بسم الله الرحمن الرحيم

﴿ اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ ﴾

صدق الله العظيم

(سورة العلق الآية 1)

Dedication

I dedicate this research to

My magnificent father...
who gave me the power and support in every steps in my life

My beloved mother.....
Who taught me how I could be humane

My beloved brothers and sisters....
For their support and kindness

My lovely husband and kid.....
The persons whom I love, respect and appreciate.....

&

Every one from whom I learned...

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Abstract

This study was carried out in Khartoum State during the period from March 2013 to March 2014, to study phenotypic and genotypic characterization of bacterial pathogens in hemodialysis patients and their antibiotics susceptibility. Two hundred and one blood specimens for culture were collected from patients attended 17 Dialysis Units. The specimens were cultured on Thioglycollate broth which support the growth of anaerobes and aerobes and has been used in modified form for blood culture purposes. The obtained colonies were investigated using VITEK 2 Compact System for bacterial identification and susceptibility testing. During this study, 62 patients showed positive blood culture. Out of them 56 (90.3%) patients had Gram-positive bacterial infections and 6 (9.7%) patients had Gram-negative bacterial infections. *Staphylococcus epidermidis* was the most common microorganism associated with hemodialysis catheter-related bloodstream infection, it involved 35 of the 62 (56.5%) cases. Other prominent bacteria included six *Enterococcus faecalis* and six *Enterococcus faecium* (9.7%),

Staphylococcus aureus 4 (6.5%), *Pseudomonas aeruginosa* 3 (4.8%), *Staphylococcus vitulinus, Staphylococcus hominis, Staphylococcus simulans, Streptococcus uberis*, *Enterobacter cloacae, Serratia marcescens* and *Escherichia coli* (1.6% each). The antibiotic susceptibility results showed that only vancomycin, linezolid, tigecycline and nitrofuranation were fully efficacious against Gram-positive isolates, they were highly resistant to benzylpenicillin (92.9%) and oxacillin (83.9%). While Gram-negative isolates were fully resistant (100%) to ampicillin, ampicillin/sulbactam, cefazolin and cefoxitin. They were all susceptible to amikacin.

In attempting to identify of *Staphylococcus epidermidis, P. aeruginosa*, *Enterococcus faecalis, Enterococcus faecium and Staphylococcus aureus* strains at the DNA level, Polymerase chain reaction (PCR) was used based on specific primer for 16S rRNA gene. The results showed that PCR was found to be rapid and more sensitive and specific in identification.

The presence of class 1 and 2 integrons was tested by PCR using primers specific for the integron integrase genes intI1 and intI2. Class 1 integrase Gene was present in all Gram-negative isolates (6) and in 48 of 56 Gram- positive isolates. The class 2 intI gene was not found in this study. Most integrons were present in the multi-resistant isolates, indicating a general concordance between the presence of

integrons gene and antibiotic resistance, and that the integrons have played an important role in the dissemination of antimicrobial resistance in these species.

الخلاصة

أجريت هذه الدراسة في ولاية الخرطوم في الفترة ما بين مارس 2013 وحتي مارس 2014 لدراسة خواص الطراز المظهري والجيني للبكتريا المسقمه عند مرضي غسيل الدم وحساسيتها للمضادات الحيويه. جمعت 201 عينه من الدم من مرضي يترددون علي 17 مركز للاستصفاء الدموي. وتم تزريع عينات الدم في اوساط ثيوجليكوليت السائله التي تستخدم لتحفيز نمو البكتريا الهوائيه واللاهوائيه. تم تحديد نوع البكتريا الممرضه واختبار حساسيتها للمضادات الحيويه بواسطة جهاز VITEK 2 Compact System .

