Bactermia and Septicemia in the ChildrenUnder three years at Al-Nasseria Province.

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الخلاصة

اجريت هذه الدراسة في مستشفى الحبوبي للولادة والاطفال في مدينة الناصرية. اذ تم زرع الدم لاربع وخمسين طفلا (العمر الزمني لغاية ثلاث سنوات)كانوا يعانون من تاريخ لحالات مرضية،الحمى،واخماج تم عزل ثلاث واربعون عزلة بكتيرية من اربعون طفلا (22 ذكور و18 أناث)يعانون من اخماج الدم البكتيرية الموجبة لصبغة رام كانت السائده (60.46%) للمكورات السبحية الرئوية (18.60%)،المكورات المعلقودية الذهبية (16.22%)والمكورات السبحية لانزيم التخثر(9.30%)اضافة الى العزلات السالبة لصبغةرام مثل اشيريشيا القولون (4.65%)والزائفة والهيمفيلس انفلونزا(4.65%) والتي اظهرت نتائج الدراسة للحساسالدوائية ان العقارات سفترياكسون وسيفوتاكسيم وكمنتين، اموكسيلين و الامبيكلوكس هم الاكثر تاثيرا بالبكتريا الموجبة لصبغة كرام وكذلك الجنتاميسين والمثبريم هم المضادات الاكثر تاثيرا تجاه البكتريا السالبة لصبغة رام.

Abstract

This study was carried out in Al-Habobi Hospital for Children and Maternity in Al-Nasseria city. Fifty-four blood cultures were obtained from 54 children (age from 7 days to three years) with history of febrile, focal infection and history of illness. Forty-three isolates were isolated from forty patients (22 males and 18 females) with blood steam infections. Gram positive microorganisms were predominate (60.46%)such as *Streptococcus pneumoniae* (18.60%),*Enterococcus faecalis, Staphylococcus aureus* (16.22%),Coaglase negative Staphylococci (9.30%), and Gram negative bacteria, *Escherichia coli* (16.22%), *Pseudomonas* spp. ,*Hemophilus influenza* (4.65%) respectively. Results of antimicrobial sensitivity which showed that Ceftriaxon, Cefotaxime, Augmentin, Amoxicillin and Ampiclox were the high effective against Gram positive bacteria, and the Gentamycin, Amikacin and Trimotheprim the most suitable antimicrobial against Gram negative bacteria.

Introduction

Bloodstream infection is an important cause of serious morbidity and mortality. Approximately 200,000 patients are diagnosed with bloodstream infections annually in the United States [1] .The term bacteremia refers to the presence of a positive blood culture without reference to specific clinical symptomatology, bacteremia may resolve spontaneously, progress to septicemia with clinical signs of abnormal perfusion parameters and altered mental status, or associated with focal serious bacterial infections, the risk of bacteremia decrease with age, with the greatest incidence in the first 3 months of life[2].

Septicemia was defined as isolation of microbial species from the blood of a patient who had shown clinical signs of sepsis such as clinical deterioration, fever, unstable hemodynamic parameters or coagulopathy [3]. The diverse microbial etiology of septicemia has always caused concern for effective management of patients, despite advancement in diagnostic facilities and antibiotics, chemotherapy, mortality from septicemia has not significantly reduced compared with that of the pre-antibiotic era[4] .

The outcome of septicemia is influenced by various factors, such as underlying condition and patients age, the microorganisms involved and its source as well as choice of antibiotic therapy, while in developed countries septicemia is mainly hospital acquired reports, indicate widespread community acquired pathogens [5] .

First described in the 1960s in febrile children with unsuspected pneumococcal infection, fever is common in pediatric patients, much of the pathophysiology of occult septicemia is not fully understood, the presumed mechanism begins with bacterial colonization of respiratory passage, bacteria may egress into the bloodstream of some children because of host and organism specific factors, once viable bacteria have gained access to the bloodstream, they may be cleared spontaneously, they may establish a focal infection, or the infection may progress to septicemia include shock, intravascular coagulation, multiple organ failure, and death [6] .

The aims of this study to define the pattern of septicemia in relationship with susceptibility of the implicated microbes to various antimicrobial agents, and evaluated in relation to the patient's age, sex, underlying condition.

Patients and Methods

This study was carried out in Al-Habobi Hospital for Child and Maternity Al-Nasseria city at period from January 2006 to June 2007 (18 months). A total of 54 blood cultures were performed .These samples were analyzed and records of 40 patients with diagnosed septicemia, during the above period. Ten ml of blood were collected from 40 (22 males and 18 females) patients with clinical signs of infections treated at this hospital.

