

Bacterial profile and antibiogram of bacteremic Children in Karbala city ,Iraq

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Keywords:Children bacteremia, Bacterial profile,Antibiogram.

Received (March) , Accepted (June).

Abstract

A prospective study was carried out on 250 cases of bacteremia in pediatric age groups with fever and suspected bacteremia in children seen and admitted the Pediatric Teaching Hospital in Kerbala. This study was started from May 2014 to March 2015. Clinical and microbiological data were obtained from patient medical records. After culturing, the blood samples resulted were 103(41%) positive cultures ,consisting of 45(43.86 %) Gram-positive bacterial isolates and 58 (56.14%) Gram-negative isolates, represented by *Staphylococcus aureus* (19.4%), *alpha hemolytic Streptococcus* (17.5%), *E.coli* (14.6%), *Klebsiella pneumonia* (9.71 %), *Enterobacter cloaca* (6.8 %), *Enterococcus fecalis* (5.83 %), *Non hemolytic streptococcus* (4.85 %), *Proteus mirabilis* and *Acinitobacter buamani* (3.88 %), *Pseudomonas aeruginosa* (2.91 %), *Citrobacter* (1.94 %), *B-hemolytic Streptococcus*, *Streptococcus pneumonia* , *Kluyvera spp* , *Ewingella americana* , *Haemophilus influenza*, *Raoulktella ornitholyticus* , *Providencia rettgeri* , *Serratia rabidaen* and *Pseudomonas luteola* was (0.97). The major infection of Bacteremia was most common in neonates(0-1 month)(63. 1%), more frequently seen in infant (1 month-2 years) (26%) less than in children 9% and in adolescent . All bacterial strains isolated from patients were submitted to sensitivity testing, results showed various reactions toward different types of antibiotics used in this study.

أنماط البكتيريا وحساسيتها للمضادات الحيوية للأطفال المصابين بتجرثم الدم

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الكلمات المفتاحية: تجرثم الاطفال, انماط البكتيريا, حساسية المضادات الحيوية

الخلاصة

اجريت هذه الدراسة على 250 حالة تجرثم دموي لفئات عمرية مختلفة مصابين بالحمى, يحتمل تجرثم في الاطفال شوهدت و ادخلت الى مستشفى الاطفال التعليمي في كربلاء. هذه الدراسة بدأت من اذار 2014 حتى نيسان 2015.البيانات السريرية والمجهرية استحصلت من التسجيلات الطبية للمرضى. بعد زراعته عينات الدم اظهرت النتائج ان 103 عينة (41%) كانت نتائج ايجابية متكونه من 45 بنسبه (43.86%) بكتريا موجبه لصبغه غرام و 58 بنسبه (56.14%) عزلات سالبه. ممثله ب *Staphylococcus aureus* بنسبه (19.4%) ايضا *alpha hemolytic Streptococcus* بنسبه (17.5%), *E.coli*, (14.6%), *Klebsiella pneumonia* , (9.71%) *Enterobacter cloaca*, (6.8%) *Enterococcus fecalis*, (5.83%) *Non hemolytic* , (4.85%) *Proteus mirabilis* and *Acinitobacter buamani*, (3.88%) *Pseudomonas* , (2.91%) *Citrobacter* , (1.94%) *B-hemolytic Streptococcus*, *Streptococcus pneumonia* , *Kluyvera spp* , *Ewingella americana* , *Haemophilus influenza*, *Raoulktella ornitholyticus* , *Providencia rettgeri* , *Serratia rabidaen* and *Pseudomonas luteola* was (0.97). The major infection of Bacteremia was most common in neonates(0-1 month)(63. 1%), more frequently seen in infant (1 month-2 years) (26%) less than in children 9% and in adolescent . All bacterial strains isolated from patients were submitted to sensitivity testing, results showed various reactions toward different types of antibiotics used in this study.

