Bacterial aerobic Bacteraemia at AL- Kindi Teaching Hospital 2007-2009: Etiology diversity, Clinical features, and Outcome.

البكتريا الهوائية المسببة لتجرثم الدم في مستشفى الكندي للفترة من 2007 ولغاية 2009 الاسباب المؤدية ومتغيراتها ، المظاهر السريرية والمحصلة النهائية

Mazin K. Ameen **[*]Khawlah J. Khalaf** **[*]Suzan I. Majeed**

Department of Microbiology AL-Kindi Teching Hosital

* Department of Biology/ AL- Mustansiriya University

مازن قيس امين ***خولة جبر خلف** ***سوزان اسماعيل مجيد**

قسم الاحياء المجهرية / مستشفى الكندي التعليمي

*قسم علوم الحياة /كلية العلوم/الجامعة المستنصرية

Abstract

Data regarding the incidence, etiology and outcome of Bacteraemia taken from AL-Kindi hospital were collected, and compared the situation between the three years: 2007, 2008, 2009. A total number of blood samples was (505), from this number only (70) (13.8%) is positive. The rate of positivity was significant greater in 2009 (17.7%) than 2008 (11.8%) and 2007 (9.1%). The calculated incidence of significant episodes of bacteraemia was 12.6% .The five most commonly isolated microorganisms were: *Salmonella typhi*30(46.8%), *Staphylococcus aureus* 12 (18.7%), *Escherichia coli* 10 (15.6%),*Klebsiella* 4(6.2%) and *Enterobacter sp.*3(4.6%) varied throughout this period, significant increase was noted in 2009. The acquisition of blood stream infections was nosocomial in 8.5% of cases.60% of *Salmonella typhi* were Amoxicillin resistant. Also *Staph.aureus* isolates, 58%were resistant to Amoxicillin and Erythromycin. Cephalexin-resistant *E.coli* in70% of the isolates and Gentamycin-resistant *Klebsiella* occurred in 75% of the isolates. The incidence of BSI did not differ significantly from other reported studies.

المستخلص

جمعت المعلومات عن حوادث اصابات تجرثم الدم من مستشفى الكندي وقورنت تلك الحالة بين السنوات الثلاثة 2007 ، 2008 و 2009 . مجموع عينات الدم كانت 505 عينة في تلك السنوات وكانت فقط 70 (13,8%) عينة موجبة للفحص . تمثلت النسبة الاعلى في سنة 2009 (17,7%) بينما في سنة 2008 كانت (11,8%) وفي سنة 2007 كانت (9,1%) اما مجموع الحوادث المهمة لتجرثم الدم فتمثلت بنسبة (12,6%) . الاحياء المجهرية الخمسة المهمة في تجرثم الدم هي *Salmonella typhi* 30 (46,8%) ، *Staphylococcus aureus* 12 (18,7%) ، *E.coli*10 (15,6 %) ، *Klebsiella sp* 4 (6,2 %) و *Enterobacter sp* 3(4,6%) تنوعت خلال هذه الفترة ، والزيادة الهامة لوحظت في عام 2009 . اما حالات تجرثم الدم Bacteraemia المكتسبة من المستشفى فشكلت نسبة 8,5 % من الحالات . 60% من عزلات بكتريا *Salmonella typhi* كانت مقاومة لمضاد الاموكسسيلين ومن عزلات بكتريا *S. aureus* كانت 58% مقاومة لمضاد الاموكسسيلين والايرثروماسين. مقاومة السيفالكسين من قبل عزلات *E.coli* كانت بنسبة 70% ومقاومة الجنتاميسين من قبل عزلات *Klebsiella* وبنسبة 75%. ان حوادث تجرثم الدم في هذه الدراسة لاتختلف عن الحوادث في الدراسات المسجلة .

Introduction

Microorganisms present in the circulating blood whether continuously intermittently are threat to every organ in the body. Approximately 200,000 cases of bacteraemia and fungemia occur annually with mortality rates ranging from 20-50% [1].Therefore early diagnosis and appropriate treatment of these infections can make the difference between life and death [2].Since early 1950s,there is striking increase in incidence of bacteraemia caused by members of Enterobacteriaceae and other gram negative bacilli [3]. During the last years, most authors have focused on special aspects of BSI, such as bacteraemia involving specific microorganisms [4].Furthermore the number of longitudinal studies is limited [5].This search reports the microbial etiology, clinical characteristics, and outcome of 64 episodes of BSI in AL-Kindi Hospitals during the 3-years from 11 January 2007 through 23 December 2009. BSI surveillance is the cornerstone of prevention and control since it facilitates the development of appropriate intervention measures and helps to evaluate their efficacy [6, 7].

Material and Methods:

Blood culture

Venous blood 5ml was obtained aseptically and inoculated into brain heart infusion broth. Blind subculture was done on to fresh 5%sheep blood agar and MacConkey's agar. Negative result was followed up by examining the broth daily and doing final subculture at the end of 7^{th} day or at the appearance of turbidity. Organisms were identified by cultural characters, morphology and standard biochemical tests [8].

