

# **ANTIMICROBIAL RESISTANCE AMONG BACTEREMIC PEDIATRIC PATIENTS IN EMERGENCY DEPARTMENT**

**Thesis**

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# مقاومة مضادات الميكروبات بين الأطفال المرضى بـ*كوفيد-19* في الدم في قسم الطوارئ

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# Abstract

In pediatric emergency department (PED), bloodstream and lower airway infections are the most common infections. Because of multiple factors, PEDs are known sources of antimicrobial-resistant organisms. Bacterial resistance to antibiotics is growing up day by day in both community and hospital setting, increasing mortality and morbidity. The purpose of the present study was to determine the causative organisms, antimicrobial resistance patterns and outcome of different types of infections in patients admitted in pediatric emergency department of Cairo University Specialized Pediatric Hospital (CUSPH) aiming to be able to design antibiotic policy for pediatric emergency department. Different clinical samples were collected properly from 388 patients suffering from commonest infections in ER unit. Different specimens were cultured and the isolates were identified by the routine biochemical reactions. Antimicrobial susceptibility (AST) of all isolates were determined by the standard *Kirby Bauer* disc diffusion method. It was found that the most common organism isolated from patients with pneumonia was *pseudomonas* (27.7%), while *CONS* was the most prevalent among patients with sepsis (42.9%) and *E.coli* among patients with UTI (7/11) 63.6%. Gram negative organisms isolated from blood showed highest sensitivity to: ciprofloxacin (CIP) 67%, aztreonam (ATM) 53.6% and gentamycin (GN) 41.3%, while Gram positive organisms, showed highest sensitivity to: vancomycin (VA) 100%, teicoplanin (TEC) 86.5% and clindamycin (DA) 42.5%. Gram negative organisms isolated from BAL showed highest sensitivity to: ciprofloxacin (CIP) 43.4%, imipenem (IPM) 42.3% and meropenem (MEM) 37%, while Gram positive organisms showed 100% sensitivity to vancomycin (VA), teicoplanin (TEC), clindamycin (DA) and erythromycin (E) and 66% to doxycycline (DO). Gram negative organisms isolated from urine culture samples showed highest sensitivity to: ciprofloxacin (CIP) 83.3%, meropenem (MEM) 44.3% and amikacin (AK) 25%, while Gram positive organisms showed 100% sensitivity to vancomycin (VA), 100% to gentamycin (GN), 0% to doxycycline (DO). Antibiotic sensitivity pattern in cases of pneumonia showed that the most sensitive antibiotics include ciprofloxacin (CIP), imipenem (IPM) and meropenem (MEM), in cases of sepsis include vancomycin (VA), teicoplanin (TEC), and clindamycin (DA) and in cases of UTI include ciprofloxacin (CIP), ceftazidime (CAZ) and amikacin (AK). Antibiotic sensitivity pattern in cases of community acquired infections showed that the most sensitive antibiotics in Gram negative organisms were as follows: ciprofloxacin (CIP), imipenem (IPM), meropenem (MEM) and amikacin (AK), while the most sensitive antibiotics in Gram positive organisms were vancomycin (VA), teicoplanin (TEC) and clindamycin (DA). Antibiotic sensitivity pattern in cases of hospital acquired infections showed that the most sensitive antibiotics in Gram negative organisms were as follows: ciprofloxacin (CIP), imipenem (IPM) and meropenem (MEM), while the most sensitive antibiotics in Gram positive organisms were vancomycin (VA), teicoplanin (TEC) and clindamycin (DA). This antibiotic policy is updated periodically according to microbiology laboratory reports according to the most prevalent organism and most sensitive antibiotics in each sample.