B-hemolytic streptococcus ,(1.94%) *Citrobacter* ,(2.91%) *aeruginosa* *Streptococcus pneumonia* , *Kluyvera* , *Ewingella americana* , *Haemophilus influenzae* , *Raoultella ornitholyticus* , *Providencia rettgeri* , *Serratia rabidaen* and *Psudomonas luteola* ,(0,97%). بينت الاصابات بتجرثم الدم الاكثر شيوعا في الاطفال حديثي الولادة من (0-1 شهر) (63.1%) واكثر تواترا في الرضع من (1 شهر -2 سنة) (26%) ثم اقل مما كانت عليه في الاطفال (9%) واقل في سن المراهقة. كل أنواع العترات البكتيرية المعزولة من المرضى قدمت لاختبار الحساسية ، وأظهرت النتائج ردود فعل متباينة تجاه أنواع مختلفة من المضادات الحيوية المستخدمة في هذه الدراسة.

Introduction

Bacteremia signifies the presence of bacteria in the blood stream⁽¹⁾ . Bacteremia may be continuous or transient. In circulating blood microorganisms are present , whether continuously, transiently, or intermittently, are a threat to every organ in the body. They can have real consequences like shock, multiple organ failure, disseminated intravascular coagulation, etc. thence, the blood stream infections represent one of the most serious situations and, as a result, well timed detection and identification of blood stream pathogen is important⁽²⁾ . Bacteremia has been reported increasingly in pediatrics age group. There are no dependable data on the incidence or prevalence of invasive bacterial infection introversion pediatrics age group. The bacterial isolation from blood cultures is usually significant of serious invasive infection that's require immediate antibiotic treatment⁽¹⁾. Bacteremia is a pathological condition with a high mortality rate that varies between 30 and 70 per cent and depended on several risk factors^(3,4) .

The majority of bacteremia cases are caused by a number of pathogens including *Staphylococcus spp* , *Streptococcus spp* , *Escherichia coli* and *Klebsiella pneumonia*⁽⁵⁾ .

Neonates are particularly susceptible to infections because of their weak immune barriers. Several risk factors have been identified both in the neonates and children which makes them susceptible to infections⁽⁶⁾ . Children with bacteremia present with fever, difficulty in breathing, tachycardia, refusal of feeds ,malaise, or lethargy⁽⁷⁾ . In such a potentially life-threatening condition, isolation of the causative pathogen in blood culture is decisive for proper antimicrobial treatment. Different organisms have different antimicrobial susceptibilities and successful treatment is dependent on the motivate administration of the correct drug^(8,9) This may improve the prognosis of the patients with bacteremia . The delay, however, may mean inessential treatment or the use of ineffective therapy given to antibiotic resistant organisms. There is a wide variation in the incidence and clinical characteristics of invasive infections caused by different species of bacteria. Identifying the causative species

and characterizing the clinical significance in a specific age group in a community is essential for the prevention and treatment of these infections. The successful recovery of microorganism from blood by possible types of bacteremia depends upon blood volumes ,specimen collection methods, the number and timing of blood cultures. There is a wide variation in the incidence and clinical characteristics of invasive infections caused by different species of bacteria. Bacteremia continues to be a serious problem that inevitably immediate observance and treatment, the aim of this study was to determine the types of bacteria from blood stream that cause bacteremia in pediatrics age group and antibiotic sensitivity to the commonly used antibiotics.

MATERIAL AND METHODS

In this study, 250 blood samples were collected from different age groups male 53 (51%) female 50 (49%) (aged from 1day to 16 years) admitted the pediatric teaching Hospital in Karbala- Iraq during a period of one year (May 2014 to July 2015). The patients included all newborn babies and different age groups suffered with fever and suspected of having sepsis. The cases were categorized into 4 clinical groups: Group I [0-1 month–neonates], Group II [1 month-2 years old infant], Group III [2years-12 years old] and Group IV [12 to 16years] (Table 1). Blood specimens were collected from bacteremia patients and inoculated in a biphasic blood culture bottle (BioMerieux, France). Bottles were incubated at 37°C for 48h and continuously monitored for turbidity of bacterial growth. An aliquot of the positive blood culture was aseptically taken by a syringe for Gram stain testing and sub cultured on enriched and selective media like blood agar ,Nutrient agar and Mac Conkey agar for wide variety of pathogens. The organisms were grown on agar plates of blood specimens were identified by standard laboratory methods including bio typing and API 20E (Bio Merieux, France). The obtained growth was identified by conventional biochemical tests and the antibiotic sensitivity testing was performed on Mueller–Hinton agar plates by Kirby– Bauer disc diffusion method. Zone diameter was measured and interpreted per the Clinical and Laboratory Standards Institute(CLSI) guidelines ⁽¹⁰⁾ .The antibiotic sensitivity of the isolates was tested .