اظهرت هذه الدراسه ان 62 عينة زراعة دم ايجابية النمو البكتيري، 56 ((90.3% منهم موجبه لصبغة جرام بينما 6 (9.7%) سالبه لصبغة جرام. اظهرت

الدراسه ان العنقوديه البشرويه البيضاء هي الاكتر شيوعا بين البكتريا المسببه لالتهاب الدم الناتج عن التهاب قسطرة الاوعيه الدمويه التي تستخدم في عملية الاستصفاء الدموي وتمثل 35 من اصل 62 حاله، يليها 6(9.7%) من المكوره المعويه البرازيه و 6 (9.7%) من المكوره المعويه الاليويه و4 (6.5%) من المكوره العنقوديه الذهبيه، 3(4.8%) من الزائفه الزنجاريه وواحده من كل من المكوره العنقوديه فيتيولينيس و المكوره العنقوديه هومينس والمكوره العنقوديه سميولنس و المكوره العقديه ابرايس والامعائيه المزرقيه والسراتيه الزابله والاشريكيه القولونيه بنسبة (1.6%) لكل.

عكست هذه الدراسة مقاومة البكتريا الموجبه لصبغة جرام للبنزايل بنسلين (92.9%) و الاوكساسلين (83.9%)، بينما لاتوجد مقاومه للفانكوميسين والليزوليد والتيقسايكلين والنيتروفيرانتوين وان البكتريا السالبه لصبغة جرام عالية المقاومه (100%) لكل من الامبسلين والامبسيلين سلباكتام والسيفازولين والسيفواكزتين. وعكست ايضا فعالية المضاد الحيوي الاميكاسين علي كل انواع البكتريا المعزوله.

قد اظهر (PCR) خلصت الدراسه الي ان استخدام تفاعل البلمره المتسلسل دقه و حساسيه عاليه في تحديد جنس ونوع البكتريا تحت الدراسه وهي العنقوديه البشرويه البيضاء و الزائفه الزنجاريه و المكوره المعويه البرازيه و المكوره المعويه الاليويه و المكوره العنقوديه الذهبيه في وجود البادئ المتخصص لجين (16S rRNA).

و intI1))فئة 1 integron integrase وايضا تم التحقق من وجود الجينات واظهرت الدراسه (PCR) بواسطة تفاعل البلمره المتسلسل (intI2) فئة 2 موجود في كل البكتريا السالبه لصبغة جرام بينما وجد في 48 intI1 ان جين لم يوجد في هذه intI2 من 56 من البكتريا الموجبة لصبغه جرام وان جين يلعب دورا هاما في انتشار intI1 الدراسه. توصلت الدراسه الي ان جين مقاومه البكتريا للمضادات الحيويه.

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List of Abbreviations

Abbreviation	Meaning
(pmp)	per million population
AMC	amino-methylcoumarin
AST	antimicrobial susceptibility testing
ATCC	American type culture collection
AV	Arteriovenous
AVFs	Arteriovenous fistulas

AVGs	Arteriovenous grafts
BSIs	Bloodstream infections
CAB	Catheter-associated bacteremia
CDC	Centers for Disease Control and Prevention
CKD	Chronic kidney disease
CKF	Chronic kidney failure
CoNS	Coagulase-negative staphylococci
CRB	Catheter-Related Bacteramia
CRBI	Catheter-related bloodstream infection
CVCs	Central venous catheters
DNA	Deoxyribonucleic acid
DOQI	Dialysis Outcome Quality Initiative
ESRD	End-stage renal disease
FMCNA	Fresenius Medical Care-North America
GFR	Glomerular filtration rate
GHL	Gentamicin and heparin lock
GN	Gram negative
GP	Gram positive
HCRI	Hemodialysis-catheter related infections
HD	Hemodialysis
ID	Identificaton card
int	integrase
MICs	minimum inhibitory concentrations
MU	methylumbelliferone
NHSN	National Healthcare Safety Network
PCR	Polymerase Chain Reaction
PCs	permanent access
RI	Resistant integron
SI	Superintegrons

TCC	Tunneled central venous catheter
TDCs	Tunneled dialysis catheters
UTIs	Urinary tract infections
VRE	Vancomycin-resistant enterococci