



## RESEARCH ARTICLE

### SCREENING FOR SEPTIC HIP ARTHRITIS IN NEONATAL SEPSIS

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#### ABSTRACT

**Aim:** To screen for septic arthritis of the hip joint in neonatal sepsis to know the prevalence and factors associated with septic arthritis.

**Subjects and Methods:** This study was conducted on 80 septic neonates (cases) and 20 normal neonates (controls) in Benha University NICU from February 2015 to January 2016. Cases were screened for diagnosis of septic arthritis of the hip joint by using ultrasonography (General Electric 2012).

**Results:** Among 80 septic neonates and 20 normal neonates about 16 cases of them had positive hip findings. There were 8 cases out of 80 (10%) presented with septic arthritis, 7 cases (8.8%) presented with tenosynovitis and only one case (1.25%) presented with developmental dysplasia of the hip joint. They showed a highly significant correlation with femoral arterial blood gas sampling, interventions for urinary tract and also similar conditions in the family as risk factors. Ultrasound revealed severe effusion with turbidity in septic hip arthritis and minimal effusion with no turbidity in tenosynovitis.

**Conclusion:** Our results revealed that 16 cases (20%) out of 80 septic neonates had positive hip findings by ultrasound examination as follows: 8 cases (10%) with septic arthritis, 7 cases (8.75%) with tenosynovitis, and one case (1.25%) with developmental dysplasia of the hip joint.

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## INTRODUCTION

Septic arthritis is defined as bacterial, Fungal and mycobacterial infection in joint (Frazee et al., 2009). Acute septic arthritis in neonates is most often of haematogenous origin (Paakkonen and Peltola, 2012). Boys are more prone than girls. Hip joint is frequently affected. Staphylococcus aureus is the most common causative agent followed by respiratory pathogens: Streptococcus pyogenes, streptococcus pneumonia and haemophilus influenza type b (Carrilo – Marquez et al., 2009). Generally known risk Factors are neonates, male gender, respiratory distress syndrome, umbilical artery catheterization, host phagocytic defects, haemoglobinopathies, interventions on joints and instrumentation of the urinary or intestinal tract. However, most cases of septic arthritis occur in previously healthy children (Shah and Desai, 2013). The most serious complication of septic arthritis of hip in newborns is the avascular necrosis of the femoral head, leading to partial or complete destruction of the capital femoral epiphysis, the growth plate or both. The aim of treatment of sequelae of

neonatal septic arthritis of the hip is to preserve good relation between the femoral head and acetabulum (Rozbruch et al., 2005). Despite the use of laboratory investigations, the gold standard for the diagnosis of septic arthritis is the level of clinical suspicion of a physician experienced in the diagnosis and management (Mathews et al., 2008).

**The aim:** is screening for septic arthritis of the hip joint in cases of neonatal sepsis to know the prevalence and factors associated with septic arthritis.

## PATIENTS AND METHODS

This prospective case- control study was conducted in Benha University NICU on 80 septic neonates and 20 healthy control neonates who didn't suffer from previous sepsis .

**Inclusion Criteria:** Neonates with septic hip arthritis among cases of neonatal sepsis, full term babies, preterm >30weeks gestational age, admitted at Benha University NICU, risk factors such as ABG sample withdrawal from femoral artery, interventions of urinary tract and the diagnostic criteria of neonatal septic hip arthritis are based on history, clinical examination and investigations.

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**Exclusion Criteria:** Presence of any deformity in hip joint, congenital anomalies of pelvis and preterm babies < 30 weeks. All neonates in both groups were subjected to full history taking (according to special sheet), physical examination (general & local), hip ultrasound, erythrocyte sedimentation rate and C-reactive protein. Informed written consent was obtained from the parents of neonates participating in this study after informing them about the steps of study.

**Statistical analysis:** The collected data were tabulated and analyzed using SPSS version 16 soft ware (Spss Inc, Chicago, ILL Company). Categorical data were presented as number and percentages while quantitative data were expressed as mean  $\pm$  standard deviation, median and range. Chi square test ( $X^2$ ), or Fisher's exact test (FET), were used to analyze categorical variables. Relative risk (RR) and the corresponding 95% CI were calculated. Quantitative data were tested for

normality using Kolomogrov Smirnov test, using Student "t", or Man Whitney U test, if not normally distributed. The accepted level of significance in this work was stated at 0.05 (P <0.05 was considered significant).

