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Bacterial Infections Of Bloodstream And Antimicrobial Sensitivity Test Of Neonate And Adult Iraqi Patients.

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ABSTRACT

This study was undertaken to investigate blood stream infection in neonate and adult patients and used antibacterial sensitivity test in vitro for the bacteria isolated from the patients to reduce the infection of bloodstream and multi drug resistant. A total of 1242 blood samples were collected included 457 and 785 from neonatal and adult respectively who attending and/ or admitted (in and out) at Al-Yarmouk teaching hospital in Baghdad city and were clinically suggestive bacteremia and antimicrobial sensitivity test for positive culture was done This study appear that 122 samples out of 1242 were recorded as positive for bacterial culture, nine bacterial species were isolated from a total of 122 positive blood samples for culture , The most common bacteria in neonates were *Acinetobacter* as gram negative that recorded (37.7%) and for *Staph.aureus* (10.7%) as gram positive bacteria while *E. coli* (18%) gram negative bacteria was the prevalent bacteria that isolated from both in and out adult patients compared with other species. The antibacterial sensitivity test in vitro showed that Amikacin AK and Imipenem IMP (11%) were poor resistant and effective antibacterial drugs while, each of Ceftriaxone CTR, Tetracyclin TCC, Erythromycin E and Clindamycin CD (89%) were more resistant and poor antibacterial drug activity. Patients' blood contains different strains of bacteria with higher incidence for *E.coli* infections .Also, and on the spread of resistance patterns for different antibiotics.

Keywords: bloodstream, antibacterial sensitivity test , bacteremia , septicemia

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INTRODUCTION

Blood stream infection , remains one of the leading to causes of morbidity and mortality worldwide. Approximately 200,000 cases of bacteremia occur each year with a mortality rate of 20-50% worldwide [1]. Blood stream infection enumeration for 10-20% of all the reported infections and is the eighth reasons of death, in the United States some of the 17% blood bacterial infection leads to death [2]. Among these diseases, neonatal sepsis is one of the prevalent causes of admission to neonatal units in developing countries (3). Many bacteria have been reported as a causative agent with differing in distribution from one place to another (4,5). A relationship between the type of organism in the bloodstream and the patient's diagnosis has been shown , the isolation of gram negative bacteria , enterococci and fungi associated with increasing mortality(6). Despite significant advances in the therapy and prevention of infectious diseases, they are a major cause of death, disability and deterioration in the quality of life, mostly for millions of people in developing countries, as Bacteremia are increasing in some parts of the world (7). Bloodstream infections have serious consequences such as shock, coagulation, multiple organ failure ,disseminated intravascular and even death (8,9). Although the use of antibiotics is currently the only way to treatment of bacteremia however, many bacterial infections have become resistant to antibiotic drugs and become a serious concern for public health with economic and social impacts worldwide (10). Antibiotics resistance is a growing trouble in developing countries [11]. Many studies have pointed that insufficient experimental treatment of bacterial infections is correlating with adverse outcomes, including increased drug resistance and mortality [12,13,14].

MATERIAL AND METHODS

Patient population

The total blood sample were collected 1242, 457 from neonate and 785 from adult in and out patients of clinically suggestive bacteremia admitted in different units of Al-Yarmouk teaching hospital from August 2014 to June 2017.

Collection of the samples

For blood culture, 10 mL and 2mL of blood was collected from adult and neonates patients respectively. The blood was incubated at 37°C in a sterile bottle containing Brain heart infusion broth B.H.I for two or three days incubated, then in third or fourth day Gram stain was Done for macroscopically positive blood samples (turbidity)and subcultures were made onto Blood agar, chocolate agar, MacCankey agar and mannitol salt agar .The media were incubated 24h at 37°C and this technique was repeated three times along seven days (one week). The positive blood cultures were inspected and the necessary biochemical tests were done (indole methyl red , coagulase ,catalase test , Voges–Proskauer, urease, oxidase , and sugar fermentation reaction). In addition to Api 20 E(Enterobacteracea) and Api 20 Staph.

Antibacterial susceptibility testing

Agar disc diffusion method was done by using Antibiotic disks and Muller Hinton agar for isolated bacteria as described by the National Committee for Clinical Laboratory Standards [15]. The antibiotic disks and their concentrations per disk (μg) comprised in following: ampicillin (AMP 10), erythromycin (E 15), gentamycin (CN 10) , ciprofloxacin (CIP 5), Amikacin (AK 30) Ceftriaxone (CTR 30) chloramphenicol (C 30) , Clindamycin (CD 2) , trimethoprim-sulphamethoxazole (SXT 25) ,Tobramycin (TOB 10), Imipenem(IMP 10) and tetracycline (TTC 30).

Statistical analysis: was done using SPSS version 21.0 software and Microsoft Excel 2013. Categorical data formulated as count and percentage. Chi-square test was used to characterize the association of these data. A p-value of less than 0.05 was considered as statistical significance.