**Key words:** Incidence, Antimicrobial resistance, Pediatrics, Infection control, Nosocomial infection.

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## List of Abbreviations

### List of Abbreviations

<b>ABCs</b>	Active Bacterial Core Surveillance
<b>ACCM</b>	American College of Critical Care Medicine
<b>AHA</b>	American Heart Association
<b>AIDS</b>	Acquired Immunodeficiency Syndrome
<b>AK</b>	Amikacin
<b>AMC</b>	Amoxicillin Clavulanic acid
<b>AMP</b>	Ampicillin
<b>AOM</b>	Acute Otitis Media
<b>ARDS</b>	Acute Respiratory Distress Syndrome
<b>ATM</b>	Aztreonam
<b>BAL</b>	Bronco Alveolar Lavage
<b>BID</b>	Twice Daily
<b>Bla1</b>	$\beta$ -lactamase Inhibitor
<b>BlaR<sub>1</sub></b>	$\beta$ -lactamase Regulator <sub>1</sub>
<b>BlaZ</b>	$\beta$ -lactamase Z
<b>BLR</b>	$\beta$ -lactamase Resistant
<b>BSBL</b>	Broad Spectrum $\beta$ -lactamases
<b>BSI</b>	Blood Stream Infections
<b>CA-MRSA</b>	Community Acquired Methicillin-Resistant <i>Staphylococcus aureus</i>
<b>CAP</b>	Community Acquired Pneumonia
<b>CAZ</b>	Ceftazidime
<b>CDC</b>	Centers for Diseases Control and Prevention
<b>CEC</b>	Cefaclor
<b>CFP</b>	Cefoperazone
<b>CIP</b>	Ciprofloxacin
<b>CLSI</b>	Clinical and Laboratory Standards Institute
<b>CMBCS</b>	Continuous Monitoring Blood Culture Systems
<b>cMLS<sub>B</sub></b>	Constitutive Macrolide-lincosamide-streptogramin B
<b>CMV</b>	Cytomegalovirus.
<b>CNS</b>	Central Nervous System
<b>CONS</b>	Coagulase Negative Staphylococci
<b>CPIS</b>	Clinical Pulmonary Infection Score
<b>CRO</b>	Ceftriaxone
<b>CRP</b>	C-Reactive Protein
<b>CRT</b>	Capillary Refill Time
<b>CSF</b>	Cerebrospinal Fluid
<b>CTX</b>	Cefotaxime
<b>CUSPH</b>	Cairo University Specialized Pediatric Hospital
<b>CXM</b>	Cefuroxime

## List of Abbreviations

<b>D &amp; V</b>	Diarrhea and Vomiting
<b>DA</b>	Clindamycin
<b>D-Ala</b>	D-Alanine
<b>DNA</b>	Deoxyribonucleic Acid
<b>DO</b>	Doxycycline
<b>DRSP</b>	Drug Resistant <i>S pneumoniae</i>
<b>DVT</b>	Deep-Vein Thrombosis
<b>E</b>	Erythromycin
<b>E.coli</b>	Escherichia Coli
<b>ED</b>	Emergency Department
<b>erm</b>	Erythromycin ribosome methylase
<b>ESBL</b>	Extended -Spectrum $\beta$ -lactamase
<b>ESR</b>	Erythrocyte Sedimentation Rate
<b>ETT</b>	Endotracheal Tube
<b>FDA</b>	Food and Drugs Administration
<b>FEB</b>	Cefepime
<b>GASpharyngitis</b>	Group A Streptococcal Pharyngitis
<b>GN</b>	Gentamycin
<b>HBV</b>	Hepatitis B Virus
<b>HCP</b>	Health Care Personal
<b>Hib</b>	<i>Haemophilus influenzae</i> type b
<b>HIV</b>	Human Immunodeficiency Virus
<b>HPS</b>	Health Protection Scotland
<b>ICU</b>	Intensive Care Unit
<b>IDSA</b>	Infectious Diseases Society of America
<b>IHI</b>	Institute for Health Care Improvement
<b>ILs</b>	Interleukins
<b>IMLS<sub>B</sub></b>	Inducible Macrolide-lincosamide-streptogramin B
<b>IPM</b>	Imipenem
<b>IV</b>	Intravenous
<b>IVP</b>	Intravenous Pyelography
<b>KPC</b>	Klebsiellapneumoniae Carbapenemase
<b>LOS</b>	Length of Stay
<b>LPF</b>	Low-Power Field
<b>LPS</b>	Lipopolysaccharide
<b>LRT</b>	Lower Respiratory Tract
<b>MDR</b>	Multidrug Resistance
<b>Mec A</b>	Methicillin A
<b>Mec I</b>	Methicillin Inhibitor
<b>Mec R<sub>1</sub></b>	Methicillin Regulator
<b>MEM</b>	Meropenem
<b>MIC</b>	Minimum Inhibitory Concentration
<b>MLSB</b>	Macrolide-lincosamide-streptogramin B

