Antibiotics sensitivity of bacteria isolated from children with septicemia

Maysam Adnan Mezher

College of pharmacy, University of Tikrit, Tikrit, Iraq

Abstract

This study aimed to determine the frequency of microorganisms isolated from blood samples of patients with septicemia admitted to pediatric protection teaching hospital in Baghdad city, the most frequently isolates were gram+ve cocci (*Staphylococcus aureus* 7 strian and *S.epidermidis* 11 strain), followed by, *Klebsiella pneumoniae* 9 strain, *Escherichia coli* 5 strain and *Enterobacter* 2strain. There was a significant difference between *Staphylococcus aureus* and *S.epidermidis* in Antibiotic sensitivity P value ≤ 0.05. *S. aureus* 7 strain were resistant to ampicillin, erythromycin and sensitive to vancomycin, cloxacillin, Gentamicin, Ciprofloxacin While *S.epidermidis* 11 strain were resistant to ampicillin, gentamicin and sensitive to erythromycin, vancomycin, cloxacillin, Ciprofloxacin.

Keywords: Bacteria, Resistance to Antibiotics, septicemia

دراسة حساسية المضادات للبكتريا المعزولة من الاطفال المصابين بتسمم الدم

ميسم عدنان مزهر

الخلاصة

الدراسه الحالية ركزت على تحديد تردد العزلات المسببه لتسمم الدم من المرضى الراقدين في الاطفال دون السنتين في مركز حماية الاطفال في محافظة بغداد ، البكتريا الأكثر ترددا هي البكتريا الموجبه لصبغة كرام 7 عزلات من المكورات العنقوديه الذهبيه و 11 عزله من المكورات العنقوديه البشرويه يتبعها العزلات التابعه لنوع الكلبسيله الرئويه ايضا بلغ عددها 9عزله ضمن الدراسه الحاليه ، الاشريكه القولونيه 5 عزلات و الامعائيه عزلتين . هنالك فروقات معنويه بين بين مقاومة المكورات العنقوديه الذهبيه والمكورات العنقودية البشرويه في مقاومة المضادات الحيويه المستخدمه في الدراسه المكورات العنقودية الذهبيه 7 عزلات اظهرت مقاومتها لمضاد الامبسلين والارثرومايسين وحساسيتها تجاه الفانكومايسين، كوكساسلين ، جنتانايسين وال سوبرفلاكسين بينما المكورات العنقوديه البشرويه 11 عزله اظهرت مقاومتها للامبسلين والجنتامايسين وحساسيتها للارثرومايسين ، الفانكومايسين ، كوكساسلين والسبروفولاكين.

Introduction

Septicemia refers to generalized infection with positive blood culture in the early 28 days of neonates [1]. Advances in early diagnosis and treatment have led to better prognosis of new borns, various diseases of new born including septicemia, meningitis, arthritis, pneumonia, osteomyelitis and urinary tract infection [2]. Septicemia can be classified into two subtypes: Early onset neonatal sepsis (EONS) depending on the onset of symptoms before 72 hours and after 72 hours up to 28 days of life it is considered as late-onset neonatal sepsis (LONS) [3].Risk factors for early onset sepsis includes prolonged ruptured membranes (> 18 hours) [4], fetal distress, preterm delivery, history of Group B Streptococcus (GBS) infection in previous infant, GBS bacteriuria in this pregnancy [5]. Late onset sepsis occurs due to prolonged hospitalization. This retrospective study was undertaken to evaluate major bacterial isolates causing neonatal septicemia and their antibiogram pattern [6].

Aims of the study

To study the spectrum of the significant bacterial isolates from positive blood culture causing septicemia in children under2 years and to determine the antimicrobial sensitivity pattern of the bacterial isolates obtained from positive blood culture causing septicemia in children.

Material and Methods

Sample Collections

Forty five samples were collected from children under 2 years, Blood was collected under complete aseptic precautions .Blood was inoculated directly into blood -culture bottles . The ratio of blood to media brain heart infusion broth was 1:5 thoroughly mixed to prevent clotting, therefore, no anticoagulant was needed [7] and incubated at 37ºC for 1 week and examined by subculture on selective media (mannitol salt agar) and routine culture media nutrient agar and MacConkey agar .All colonies appeared on different media were further identified both morphological and by biochemical reactions [8]. Susceptibility to antibiotics were determined for all bacterial isolates by standard disk diffusion method [9, 10], using 6 commercially available disks (Al-Raze Center Disks). The following antibiotics were tested: ampicillin Ciprofloxacin gentamicin, vancomycin, erythromycin, cloxacillin (Oxoid, UK).