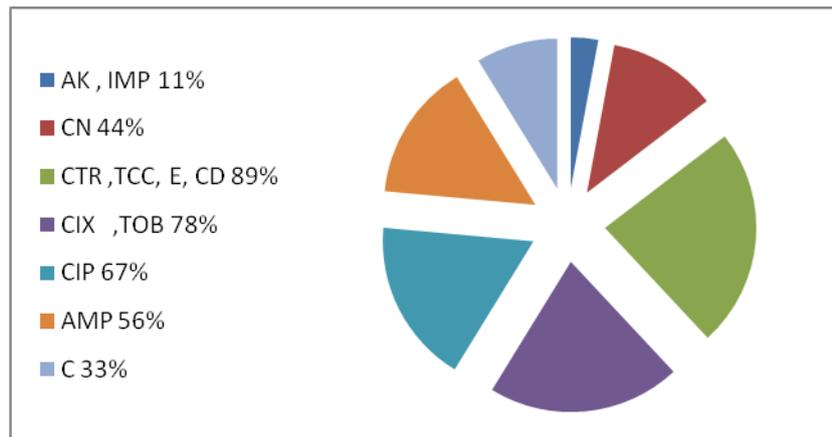


Fig 1: Frequency of antibiotic resistant of bacteria isolated from blood culture

RESULTS

Study population:

Neonatal patients: From the total of 457 blood samples of neonatal patients were obtained for blood culture, only 57 (12%) neonatal patients were positive for blood culture for the period of the study. According to gender, the odds ratio (OR) of infection in male was higher than females (OR=1.38, CI 95% 0.78-2.42) (table 1).

Table 1: The total positive blood samples in neonatal infection from 2014-2017

Years	Male Positive	Female Positive	Total positive	Total	OR	95%CI	P
2014-2015	20	10	30	173	1.38	0.78-2.42	0.26
2015-2017	12	15	27	284			
Total	32	25	57	457			

Adults: From the total of 785 blood samples of adult male and female patients were obtained for blood culture , only 65 (8.3 %) in and out patients were positive for blood culture during work time. The result was statistically significant (P<0.001). Chi-square value (20.40) table 2.

Table 2: The total positive blood samples in adults patients according to year

Year	Total positive	Total number	Chi-square value	P
2014	7	157	20.40	<0.001
2015	33	404		
2016	15	119		
2017	10	105		
Total	65	785		

Of the total 65 adult patients 35 (53.8) male and 30 (46.2) female , males were more infected than females , adult patients divided into two groups 35 inpatients and 30 outpatients were positive for blood culture results table (3,4) .

Table 3: The total positive blood samples of adult (In-patients) males and females according to year

Year	Total positive male	Chi square value	P	Total positive female	Chi-square value	P
2014	3	1.82	0.40	0	6.61	0.03

2015	12		7	
2016	3		4	
2017	3		3	
Total	21		14	

Table 4: The total positive blood samples of adult (out- patients) males and female according to year

Year	Total positive male	Chi-square value	P	Total positive Female	Chi-square value	P
2014	3	1.00	0.60	1	9.46	0.008
2015	5			9		
2016	3			5		
2017	3			1		
Total	14			16		

Isolation of bacteria : In current study , nine bacterial species were isolated from a total of 122 positive blood samples for culture , The most common bacteria in neonates were *Acinetobacter* 37.7% compared with other species. *S.aureus* (10.7%) gram positive bacteria was isolated from adult inpatients and outpatients. While *E. coli* (18%) gram negative bacteria the most common bacteria in adult inpatients and outpatients compared with other species table 5.

Table 5: Frequencies of bacteria species isolated from neonatal and adult (In,out) positive blood culture

Gram reaction	Bacteria	Neonatal	In patient	Out patient	Total	%
G+	<i>Staph.aureus</i>	3	4	6	13	10.7%
G-	<i>Klebsiella pneumonia</i>	2	7	4	13	10.7%
	<i>Acinetobacter</i>	42	3	1	46	37.7%
	<i>Esherichia coli</i>	3	12	7	22	18%
	<i>Proteus sp.</i>		2	5	7	5.7%
	<i>Enterobacter sp.</i>	2	1		3	2.5%
	<i>Salmonella typhi</i>			2	2	1.6%
G-	<i>Stenotrophomonas</i>			1	1	0.8%
G-	<i>Pseudomonas eruginosa</i>	5	6	4	15	12.3%
	Total	57	35	30	122	100%

Antibacterial susceptibility testing: Regarding the data, it was revealed that AK (11%) , IMP (11%) , CN (44%) and C (33%) , are respectively were poor resistant and effective antibacterial drugs while CTR (89%) , TCC(89%), E (89%) , CD (89%) CIX (78%) ,TOB (78%) , CIP (67%) and AMP (56%) respectively were more resistant and poor antibacterial drug activity figure (1). In this study , *Staph aureus* , *Proteus sp.* *Enterobacter sp.* *Salmonella typhi* and *Acinetobacter* were sensitive only to AK, C, IMP and CN compare with other antibiotics used in antibacterial susceptibility testing. while *Klebsiella* , *E.coli* , *Pseudomonas* were more resistant to E , CTR , CD , TCC , AMP , CIX and TOB than other antibiotics , but *Stenotrophomonas* was fully resistant to all antibiotics.