## RESULTS

In our study, we screened 80 septic neonates and 20 normal neonates, 44 males (44%) and 56 females (56%) for septic arthritis of the hip joint in cases of neonatal sepsis in Benha University NICU using ultrasound and some laboratory investigations. In our study we screened 70 full term (70%) neonates and 30 preterm (30%) neonates. There were 49 neonates (49%) delivered by normal vaginal delivery and 51 neonates (51%) delivered by caesarian section (Table 1). Regarding risk factors like femoral ABG sampling and

**Table 1. Perinatal history and clinical data of the studied groups**

Variable	Septic neonates (n=80)		Controls (n=20)		$X^2$	P	
	No.	%	No.	%			
Age	Preterm	23	28.8	7	35.0	0.29	0.58 (NS)
	Fullterm	57	71.2	13	65.0		
Sex	Male	37	46.2	7	35.0	0.82	0.37 (NS)
	Female	43	53.8	13	65.0		
Mode of delivery	NVD	36	45.0	13	65.0	2.56	0.11 (NS)
	CS	44	55.0	7	35.0		
History of consanguinity	Negative	64	80.0	13	65.0	FET	0.23 (NS)
	Positive	16	20.0	7	35.0		
Weight (kg)	Mean $\pm$ SD	3.13 $\pm$ 0.72		3.05 $\pm$ 0.65		St. "t"= 0.48	0.63 (NS)
	Range	1.75-5		2.1-5			
Age of onset of sepsis (d)	Mean $\pm$ SD	2.8 $\pm$ 1.6		-----			
	Range	1-7		-----			
Age of discharge (d)	Mean $\pm$ SD	12.2 $\pm$ 4.7		-----			
	Range	4-30		-----			
Duration of sepsis (d)	Mean $\pm$ SD	6.5 $\pm$ 4.3		-----			
	Range	1-21		-----			

**Table 2. Comparing septic cases with and without arthritis of the hip regarding risk factors**

Variable	No septic arthritis (n=65)		Septic arthritis (n=15)		P	RR (95%CI)	
	No.	%	No.	%			
Similar conditions in the family	Negative	61	92.4	4	7.6	<0.001	9.4 (3.8-23.2)
	Positive	4	28.4	10	71.4		
Femoral ABG	Negative	61	98.4	1	1.6	<0.001	47.6 (6.8-333.3)
	Positive	4	22.2	14	77.8		
Interventions for UTI	Negative	65	100	0	00	<0.001	----- (HS)
	Positive	0	0	15	100		

**Table 3. Distribution of the studied cases according to signs of septic hip**

Variable	Number (N=80)	Percentage	
Hotness	Negative	63	78.8
	Positive	17	21.2
Redness	Negative	65	81.2
	Positive	15	18.8
Tenderness	Negative	63	78.8
	Positive	17	21.2
Immobility	Negative	64	80.0
	Positive	16	20.0

**Table 4. Distribution of the studied cases according to ultrasound findings**

Variable	Number (80)	Percentage	
Diagnosis	Normal	64	80.0
	Septic arthritis	8	10.0
	Tenosynovitis	7	8.75
	Developmental dysplasia of the hip joint(DDH)	1	1.25
Turbidity (n=15)	Not turbid	7	46.7
	Turbid	8	53.3
Effusion (n=15)	Minimal	7	46.7
	Severe	8	53.3

intervention of urinary tract, in our study, we found that distribution of cases with septic hip arthritis showed a highly significant correlation with the previous risk factors such as femoral ABG in 14 cases (17.5%), interventions for urinary tract in 15 cases (22.5%) and similar conditions in the family in 14 cases (17.5%) (Table 2). In our study, we found that distribution of the studied cases according to signs of septic hip were as follows: hotness was positive in 17 cases (21.2%) and negative in 63 cases (78.8%). Redness was positive in 15 cases (18.8%) and negative in 65 cases (81.2%). Tenderness was positive in 17 cases (21.2%) and negative in 63 cases (78.8%). Immobility was positive in 16 cases (20%) and negative in 64 cases (80%) (Table 3). In our study we found 16 cases with positive hip findings: 8 cases (10%) with septic arthritis, 7 cases (8.75%) with tenosynovitis and one case (1.25%) with DDH. We found severe effusion with turbidity in cases of septic arthritis (8 cases) and minimal effusion without turbidity in cases of tenosynovitis (7 cases) by ultrasound (Table 4). In our study CRP and ESR were not significantly elevated in septic neonates with septic hip arthritis.

