram positive bacteria including CONS (27.5%) and staph aureus (20%) and gram negative bacteria (klebsiella Pneumonia (20.8%) followed by E coli (15%) then acenobacter (10%) and pseudomonas (10%)). Consistent study showed that the coagulase-negative Staphylococcus (CONS) was the most prevalent causative agent [32]. However, a recent study in Saudi Arabia showed a different distribution of causative agents, as the most common organism was E-coli [33].

Conclusion

The presently conducted prospective case controlled study showed that preterm pregnancy and CS delivery is associated with higher risk for neonatal sepsis. Gram positive bacteria were the most prevalent type of isolates in our hospital including CONS and staph aureus. The gram negative bacteria were klebsiella Pneumonia followed by E coli then Acenobacter and pseudomonas (10%).

ETHICS: This study was approved from the Ethical Committee of Ohud Hospital, Almadina Almunawara, Saudi Arabia and a written informed consent was obtained from the parents of included neonates.

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DISCLOSURES: No conflicts of interest

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