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Research Article

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Prevalence and Causes of Neonatal Sepsis in Soba University Hospital, Sudan

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Abstract

Objective: This study aimed to determine the isolated organisms and, the most common causes of neonatal sepsis; and to evaluate the susceptibility pattern of isolates to different antibiotics.

Methods: A total of 119 blood samples were collected and inoculated in brain heart infusion broth, then incubated up to 7days at 37°C. All isolates were identified based on culture charters, Gram stain, and standard biochemical test. Antimicrobial susceptibility tests were done according to CLSI guidelines 2011.

Results: Out of 119 blood samples investigated only 37.8% (45/119) were found to be positive for neonatal septicemia and all cases was early onset sepsis. The frequency of Gram-positive and Gram negative bacteria is 57.8% and 42.2% respectively. MRSA and *K. pneumoniae* are the most common isolated organisms. All Gram –ve isolates were resistant to ceftriaxone, cephalexin, and cotrimoxazol and sensitive to imipenem (100%). While most isolates were sensitive to Vancomycin, and resistant to Ciprofloxacin, Amoxyclav, Erythromycin, and Oxacillin.

Conclusion: Neonatal sepsis is a major health problem worldwide, and the emergence of MDR isolates can limit the therapeutic options. Proper antibiotic discretion and regular updating of antibiotics susceptibility through continuous surveillance is essential to maintain a good infection control program and it can play a key role in avoiding and limiting the extending of this problem.

Keywords

Neonatal sepsis; Antimicrobial; Gram -ve; Gram +ve; Sudan

Introduction

Neonatal septicemia (Neonatal sepsis) is defined as infection in the first 28 days of life documented by a positive blood culture [1]. It may be early onset neonatal septicemia which observed before 72 hours of age, or late onset Neonatal septicemia that observes after 72 hours of age, both were defined as illnesses appearing from birth to three days and from four to twenty eight days post natal, respectively. Despite the advances in health care, Neonatal sepsis, and especially that caused by gram negative rod bacteria, is a significant cause of morbidity and mortality among neonates. The most common cause of Neonatal septicemia were Staphylococcus (*S. aureus*), Enterococcus faecalis (*E. faecalis*), *Pseudomonas aeruginosa* (*P. Aeruginosa*), *Klebsiella pneumoniae* (*K. pneumoniae*), *Escherichia coli* (*E. coli*) and *listeria monocytogenes* (*L. monocytogenes*) [2]. Neonatal sepsis caused by Gram -ve microorganisms was responsible for 18%-78% of all Neonatal sepsis [3-7]. In the developing world *E. coli*, *K. pneumoniae, S. saureus,* and *P. aeruginosa* was the most common pathogens. Microorganisms implicated in neonatal septicemia have developed increased drug resistance to commonly used antibiotics and thus making treatment extremely difficult [8]. This study aimed to investigate the causes and prevalence of Neonatal septicemia in Soba University hospital; and the susceptibility of isolated bacteria to different antibiotics.

Materials and Methods

This a cross sectional hospital base study, conducted in Soba University hospital during the period of March to July, 2016 in which a total of 119 blood samples (3 ml of blood from neonate) were collected from neonate under aseptic condition. Each sample was cultured in blood culture bottle (Brain Heart Infusion broth) and incubated aerobically at 37°C up to 7 days [9]. Regular observation of bottle color, and turbidity, direct Gram stain, and subculture was done to detect the positive one. Regular subcultures were done after one day of incubation, then after 2 days and then 3 days later. Each sample subculture on blood agar, MacConkey agar, and Chocolate agar and incubated aerobically at 37°C for 24 h. No media change or negative subculture for up to 7 days, blood culture considered negative. Identification was done base on colonial morphology, Gram stain, and standard biochemical test (10). Antimicrobial susceptibility test was done according to CLSI guidelines 2011 [10]. The applied antibiotics for Gram+ve cocci include tetracycline, erythromycin, clindamycin, co.trimexazon, vancomycin, and oxycillin to check MRSA [11] and for Gram negative rod includes Ampicillin+Am oxyclav+Gentamycin, Cephalexin, Cefitazidime, Ciprofloxacin, Cefuroxime, Ceftriaxone, and Imipenem [10]. *E. coli* ATCC 25922 was used as Control strain. Data were analyzed by statistical package for social sciences (SPSS) software version 21. Chi square test were done. *P* value ≤ 0.05 were considered significant in comparative data.

Results

Out Of 119 blood samples investigated only 37.8% (45/119) were found to be positive for neonatal septicemia and all cases was early onset sepsis. The frequency of Gram+ve and Gram negative bacteria were (57.8%) and (42.2%), respectively. MRSA and *K.pneumoniae* were the most common isolated organisms (Table 1).

Discussion

Septicemia is a big problem in the entire world; so many studies

Table 1: Frequency of isolated organisms.