- Susceptibility testing

During the 3 years of this study the antibiotic susceptibility testing was performed by the Kirby -Bauer disc diffusion method as per NCCLS recommendation [9].

The list of antimicrobials (Oxoid – England) included: Penicillin (10μg), Ampicillin (10μg),Gentamycin (30μg), Cefotaxime (30μg), Meropenenm (10μg), Augmentine (30μg), Trimethoprin + sulfonamides (25μg), Erythromycin (15μg), Amikacin (40μg), Ampiclox (25μg), Amoxicillin (25μg), Ciprofloxacin (10μg), Ceftriaxone (30μg), Tobramycin(10μg), Cephalexin (30μg), and Chloramphenicol (30μg).

Predisposing factors to bloodstream infection:

Medicin, outpatient, burns, dialysis, Neurosurgery, central care unit and Respiratory care unit.

- Statistical analysis:

We expressed continuous variables as the mean and standard deviation (SD), and discrete variables as percentages.

Results

The total number of blood samples obtained for blood culture during three years was 505 Table (1). In 2007 a blood sample for blood culture was 142. In 2008 was 127 and in 2009 was 236, being significantly higher at 2009 than other years. The rate of positivity was significantly greater in 2009 (17.3%) than 2007 and 2008 (7.7%, 9.4%) respectively.

Table (1): Microbiology Workload in 2007-2009

	2007	2008	2009	Total
Total number of blood samples	142	127	236	505
Positive blood samples	13	15	42	70
Percentage of positives	9.1%	11.8%	17.7%	13.8%
Significant episodes of blood stream	11	12	41	64

Microbiology data

The number of microorganism isolated from significant episodes of bacteremia was 64.The etiology of the episodes is summarized in table(2). The five most commonly isolated microorganisms were: *Salmonella typhi, S. aureus, E. coli, Klebsilla* and *Enterobacter* were accounting for 46.8%, 18.7%, 15.6%, 6% and 4.6% respectively. When only 1.5% for each one of these bacteria: *Streptococcu*s (*β*_hemolysis), *Acinetobacter baumanii, Aerococcus viridans, Pseudomonas and Stenotrophomonas maltophilia*. Out 64 isolates 51(79.6%) were gram negative bacilli while13 (20.3%) were gram positive bacteria shown in the table(3). *S. epidermidis* bactereamia occurred mainly in patients was associated with nosocomial infection (8.5%).

Table (2): most frequent isolates

Bacteria	(n=11)	(n=12)	(n=41)	(n=64)
Salmonella typhi	**8**	**2**	**20**	**30(46.8%)**
S .aureas	**1**	**3**	**8**	**12(18.7%)**
E.coli	**1**	**3**	**6**	**10(15.6%)**
Klebsiella	**_**	**3**	**1**	**4(6.2%)**
Enterobacter sp.	**1**	**_**	**2**	**3(4.6%)**
Streptococcus B hemolytic	**_**	**1**	**_**	**1(1.5%)**
***Others**	**_**	**_**	**4**	**4(6.2%)**

Acinetobacter baumanii,Pseudomonas sp. ,Aerococcus viridans, Stenotrophomonas maltophilia

Table (3): Distribution of Bacterial Pathogens

Organisms	No. of isolates	%
Gram positive bacteria	13	20.3
Gram negative bacteria	51	79.6

Resistance patterns of the most frequent isolates:

Antimicrobial susceptibility data are presented in table – 4. Overall, 60%of *Salmonella typhi* were resistant to Amoxicillin and Erythromycin was 58%. Cephalexin - resistant *E.coli* in 70% of the isolates and Gentamycin-resistant *Klebsiella* occurred in 75% of the isolates.

Table (4): Resistance Patterns of the most frequent isolates

Microorganism	Antimicrobial	Total No. of isolates tested	% of resistance
Salmonella typhi	Ampicillin	30	26.6
	Cefotaxime	30	0.0
	Augmentin	30	20.0
	Trimethoprim	30	30.0
	Ampiclox	30	20.0
	Amoxicillin	30	60.0
Staph.aureus	Ampicillin	12	50.0
	Augmentin	12	0.0
	Erytheromycin	12	58.3
	Amikacin	12	0.0
	Amoxicillin	12	58.3
	Ampiclox	12	33.3
E.coli	Ceftriaxone	10	60.0
	Cephalexin	10	70.0
	Ciprofloxacin	10	20.0
	Gentamycin	10	20.0
Klebsiella s.pp	Gentamycin	4	75.0
	Meropenem	4	75.0
	Amikacin	4	75.0
	Ceftriaxone	4	50.0

Interpretive criteria for each antimicrobial tested determined using NCCLS (2000)

-Clinical information

We obtained complete clinical information of 64 individuals with bloodstream infections Table (5).There were 25 males (39%)[5(45%) in 2007 , 6 (50%) in 2008 and 14 (34%) in 2009] and 39 female (60%)[6 (54%) in 2007 , 6(50%) in 2008 and 27 (65%) in 2009] whose ages ranged from 12 years to 80 years (mean 35.5 years, SD 15.5).