## List of Abbreviations

<b>MMWR</b>	Morbidity and Mortality Weekly Report
<b>MODS</b>	Multiple Organ Dysfunction Syndrome
<b>MOTTS</b>	Mycobacteria Other Than Tuberculosis
<b>MRI</b>	Magnetic Resonance Imaging
<b>MRSA</b>	Methicillin-Resistant <i>Staphylococcus aureus</i>
<b>MSSA</b>	Methicillin-Sensitive <i>Staphylococcus aureus</i>
<b>NDM<sub>1</sub></b>	New Delhi Metallo- $\beta$ -lactamase-1
<b>NF</b>	Nuclear Factor
<b>NHS</b>	National Health Service
<b>NICU</b>	Neonatal Intensive Care Units
<b>NI</b> s	Nosocomial Infections
<b>NNIS</b>	National Nosocomial Infections Surveillance
<b>NP</b>	Nasopharynx
<b>OD</b>	Once Daily
<b>OP</b>	Oropharynx
<b>OPA</b>	Ortho-Phthalaldehyde
<b>OSHA</b>	Occupational Safety and Health Administration
<b>OX</b>	Oxacillin
<b>PALS</b>	Pediatric Advanced Life Support
<b>PBP</b>	Penicillin Binding Protein
<b>PCMX</b>	Para Chloro Meta Xylenol
<b>PCR</b>	Polymerase Chain Reaction
<b>PCT</b>	Procalcitonin
<b>PCV7</b>	Pneumococcal Conjugate Vaccine
<b>PED</b>	Pediatric Emergency Department
<b>PEEP</b>	Positive End Expiratory Pressure
<b>PICU</b>	Pediatric Intensive Care Unit
<b>PJP</b>	<i>Pneumocystis Jirovecii</i> Pneumonia
<b>PVL1</b>	Panton-Valentine leukocidin
<b>QID</b>	Four Times Daily
<b>RNA</b>	Ribonucleic Acid
<b>RNS</b>	Reactive Nitrogen Species
<b>ROS</b>	Reactive Oxygen Species
<b>RSV</b>	Respiratory Syncytial Virus
<b>SAM</b>	Ampicillin- Sulbactam
<b>SCF</b>	Sulperazon
<b>SIRS</b>	Systemic Inflammatory Response Syndrome
<b>SPSS</b>	Statistical Package for the Social Science
<b>SSSS</b>	Staphylococcal Scalded Skin Syndrome
<b>SXT</b>	Sulfamethoxazole-Trimethoprim
<b>TB</b>	Tuberculosis
<b>TEC</b>	Teicoplanin



## List of Abbreviations

<b>TID</b>	Thrice Daily
<b>TSS</b>	Toxic Shock Syndrome
<b>TSST-1</b>	Toxic Shock Syndrome Toxin-I
<b>TZP</b>	Piperacilina+Tazobactam
<b>UNICEF</b>	United Nations Children's Emergency Fund
<b>URT</b>	Upper Respiratory Tract
<b>USA</b>	United States of America
<b>UTI</b>	Urinary Tract Infection
<b>VA</b>	Vancomycin
<b>VAP</b>	Ventilator Associated Pneumonia
<b>VISA</b>	Vancomycin Intermediate <i>Staphylococcus aureus</i>
<b>VRE</b>	Vancomycin-Resistant Enterococcus
<b>VRSA</b>	Vancomycin Resistant <i>Staphylococcus aureus</i>
<b>VUR</b>	Vesicoureteral Reflux
<b>WBCS</b>	White Blood Cells
<b>WCC</b>	White Cell Count
<b>WHO</b>	World Health Organization

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*Introduction*  
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