Organism	Frequency
MRSA	40% (18/45)
S. aureus	11.1% (5/45)
E. fecalis	6.7% (3/45)
K. pneumoniae	24.4% (11/45)
E. coli	4.4% (2/45)
P. aeruginosa	13.3% (6/45)
Total	45

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were done for effectual management of septicemia (Table 2) In this study, the culture-positivity for aerobic organism is 37.8% (45/119) which similar to results of Jyothi et al. (Karnataka), Mohammadi et al. (Iran) and Mahda et al. (Tanzania) studies [11-13] and it is lower than the result of Zakaria et al. (india) study [14]. Neonatal sepsis pathogens differ from one to other countries, in this study the frequency of Gram positive is more than Gram-ve, and the most common isolates was *S. saureus* followed by *K. pneumoniae*. These results similar to other Lamba et al. (North India), Shrestha et al. (Nepal), and Mohammed et al. (Iran) studies [12,15,16]. It differs from results of Nikkhoo et al. (Kurdistan), Patel et al. (India), and Monjur et al. (Bangladesh) studies which reported the frequency of Gram-ve is more than Gram+ve (18.19,20). In this study, Gram-ve and Gram Gram+ve septicemia was encountered in 42.2% and 57.8% respectively, of culture positive cases, all cases were early onset sepsis, which were similar to results of Lamba et al. (North India), Reyes et al. and Jyothi et al. (karantaka), and kangozhinova et al. (Astana) studies [11,15,17-19]. Treatment of neonatal septicemia can be minimized by identification of etiological agents and their antibiotic sensitivity patterns. Antibiotic resistance to day is a global problem, and multi drugs resistant bacteria causes neonatal sepsis were increased, as the miss-uses of broad spectrum antibiotics may explain this appearance [20]. The epidemiology of neonatal sepsis is variable, because that, it's difficult to compare antibiotic resistance between countries [21,22]. In this study, the maximum sensitivity of Gram-ve to imipenem (100%) and amikacin (89.5%) as in [17,11,13], in contrast to Eman et al. [22] in Egypt and more resistant to Cefitazidime, cephalexin, ceftriaxone and ampicillin like Nikkhoo et al. (Kurdistan) study [23]. Among Gram+ve, the maximum sensitivity is (92.3%) to vancomycin similar to Lamba et al. [15]; and more resistant to Oxacillin as in Mohammedi et al. [12] and Mahda et al. [13]; followed by erythromycin as in study of Jyothi et al. [11]. Due to the variation of antimicrobial activity against isolates, and developing of highly resistant to antibiotics among species, treatment must be depend on the result of culture and susceptibility test. It is evident from this study that Gram-ve organisms (*Klebsiella*, *Pseudomonas*, and *E. coli*), MRSA, *S. saureus* and *E. faecalis* were the leading cause of neonatal sepsis in Soba University hospital, and most of them are resistant to multiple antibiotics (Table 3). Neonatal sepsis is a major health problem worldwide and the emergence of MDR isolates can limit the therapeutic options. Proper antibiotic discretion and regular updating of antibiotics susceptibility through continuous surveillance is essential to maintain a good infection control program and it can play a key role in avoiding and limiting the extending of this problem.

Table 2: Susceptibility of Gram-ve Isolates to Antibiotics.

Antibiotic	Frequency		*P*-value
	Sensitive/N (%)	Resistant/N (%)	
Amikacin	17 (89.5%)	2 (10.5%)	0.000
Imipenam	19 (100%)	0 (0%)	
Ciprofloxacin	3 (15.8%)	16 (84.2%)	
ceftazidime	2 (10.5%)	17 (89.5%)	
Amoxiclav	3 (15.8%)	16 (84.2%)	
Ceftriaxone	0 (0%)	19 (100%)	
Cephalexin	0 (0%)	19 (100%)	
cefuroxime	2 (10.5%)	17 (89.5%)	
Gentamycin	2 (10.5%)	17 (89.5%)	
Co.trimoxazole	0 (0%)	19 (100%)	

All Gram negative isolates were resistance to ceftriaxone, cephalexin, and cotrimoxazol. While all were sensitive to imipenem (100%). The susceptibility of Gram negative isolates to antibiotics showed significant difference, *P* vaule < 0.05.

Table 3: Susceptibility of Gram positive isolates to Antibiotics.

Antibiotic	Frequency		*P* value
	Sensitive/N (%)	Resistant/N (%)	
Clindamycin	14 (53.8%)	12 (46.2%)	0.000
Vancomycin	24 (92.3%)	2 (7.7%)	
Co-trimoxazole	13 (50%)	13 (15%)	
Gentamycin	13 (50%)	13 (50%)	
Erythromycin	3 (11.5%)	23 (88.5%)	
Oxacillin	4 (15.4%)	22 (84.6%)	
Amoxyclav	3 (11.5%)	23 (88.5%)	
Ciprofloxacin	1 (3.8%)	25 (96.2%)	

Most isolates were sensitive to Vancomycin, and resistance to (Ciprofloxacin, Amoxyclav, Erythromycin, and Oxacillin). The susceptibility of Gram positive isolates to antibiotics showed significant difference, *P* vaule < 0.05.

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