The test was performed according to the Kirby–Bauer technique [11].

Statistical analysis

Complete Randomized Design (C.R.D.) was used as an experimental design. Data were analyzed using SAS [12] to study the effect of different factors on the diameters of inhibition zones. Least significant difference (LSD) was used to compare the significant difference between means at $P \leq 0.05$.

Results and Discussion

Isolation and Identification of bacterial strains

Suspected bacterial colonies were picked up from blood agar and MacConkey's plates and identified by microscopic examination and biochemical tests. The gram-positive cocci were identified by microscopic examination and catalase and coagulase tests. Thirty four samples were found positive by bacterial infection and 11 were negative. The most frequently isolates were gram+ve cocci (*Staphylococcus aureus* 7 strian and *S.epidermidis* 11strian) , followed by , *Klebsiella pneumonia* 9 strain, *Escherichia coli* 5 strian and *Enterobacter* 2 strian as show in **Table (1)**.

Table (1): Percentage of bacterial species isolated from septicemia infections.

	Bacterial species	Number	Percentage (%)
1 -	*Staphylococcus aureus*	7	**21%**
2 -	*S.epidermidis*	11	**32%**
3 -	*Klebsiella pneumonia*	9	**26%**
4 -	*Escherichia coli*	5	**15%**
5 -	*Enterobacter*	2	**6%**
	Total	**34**	**100**

Antibiotic sensitivity pattern

The standard disk diffusion method was used to determine the sensitivity of all gram positive cocci bacterial isolates *Staphylococcus aureus* and *S.epidermidis* to several antibiotics. Results are shown in (Table-2) and (Table-3). It is obvious that a high percentage of all isolates were resistant to most used antibiotics and sensitive some of subjected antibiotics, there is significant difference between *Staphylococcus aureus* and *S.epidermidis* in Antibiotic sensitivity P value ≤ 0.05 *S.aureus* 7 strain Resistant to ampicillin, erythromycin and sensitive to vancomycin, cloxacillin, gentamicin, Ciprofloxacin as show in table 2. Whil *S.epidermidis* 11 strain resistance toampicillin, gentamicin and sensitive to erythromycin, vancomycin, cloxacillin, ciprofloxacin as show in table 3.

Table (2):-Antibiotic sensitivity Percentage of *S.aureus* isolated from septicemia infection to different type of antibiotics.

***S.aureus* (no. 7)**			
Antibiotics (Bioanalyse/Turkey)	**Concentratin µg / ml**	**Resistance**	**Sensitive**
Ampicillin	10	7	0
Erythromycin	5	4	3
Vancomycin	30	0	7
Cloxacillin	1	2	5
Gentamicin	10	1	6
Ciprofloxacin	5	2	5

P value ≤ 0.05

Table (3):-Antibiotic sensitivity Percentage of *S.epidermidis* isolated from septicemia infection to different type of antibiotics.

***S.epidermidis*(no. 11)**			
Antibiotics (Bioanalyse /Turkey)	**Concentratin µg / ml**	**Resistance**	**Sensitive**
Ampicillin	10	9	2
Erythromycin	5	4	7
vancomycin	30	2	9
cloxacillin	1	3	8
Gentamicin	10	6	5
Ciprofloxacin	5	4	7

P value ≤ 0.05

Neonatal sepsis is a life threatening emerging infection in the developing countries and it is estimated about million neonatal death occur every year worldwide. Therefore, differences in the ethnicity and socioeconomic status may contribute to the varying incidence of setic infection among neonates in different populations [13, 14]. Antibiotics are known to be effective in the treatment of septicemia worldwide [15, 16]. Generally speaking the percentages of resistance to antibiotics reported in this study are higher than those reported in some other part of the world [17, 18, 2]. This is a reflection for the misuse of antibiotics. Many of the antibiotics resistance genes were found to be carried on self-transmissible or mobilizable plasmids, and the transfer of such plasmids from one strain to another via conjugation was one of the major reasons for spreading the antibiotics resistance between bacterial population specially those belong to the *S.epidermidis* And *S.aureus* which represent the major causative agents for septicemia [19,20,3,5,13].

Conclusion

Development of more effective and less invasive procedures in the postnatal period and inadequate hand washing before and after handling babies also contributes to the neonatal sepsis in intensive care units.