Results

A total of 103 blood samples of which 53(51.45%) were from males and 50(48.54%) from females were exposed to culture. Bacteremia was more common in the age group of [0-1 month–neonates] (63. 1%) the mean of neonate patients was $0.228 \pm$, more frequently seen in [1 month-2 year old infant] (26%) the mean of infant patents was ± 4.019 ,then less than in children 9% the mean of children patient was $60.822 \pm$ and less in adolescent age group 2% the mean of the adolescent age gropes patients was $168.221 \pm$ (table 1).

Table(1): Distribution of Bacteremia patients according to age groups

Age Groups	No.		Total	%100	Mean±SD (Months)
	Male	Female			
Neonates	33	32	65	63	0.228±0.179
Infant	12	15	27	26	4.019±3.956
Children	6	3	9	9	60.822±36.888
Adolescent	2	0	2	2	168.221±002
Total			103		

All103 samples were culture positive and all of them showed monobacterial growth .None of the blood samples yielded polymicrobial growth. Gram-negative bacteria were predominant (56.31 %), while Gram-positive accounted for(43.68%) Table 2

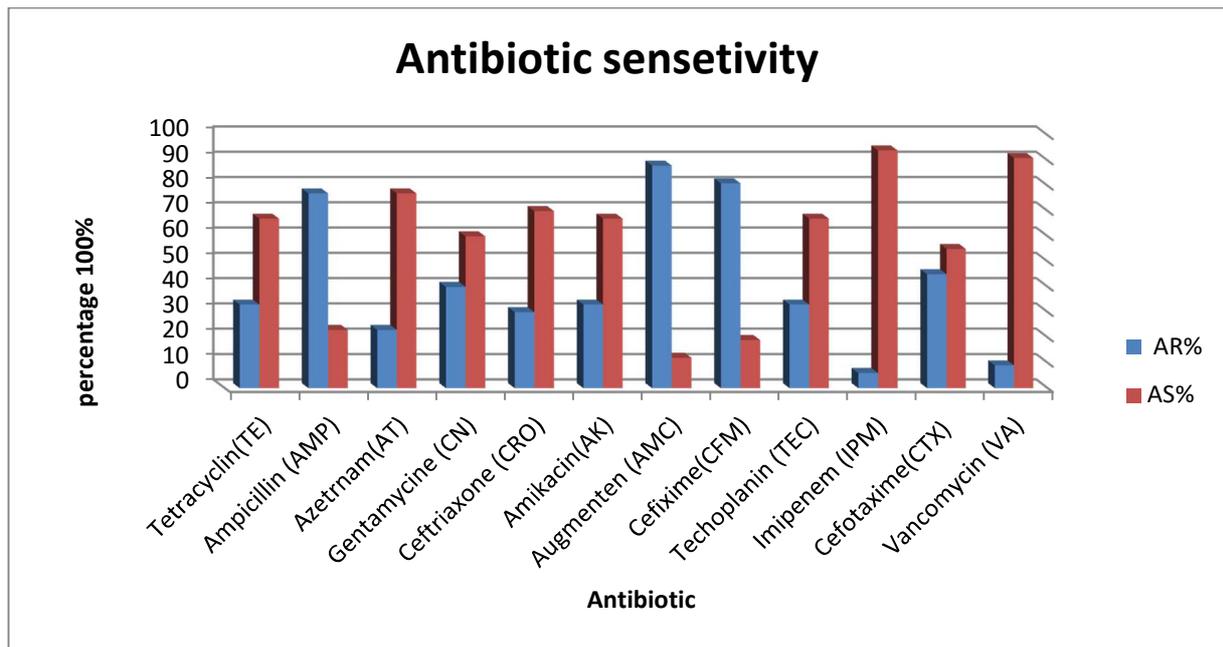
Table(2)Distribution of gram negative and gram positive isolates of cultured blood samples

Organism	Number	Percentage
Gram negative	58	56.14
Gram positive	45	43.86
Total	103	100%