All blood samples for culture were taken from patients with diagnosed bacteremia by other clinical future and investigations as fever,(hyperthermia), dyspneia, focal infection, leucocytosis, chest X-ray . Positive blood cultures were examined by smears prepared from them, stained by Gram stain and examined microscopically. Subcultures were then made onto MacConky agar ; Chocolate agar and two Blood agar plates, the first incubated anaerobically in gas pack jars, and the second was incubated aerobically with the MacConkey and Chocolate plates in 5-10% CO_2, all plates were incubated at 37Ċ overnight, except the anaerobic plates were kept for 48 hours. A sample was determined negative, if after 10 days no microbial growth becomes apparent. The pathogenic bacteria were identified by culture characteristic, Gram stain and biochemical reactions, on the other hand API 20 E, EPI-Staph., EPI-Strep. Systems (Bio-Mérieux, France) were used to confirm the identification of microorganisms in this study [7].

Bacterial isolates were tested for susceptibility to various antimicrobial agents by disc diffusion on Muller-Hinton agar [8].

Statistical analysis was done by ANOVA and t- tests for P value more than 0.05 considered statistically significant**.**

Results

During of this study, 54 blood cultures were collected from 54 children patients (age 7 days to 3 years old) with serious infections. Out of these cases 40 (74.07%) were found positive and 14 (25.92%) revealed negative or no growth.

And remaining 3 (6.97%) episodes were caused by multiple bacteria (polymicrobial). Twenty two (55.00%) of patients were males and 18 (45.00%) females.Twenty six (60.46%) bacterial isolates were Gram positive, seventeen (39.64%) were Gram negative, The most common isolates among the Gram positive organisms were *Streptococcus pneumoniae* (18.60%), *Enterococcus faecalis, S. aureus* (16.27%) respectively, there are no significant differences between them P≤0.05 (table 1).

Table 1: The number and percentage of isolates distribution on patients age group.

Microorganism	Age groups (years)							
	>1		1-2		2-3		Total	
	No.	%	No.	%	No.	%	No.	%
S.pneumoniae	4	9.30	2	4.65	2	4.65	8	18.60
Enterococcus faecalis	4	9.30	2	4.65	1	2.32	7	16.27
S. aureus	2	4.65	2	4.65	3	6.97	7	16.27
E.coli	3	6.97	2	4.65	2	4.65	7	16.27
CNS*	3	6.97	1	2.32	0	0.00	4	9.30
Klebsiella spp.	0	0.00	2	4.65	1	2.32	3	6.97
Enterobacter spp.	0	0.00	1	2.32	1	2.32	2	4.65
Pseudomonas spp.	1	2.32	0	0.00	1	2.32	2	4.65
Hemophilus influenz	0	0.00	1	2.32	1	2.32	2	4.65
Salmonella spp.	1	2.32	0	0.00	0	0.00	1	2.32
Total	18	41.86	13	30.23	12	27.90	43	100

***CNS: Coagulase negative Staphylococci; f=0.75; fC=3.35; P≤ 0.05**

Table 2 shown the prevalence of septicemia with number and percentage of patients who died, the total mortality was seven

(16.27%) of patients with septicemia. The percentage of mortality in each age group was shown 22.22% in age group > 1 year, there are significant differences between them (table 3).

Table 2: The prevalence of septicemia with reference to microorganisms isolates from blood

			Pat. who died	
Microorganism	**No.**	**%**	**No.**	**%**
S.pneumoniae	**8**	**18.60**	**2**	**25.00**
Enterococcus faecalis	**7**	**16.27**	**2**	**28.57**
S. aureus	**7**	**16.27**	**1**	**14.28**
E.coli	**7**	**16.27**	**1**	**14.28**
CNS*	**4**	**4.65**	**1**	**25.00**
***Klebsiella* spp.**	**3**	**9.30**	**0**	**0.00**
***Enterobacter* spp.**	**2**	**6.97**	**0**	**0.00**
***Pseudomonas* spp.**	**2**	**4.65**	**0**	**0.00**
Hemophilus influenza	**2**	**4.65**	**0**	**0.00**
***Salmonella* spp.**	**1**	**2.32**	**0**	**0.00**
Total	**43**	**100**	**7**	**16.27**

*CNS: Coagulase negative Staphylococci; t=5.8; t_c=1.8; P≤ 0.05

Table 3: The outcome of septicemia by age groups

Pat.

	Age groups (years)		
Age groups	**<1**	**1-2**	**2-3**
No. of microorganisms	**18**	**13**	**12**
No. of pat. who died	**4**	**2**	**1**
Percent of pat. who died	**22.22**	**15.38**	**8.33**

=patient; f=34.1; fc=7.71; P≤ 0.05

Table 4 illustrated the septicemia relationship with undergoing conditions, such as diabetes mellitus, urinary tract infections, omphalitis (umbilical infection), liver diseases, upper

respiratory infection, surgery and meningitis. On the other hand, the susceptibility pattern for ten types of antimicrobial agents, there are significant differences between them (table 5).