Acknowledgements

The authors wish to thank who helps in the arrangement this paper and made the work possible.

References

1. Bone RC, Balk RA, Cerra FB, et al. Definitions for sepsis and organ failure and guidelines for the use of innovative therapies in sepsis. The ACCP/SCCM Consensus Conference Committee. American College of Chest Physicians/Society of Critical Care Medicine. Chest. Jun 1992; 101 (6):1644-1655.

2. Levy MM, Fink MP, Marshall JC, *et al.* 2001 SCCM/ESICM/ACCP/ATS/SIS International Sepsis Definitions Conference. Crit Care Med. Apr 2003;31 (4):1250-1256.

3. Martin GS, Mannino DM, Eaton S, Moss M. The epidemiology of sepsis in the United

States from 1979 through 2000. N Engl J Med. Apr 17 2003; 348(16):1546-1554.

4. Minino AM, Heron MP, Murphy SL. Deaths: Final Data for 2004. National Vital Statistics Reports. 2004; 55:1-120.

5. Balk RA. Severe sepsis and septic shock. Definitions, epidemiology, and clinical manifestations. Crit Care Clin. Apr 2000; 16(2):179-192.

6. Balk RA, Ely E, Goyette R. Sepsis Handbook. National Initiative in Sepsis Education; 2001.

7.Vandepitte J, Verhaegen J, Engbaek K, Rohner P, Piot P, and Heuck CC.(2003). Basic laboratory procedures in clinical bacteriology. 2nd ed. W H O. Geneva .p. 14-24, 71.

8.Colle JG , Duguid JP, Fraser AG , Marmion BP , Simmons A, Mackie , and McCartney. (1996). Practical medical microbiology. 14th ed. Churchill Livinstons. New York p. 29-113.

9. Angus DC, Linde-Zwirble WT, Lidicker J, Clermont G, Carcillo J, Pinsky MR.
Epidemiology of severe sepsis in the United States: analysis of incidence, outcome, and associated costs of care. Crit Care Med. Jul 2001; 29(7):1303-1310.

10. Wenzel RP. Treating sepsis. N Engl J Med. Sep 26 2002; 347(13):966-967.

11. Bauer AW, Kirby WMM, Sherris JC, and Truck M. (1966). Antibiotic susceptibility testing by a standardized single disc method. Am J Clin Pathol, 45: 493-496.

12. SAS. (2004). Statistical Analysis System, User's Guide. Statistical. Version 7th ed. SAS. Inst. Inc. Cary. N.C. USA.

13. Pittet D, Rangel-Frausto S, Li N, *et al*. Systemic inflammatory response syndrome, sepsis, severe sepsis and septic shock: incidence, morbidities and outcomes in surgical ICU patients. Intensive Care Med. Apr 1995; 21(4):302-309.

14. Sprung CL, Sakr Y, Vincent JL, *et al*. An evaluation of systemic inflammatory response syndrome signs in the Sepsis Occurrence In Acutely Ill Patients (SOAP) study. Intensive Care Med. Mar 2006; 32(3):421-427.

15. Ueda S, Nishio K, Minamino N, *et al*. Increased plasma levels of adrenomedullinin patients with systemic inflammatory response syndrome. American Journal ofRespiratory and Critical Care Medicine. Jul 1999; 160(1):132-136.

16. Damjanovic, V. and Whitfield, E. (1986). Antibiotic sensitivities of urinary pathogens isolated from patients in Liverpool, 1984-1985. J. Hyg. Camb. 97: 299-303.

17. Davies, J. (1994). Inactivation of antibiotics and the dissemination of resistance genes. Science, 264: 375-381.

18. Harnett, N.; Mongan, L.; Brown, S. and Krishnan, C. (1996). Thermosensitive transfer of antimicrobial resistance and citrate utilization and cotransfer of hydrogen sulfide production from *Escherichia coli* isolates. Diagn. Microbiol. Infect. Dis., 24: 173-178.

19. Bermudes, H.; Arpin, C.; El-Harrif, Z. and Quentin, C. (1997). Molecular epidemiology of an out break due to extended – spectrum B. Lactamase–producing *Enterobacteria* in French Hospital. Eur. J. Clin. Microbiol. Infect. Dis., 16: 523-529.

20. Broda, P. (1979). Conjugation in bacteria. In plasmids of medical, environmental and commercial importance. Timmis K.N. and Puhler A. Elsevier; North–Holland Biomedical Press.