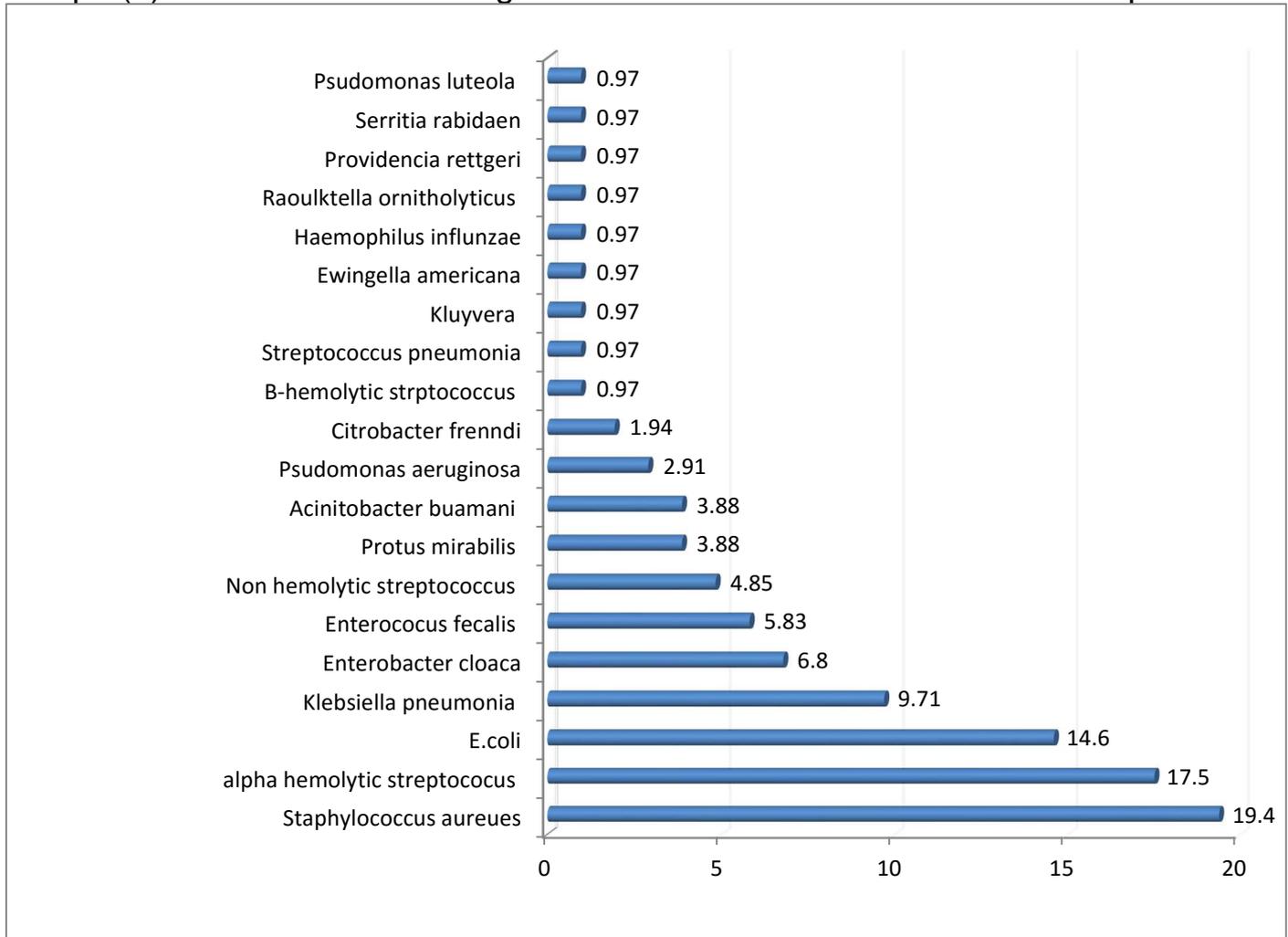
The most common cause of bacteremia in these patients was coagulase positive *Staphylococcus aureus* (19.4%), *alpha hemolytic Streptococcus* (17.5%) ,*E.coli* (14.6%), *Klebsiella pneumonia* (9.71 %), *Enterobacter cloaca* (6.8 %), *Enterococcus faecalis* (5.83 %), Non hemolytic *Streptococcus* (4.85 %), *Proteus mirabilis* and *Acinitobacter buamani* (3.88 %), *Pseudomonas aeruginosa* (2.91 %), *Citrobacter* spp (1.94 %), *B-hemolytic streptococcus* spp , *Streptococcus pneumonia* , *Kluyvera* spp , *Ewingella americana* , *Haemophilus influenzae* , *Raoulktella ornitholyticus* , *Providencia rettgeri* , *Serritia rabidaen* and *Pseudomonas luteola* (0.97) (Table3) . All