Table (5): Comparison between patients according to outcome

	2007 No=11	2008 No=12	2009 No=41	Total No=64
Age :(SD) range	30.8(10.1) 16-51	33.5(12.7) 16-54	37.4(17.3) 12-80	35.5(15.5) 12-80
Sex :Female	6(54.5%)	6(50%)	27(65.8%)	39(60.9)
Male	5(45.4%)	6(50%)	14(34.1)	25(39.06%)

The most important predisposing factors for bacteremia are summarized in Table (6). Overall, Medicine were the most common potential predisposing factor 35(54.6%), high percentage was at 2009[25 (60.9%)] .Other potential predisposing factors were: outpatients in 17 (26.5 %), burns 5 patients (7.8%) and in dialysis, neurosurgery and respiratory care unit were 2 (3.1%) for each one.

Table (6): Predisposing factors to bloodstream infection

	2007 n=11	2008 n=12	2009 n=41	Total n=64
Medicine	**9(81.8%)**	**1(8.30%)**	**25(60.90%)**	**35(54.60%)**
Outpatient	**1(9.09%)**	**6(50.00%)**	**10(24.30%)**	**17(26.50%)**
Burns	**1(9.00%)**	**3(25.00%)**	**1(2.40%)**	**5(7.80%)**
Dialysis	**0.0%**	**1(8.30%)**	**1(2.40%)**	**2(3.10%)**
Neurosurgery	**0.0%**	**1(8.30%)**	**1(2.40%)**	**2(3.10%)**
Respiratory care unite	**0.0%**	**0.0%**	**2(4.80%)**	**2(3.10%)**
Central care unite	**0.0%**	**0.0%**	**1(2.40%)**	**1(1.50%)**

Discussion

In the present study positive blood culture was seen in 70(13.8%) cases. In india [10] has reported 16.4% where as [11,12] have reported 44%,33.9% respectively. This variation might be due to the fact that most of the patients were given the antibiotics before they come to the tertiary care hospital &other reason is that in most of the cases self medication is very common as the medicines are available at the counter. In the concurrent study the incidence of gram positive organisms was 20.3% while 79.6% isolates were gram negative bacilli. It is in accordance with the study of other workers [12]. [11] have reported incidence of *Streptococcus spp and Staphylococcus spp* to be 25 %and gram negative bacilli 15%. But in most of the studies gram negative organisms have taken over the gram positive organisms 9% incidenec of *Staphylococcus spp*.have been reported by [13]. *Salmonella typhi* was isolated in 46.8 % of cases where as it has been reported to be 61.5% in the other studies [14]. While [15] has reported it to be 59% of all blood stream infections. *E.coli* was isolated from 15.6% of the cases. While [13] has reported it to be 14.4% *Klebsiella* isolation was 6.2% in consistent with the study of [2] who has reported it to be 5.7% which is in contrast to other studies who have reported it to be 25.8% [13]. *Enterobacter* was isolated in 4.6% in consistent with the study of [16] who was reported it to be 3.9%. The acquisition of blood stream infections was 8.5% through these three years. was also shifting from apredominantly nosoncomial origin to an increasing frequent community acquisition [17].This is probably due to shorter period of hospital stay even in severely ill patients [18].

Amongst the *Salmonella typhi* isolates maximum resistance was seen with Amoxicillin 60% and Trimethoprim 30%, but was seen susceptible to Cefotaxime. Cephalosporins are considered to be the drug of choice in treatment of *salmonella* bacteremia [19,20]. An increased Ampicillin and Trimethoprim resistance of 86%, 95% respectively was also reported by [15]. *Staphylococcus aureus* was generally highly susceptible to Augmentin and Amikacin but resistant to Amoxicillin and Erythromycin 58%. [2] reported that *Staphylococcus aureus* and *Streptococcus* maximum resistance was seen with Ampicillin 74.6% and Erythromycin 69.6%. Maximum resistance was seen against Cephalexin 70%, Ceftriaxone 60% for *E.coli* isolates and Gentamycin 75%, Amikacin 75%for *Klebsiella sp*. Most of the gram negative bacilli were multi drug resistant 71%. Maximum resistance was observed with Ampicillin 86.1%, Cephalexin 68.07% [2]. These resistances are

commonly mediated by extended-spectrum β-lactmases in *E.coli* and *Klebsiella spp* [4] clinical data obtaind in this study showed anon- Surprising age and Sex distribution of patient with blood stream infections. Bacteremia can occur in patients of any age group,except children because no peadiatric unit in AL-kindi Hospital.The appearance of population groups susceptible to this type of infection, such as Medicin, Outpatient and Burns. So it is concluded that septicemia is an important cause of morbidity and mortality. The retrospective study conducted showed both gram positive and gram negative bacteria were responsible for blood stream infections. Most of the strains were multi drug resistant. To bring down the incidence of bloodstream infections rational and judicious use of antibiotics is essential according to the antibiotic resistance pattern of that area.

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