Table 4: The septicemia relation with underling conditions

	Underling conditions (No.)							
Microorganisms	**DM***	**UTI**	**UI**	**LD**	**URI**	**SG**	**MG**	**Total**
S.pneumoniae	**0**	**1**	**1**	**1**	**3**	**1**	**1**	**8**
Enterococcus faecalis	**1**	**0**	**2**	**0**	**2**	**1**	**1**	**7**
S. aureus	**2**	**0**	**2**	**1**	**0**	**2**	**0**	**7**
E.coli	**2**	**3**	**0**	**1**	**0**	**1**	**0**	**7**
CNS	**0**	**2**	**1**	**0**	**0**	**1**	**0**	**4**
***Klebsiella* spp.**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**3**
***Enterobacter* spp.**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**2**
***Pseudomonas* spp.**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**2**
Hemophilus influenza	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**2**
***Salmonella* spp.**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**
Total	**6**	**7**	**8**	**4**	**7**	**7**	**4**	**43**

*DM: Diabetes mellitus, UTI: Urinary tract infection,
UI: Umbilical infection, LD: Liver disease,
URI: Upper respiratory infection, SG: Surgery, MG: Meningitis,
CNS: Coaglase negative Staphylococci
$F=27.83$; $f_c=1.98$; $P \leq 0.05$

Table 5: The susceptibility (percentage) of isolates against antibiotics.

Isolates	AMP*	AK	AUG	AML	ER	CFR	RD	STX	GM	CEF
S.pneumoniae	75	40	92	70	60	90	55	55	60	75
Enterococcus faecalis	65	50	80	65	45	85	55	40	60	90
S. aureus	60	40	65	60	30	60	50	50	55	90
E.coli	65	75	65	55	50	70	60	65	80	70
CNS	80	82	80	70	55	80	60	50	55	75
Klebsiella spp.	55	75	50	55	40	85	65	70	80	75
Enterobacter spp.	55	70	70	45	35	75	65	65	80	75
Pseudomonas spp.	45	65	70	45	55	70	60	60	60	70
Hemophilus influenza	60	35	65	60	55	75	55	45	45	70
Salmonella spp.	40	35	65	65	35	85	55	65	40	85

*AMP: Ampicillin; AUG: Augmentin; AK: Amikacin; AML: Amoxicillin; ER: Erythromycin
CFR: Ceftriaxone; RD: Rifampcin; STX: Trimethoprime; GM: Gentamycin; CEF: Cefotaxim.
$F=7.50$; $f_c=1.98$; $P\leq 0.05$

Discussion

Septicemia occurs in children with focal infections or in children who have clinical evidence other than fever of a systemic response to infection. Children with sepsis have an increase heart rate or respiratory rate and may have a change in temperature, hypotension, and hypoperfusion and or organ dysfunction [9].

From the results, the *S.pneumoniae, Enterococcus faecalis, S. aureus,* and *E. coli* were the most isolates from blood cultures, this is agree generally with previous studies such as Mellis [2] Al-Thani [3] and Berkley *et al.*[9], who found these

microorganisms and coaglase negative Staphylococci the predominate pathogens caused blood steam infections.Septicemia due to the Gram positive bacteria predominate (60.46%) over that caused by Gram negative bacteria (39.53%), a finding that confirm with reports from other workers [10,11], which refers to the increase the Gram positive septicemia is related to the indiscriminate use of the Cephalosporin, practically third generation, which probably led to the selection of Enterococci and Methicillin- resistant Staphylococci .Most of these isolates were caused by a single microorganism (93.13%) and only 6.97% of cases were caused by polymicrobial, many workers have reported blood steam infections by several microorganisms with incidence ranging from 10-18% [12,13,14].Seven patients (16.27%) were died from sepsis children, and the mortality was increased in the first age group (22.22%) (Table 2,3),these finding were comparable to the other studies made by [9,15], who referred to the infants between the ages of birth and three years are at relatively increased risks for septicemia due to the immaturity of the reticulo-endothelial system ,and the risk of septicemia decrease with age ,the greatest incidence in the first 3 months of life [2]. The septicemia among children with underlying diseases such as diabetes mellitus, omphalitis (umbilical infection), urinary tract infections, surgery, meningitis and liver diseases were associated with sepsis , that is, the complications of these diseases caused low immunity and blood steam infection will occurred [3].On the other hand, it appears from the results, the Cefotaxime, Ceftriaxon (third generation of Cephalosporins) Augmentin, Amoxicillin, and Ampiclox were the most suitable antimicrobial agents (high sensitive) for the treatment of serious Gram positive pathogens (table 5), and Gentamycin, Amikacin, Trimethoprim, and Rifampicin were the effective against the Gram negative isolates. This is in agreement with other studies [2, 10, 16, 17], who found the susceptibility of isolates to antimicrobial agents. In developed countries 10-20% of all neonates are treated for suspected sepsis but serios sepsis occurs in 1-10/1000 live birth, previously sensitive organisms are

rapidly become resistant to commonly used antimicrobial due to the indiscriminate use thus making the treatment difficult and costly [18,19,20].

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