bacterial isolates were submitted for antibiotic sensitivity test to recognize their response to various types of antibiotics; results were shown in table (4) according to this result we see the most effective antibiotic that works effectively was imipenem, the percentage of sensitivity was (94%) (graph4)

Graph (4) Percentage of antibiotic sensitivity & resistance against all of bacterial isolates



Graph (3) Distribution of Microorganisms isolated from cultured blood samples



Discussion

In progress study redefines the risks associated with unrevealed bacteremia by documenting the current low prevalence of bacteremia, the changing epidemiology of causative organisms, the capacity of continuously monitored blood cultures to determine bacteremia swiftly, and the very low incidence of severe reluctant outcomes in children. The varying microbiological pattern of bacteremia in children assurance the need for an ongoing check of the causative organisms and their antimicrobial susceptibility pattern ⁽¹³⁾. In the current study, Bacteremia was more common in age group of [0-1 month–neonates] (63. 1%) which was in contrast to studies done by Tsering *et al* and Meremkwer *et al.*, who reported that bacteremia was most frequently encountered in age group of 5-10 years.,⁽¹²⁾ ⁽⁴⁾. In our study out of the 250 clinically suspected cases of bacteremia, 103 samples were positive

culture with a blood culture positivity rate of 41%. Similar positivity rates were reported by other studies ^(11,12) . Higher positivity rates of (43.78%) have been observed by Prabhu *et al.*, ⁽¹³⁾. The highest infectious causative agent mostly isolated from samples was *Staphylococcus aureus* (19.4)% consequently, this may be due to this microorganism is widely dissemination on the skin so it might be transmitted by contamination of the needle pending sampling or can invade the blood stream throughout wound infection or burns or other infections in the skin. Other type of causative agents including other species were found in blood stream may be due to other type of infections in the body such as respiratory tract infection or gastroenteritis even so the causative microorganism can invade the blood stream from these organs and cause bacteremia .Ratio of Gram negative bacteremia cases were more than Gram positive bacteremia cases. In children, the microorganisms causing bacteremia are similar to those in adults, but there are several important differences. In general, non-immunosuppressed bacteremic children have an increased likelihood of being infected by Staphylococci, α -hemolytic Streptococci and less than in other type of gram positive like Streptococcus pneumonia and beta hemolytic Streptococcus spp , and gram negative rod bacteremia is less likely except in neonates ⁽¹⁴⁾. The increased repetition and changing etiology of bacteremia may be a result of varying patient society ⁽¹⁵⁾ .

The age group which is frequently exposed to infection with Staphylococcus aureus & E.coli was 1day –1year (64.89%), this result seems to be acceptable because of not well developed immunological status of children at this age since their defense mechanism is still uncompleted and unable to protect body organs against microorganism and low birth weight, neonatal jaundice and respiratory distress which were less frequently seen in infant and children ⁽¹³⁾. The lowest infections rate was among the age group 2 to 12 years(9%) and 12 to < 16 years(2%) this result seems to be logic since the stronger than new born babies besides the vaccination program is almost completed in this age gives a further support to the immune system to protect the body against various infections. All bacterial isolates were submitted to sensitivity test to recognize their respond to various types of antibiotics. According to the antibiotic sensitivity test the result displaced that imipenem was the most effective antibiotic used to treat all these

causative agent and less effective Ampicillin was less sensitive to many type of bacteria on and bacteria was more resist to Augmentin due to miss use or over-use of this antibiotic that make bacteria was highly resist to Augmentin ;results are shown in the graph (4)

Conclusion

The commonest Gram positive bacterial isolate was *Staphylococcus aureus*, it was the predominate causative agent of bacteremia in children and Gram negative bacterial isolate was *Escherichia coli* especially in neonate age group. The sensitivity rate of gram-negative and gram-positive bacteria isolated from blood samples to Imipenem was higher than other types of antibiotics.

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