## DISCUSSION

In our study, we screened 100 neonates; 44 males (44%) and 56 females (56%) for septic arthritis of the hip joint in cases of neonatal sepsis in Benha University NICU using ultrasound and some laboratory investigations. In this study we screened 70 full term (70%) neonates and 30 preterm (30%) neonates. There were 49 neonates (49%) delivered by normal vaginal delivery and 51 neonates (51%) delivered by caesarian section. Studies concerned with this type of postnatal screening for septic arthritis in septic neonates were using various methods and groups of patients and providing heterogenous informations. Our study was conducted on 80 cases and 20 controls. The results of our study revealed that the total incidence of septic arthritis in our screening of septic neonates admitted at NICU of Benha University hospitals was 15 cases (20%) out of 80. In a similar study (Nunn *et al.*, 2007), the incidence of septic arthritis was  $\frac{9}{40}$  (22.5%), which was higher than that of our study. In our study, there were 16 cases (20%) with positive hip findings and 64 cases (80%) with negative hip findings. There were 7 cases (8.75%) presented with septic arthritis, 8 cases (10%) presented with tenosynovitis and one case (1.25%) presented with DDH. In our study, we found that distribution of cases with septic hip arthritis showed a highly significant correlation with the previous risk factors such as femoral arterial blood gas sampling (14 cases (17.5%)), interventions for urinary tract (15 cases (22.5%)) and similar conditions in the family (14 cases (17.5%)). On general examination, we found that about 65 neonates without septic hip had fever range of 37-40°C and about 15 neonates with septic hip had fever range of 38-40°C. On local examination, we found that distribution of the studied cases according to signs of septic hip were as follows: hotness was positive in 17 cases (21.2%), redness was positive in 15 cases (18.8%), tenderness was positive in 17 cases (21.2%), immobility was positive in 16 cases (20%). In the study done by Kenneth and his Colleagues (2015), they found decreased range of motion in 100% of cases, tenderness in 100%, swelling in 71.4%, and erythema in 35.7%. Additional physical examination findings showed warmth of the affected joint in 21.4%, joint effusion in 7% and gross instability in one neonate with septic arthritis of the hip (7.1%). Mean temperature was 38.5°C (range 37.6°C to 39.3°C). In our

study, we found that 16 cases had positive hip findings: 8 cases (10%) with septic arthritis, 7 cases (8.75%) with tenosynovitis and one case (1.25%) with DDH. We found severe effusion in cases of septic arthritis (Kenneth T. Bono *et al.*, 2015), and minimal effusion in cases of tenosynovitis (Nunn *et al.*, 2007) by ultrasound. Also, there was turbidity in cases of septic arthritis while in cases of tenosynovitis there was no turbidity detected by ultrasound. These results come in agreement with the study done by Zamzam and Medhat (2006). Who found among 154 neonates with infected hip about 81 neonates with septic arthritis and 73 neonates with transient synovitis and they found in septic arthritis severe effusion with turbidity and minimal effusion without turbidity in transient synovitis. Also, Gordon *et al.* (2004) detected that septic hip arthritis was unlikely when ultrasound does not demonstrate hip effusion, but rare exceptions of septic hip arthritis in the absence of effusion had been reported when the child presented with symptoms within 24 hours. In our study there was no significant difference between cases of septic hip arthritis and cases of normal hip joint regarding C-reactive protein and ESR levels. While Kocher *et al.* (2004) set up a retrospective study in a tertiary children's hospital where they found four independent variables between septic arthritis and transient synovitis; fever  $\geq 38.5^\circ\text{C}$ , non-weight-bearing, ESR  $\geq 40\text{mm/h}$ , WBC  $>12 \times 10^9\text{cells/L}$ . If all four predictors were positive, they achieved a predicted probability of 99.6% of septic arthritis. Finally, in our study, we found that 16 cases (20%) had positive hip findings and 64 cases (80%) had negative hip findings by ultrasound examination. There were 8 cases (10%) presented with septic arthritis, 7 cases (8.75%) presented with tenosynovitis and only one case (1.25%) presented with developmental dysplasia of the hip joint.

## Conclusion

Our results revealed that 16 cases (20%) out of 80 septic neonates had positive hip findings by ultrasound examination as follows: 8 cases (10%) with septic arthritis (having severe effusion and turbidity), 7 cases (8.75%) with tenosynovitis (having minimal effusion without turbidity), and one case (1.25%) with developmental dysplasia of the hip joint. There was a highly significant correlation between positive hip findings and risk factors as femoral arterial blood gas sampling and urinary tract intervention in septic neonates.

## Recommendations

Postnatal ultrasound screening for all neonates who suffered from redness, hotness, tenderness or immobility in hip joint. We should reduce femoral arterial blood gas sampling and urinary tract intervention for fear of septic hip arthritis and tenosynovitis.

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