DISCUSSION

The result of current study demonstrated the isolated types of bacteria in blood that causing bacteremia and their susceptibility to prevalent used antibacterial agents and revealed that 57 (12%) out of 457 total samples were positive for the existence of bacteria in neonatal , while 65 (8.3%) out of 785 total samples were positive for the existence of bacteria in adult (in and out patients). In this study , from the total of 457 blood samples of neonatal patients were obtained for blood culture, only 57 (12%) neonatal patients were positive for blood culture, The higher occurrence in neonatal bacteremia has been reported from different countries (16,17). Roy et al.2002 were detected 728 blood samples for neonatal septicemia and 346

were recorded for positive bacterial culture (18). So, in their study the frequency was detected as 47.5% which was quite high, similar results was reported as 33.9% in another study (19). High probability of bacteremia in neonates may be due to low immune response, poor hygiene practices, socioeconomic status, bottle nutrition (20). Of the total 65 adult patients 35 (53.8%) male and 30 (46.2%) female showed positive results, males were more infected than females. Therefore, the results of this study was consistent with the study carried out by Kaur and Singh (2014) which reported high positive culture in 65.22% men (21). The search results show compatibility with Hussein *et al.* [2005] reported 66.66% positive for men and 33.33% for women (22) and similar observation of male dominance 86.92% more than 13.08% in female in a study by Salari, 2002 (23). The reason may be that men are the most active and earn members of most families, so they are more privileged to visit the doctor's room for treatment (9). On the other hand, bacterial resistance to antibacterial agents is a serious persistent problem in the therapy of bloodstream infection such as blood infections caused by strains of bacterial pathogens that are often resistant to a wide range of antibacterial agents (24). The current study examined the antibacterial resistance patterns of 9 bacterial strains isolated from the blood of neonatal and adult patients and recorded that *Staphylococcus aureus* was only Gram-positive pathogens responsible for bacteremia, also Alam *et al.* 2011 concluded that *Staphylococcus aureus* was the most important infectious agent responsible for septicemia (24). Similarly Falagas *et al.* 2006 were reported that staphylococci was the prevalent cause of septicemia (25), and another study from Chandigarh, North India reported *Staphylococcus aureus* was the most common pathogen involved in septicemia (26). The frequency analysis of Gram-negative pathogens in this study revealed that *Acinetobacter species* in neonatal, and *Escherichia coli* in adult were the prevalent of bacteremia compare with other bacteria species.

According to the incidence of *Acinetobacter* of this study 37.7%, similarity was recorded with a study in that infection of neonate was 35.7% (27) In contrast, the current infection rate was higher than other results 15.2% (28), 12.13% (29) and 8.3% (30) this may be due to the transmission of bacteria from the digestive system and the genitourinary system of mothers as many of these infected mothers do not show any symptoms other reason may be due to the transmission of bacteria to the fetus in the womb or during childbirth from infected mother in which the child cannot resist this infection because of the immaturity immune system In addition, the newborn's immune system may respond in ways that may create complex problems of the child's response such as the secretion of chemicals that stimulate inflammation rather than fighting the infection agent that attacks the body and causes some birth defects in the immune system It was found that the total cases of Gram-negative bacilli belonged to *Enterobacteriaceae* family including *E. coli*, *K. pneumoniae* and *Proteus spp.* (34.4%) have been shown agreement with a study carried out by Ahmed and Hussain, 2014 in that 37% of isolates belonged to *Enterobacteriaceae* family (31). While, the incidence rate of *P. aeruginosa* 12.3% was higher than result of previous studies 7.62% and 5.9% positivity (32,33).

Generality, the gram negative bacteria in this study were multi-drug resistant. The prevalent resistance were seen to CTR (89%), TCC (89%), E (89%), CD (89%). As other similar studies have reported multi-drug resistance for their isolated gram negatives bacteria (32,33). In other studies, high level of resistance has been reported with ampicillin and erythromycin (33, 34, 35). Roy *et al.* 1993 concluded that most of the Gram-negative organisms showed resistance to more antibiotic groups (36). Rapid development and proliferation of antibiotic resistance occurs due to the non-judicial use of antibiotics (10, 37, 31), Which is the most serious health threat.

Conflict: There is no conflict of interest.

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