Detection of resistance patterns among nosocomial urinary tract infection

Thesis

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LIST OF ABBREVIATION

• AmpC	β-lactamase (Class C)
• ASC	Active Surveillance Culture
• AZT	Aztreonam
• BAC	Benzalkonium chloride
• Cb	Carbacillin
• CDC	Centers for Disease Control
• Ceph	Cephaloridine
• CLSI	Clinical and Laboratory Standards Institute
• CMY	Class (C) β-lactamases active on cephmycin
• CNF1	Cytotoxic necrotizing factor 1
• CoNS	Coagulase-negative staphylococci
• CPC	Cetylpyridinium chloride
• CSU	Catheter sample urine
• CTAB	Cetyl trimethyl ammonium bromide
• CTX-M	Active on Cefotaxime
• CX	Cefotaxime
• DDS	Double disc synergisme
• DMF	Di-Methyl Forfamide
• DMSO	Di-Methyl sulphoxide
• DNP	Dinitrophenol
• EDTA	Ethylene diamine tetra acetic acid
• EPI	Efflux pump inhibitors
• EPS	Extra-cellular polymeric substances
• ESBLs	Extended spectrum β-lactamase
• GIM	German imipenemase
• GNB	Gram Negative Bacteria
• HCP	Hand hygiene, Standard and Contact Precautions
• ICU	intensive care unit
• IMP	active on Imipenem
• IP	Imipenem
• LB	Luria-Bretani
• LTCF	Long-term care facilities
• MBLs	Metallo-β-lactmase
• MDR-GNB	Multidrug resistance gram negative bacteria

• MDRO	Multidrug resistance organisms
• MIC	Minimum inhibitory concentration
• MR- VP medium	Methyl red – voges proskauer
• MRSA	Methicillin-resistant Staphylococcus aureus
• MSA	Mannitol salt agar
• MSSA	Methicillin sensitive Staphylococcus aureus
• NAG	N-acetylglucosamine
• NAM	N-acetyl muramic acid
• NAUTIs	Nosocomial acquired urinary tract infections
• NCCLs	National committee for clinical laboratory standards
• NICU	Neonatal intensive care unit
• NNIS	National Nosocomial Infection Surveillance
• NUTI	Nosocomial urinary tract infection
• Omp	outer membrane protein
• Oxa	Oxacillin
• OXA	Oxacillinase group of β-lactamases (Class D)
• PBPs	penicillin-binding-proteins
• PCR	polymerase chain reaction
• PER	pseudomonas extended resistant
• PFGE	Pulsed Field Gel Electrophoresis
• PG	peptidoglycan
• Pn	penicillin
• QRDR	qunilone resistance-determing region
• RAPD	Random amplified polymorphic DNA
• RND	Resistance nodulation division family
• SDS	Sodium dodecyle sulafate
• SHV	Sulphahydryl region variable
• SPA	Suprapubic aspirate
• SPM	Sao Paulo metallo beta lactmase
• SXT	Cotrimoxazole
• TAE	Tris acetic acid edta
• TE	Tris-edta
• TEM	Named after the patient (Temoneira)
• TSI	Triple sugar iron
• TSN	The Surveillance Network
• UPEC	Uropathogenic E.coli

• UTI	Urinary tract infection
• VF	Virulence factor
• VIM	Verona integron-encoded metallo-b-lactamase
• VRE	vancomycin resistance enterococci

ABSTRACT

Urinary tract infection (UTI) is the most common type of nosocomial infections, whereby urinary tract represents the main site for 40% of nosocomial infections . UTI can be associated with substantial morbidity and significant expenditure.

In relation to the antimicrobial susceptibility of the out- patients isolates, its clear that nitrofurantoin appeared to be the most effective antimicrobial agent against *E. coli* as 93.75% of *E. coli* isolates were susceptible to nitrofurantoin followed by ceftazidime as 76.5% *E. coli* were susceptible; while for other isolates including gram negative bacteria, *Staphylococci spp* and *streptococci spp* isolates ciprofloxacin and norfloxacin were the most effective antimicrobial agent comparative with the tested antimicrobial agent, as 100% of *klebsiella* isolates; and 78% of the total isolates were susceptible to the tested quinolone. While within the hoaspital isolates *E. coli* was responsible for 50% of urinary tract infection, followed by *klebsiella spp*. 30%, *P. aeruginosa* 10.5%, *S. aureus* 3.5%, *Proteus mirabilis 4.5%,* and *Acinetobacter baumannii 1.5%,* Also, infection more distributed in female than male 57%, 43% respectively.

Escherichia coli was also the commonest cause of nosocomial urinary tract infections (UTIs). It was responsible for 50% of infections, followed by *Klebsiella spp* 30%, *Pseudomonas aeruginosa* 10.5%, *Proteus mirabilis* 4.5%, *Acinetobacter spp*. 1.5% and *Staphylococci spp. 3.5%.*

Our data also showed a substantial reduction in susceptibility to antibiotics in hospital associated infection rather than that associated with community whereby, eleven isolates among the hospital isolates and none among the community isolates showed 100% resistance to the five tested antimicrobials and also to other antimicrobial classes with exception of amikacin which founded to be effective against the MDR-isolates.

Plasmid profile analysis of these isolates revealed that all of them harbor at least one plasmid. Plasmid curing revealed the role of plasmid in mediating both β-lactam and quinolone resistance resistances of those isolates. Molecular typing using random amplified polymorphic PCR prove the presence of nosocomial infection as it showed the responsibility of one isolate for infection among different patients.

INTRODUCTION

1- Introduction:

First of all, urinary tract infection (UTI) is the first type of nosocomial infections whereby urinary tract represents the main site for 40% of nosocomial infections; in addition, it is the second most common infectious presentation in community practice. Worldwide, about 150 million are diagnosed with UTI each year, costing the global economy in excess of 6 billion US dollars annually. Urinary tract infections (UTIs) can be associated with substantial morbidity and significant expenditure. Nosocomial UTI may lead to bacteremia with a subsequent mortality up to 30%**.** The single greatest risk factor for nosocomial UTI is urinary catheterization, approximately 10% of all patients will be catheterized during their hospital stay for a mean of four days. The risk of developing bacteriuria is about 5% for each day a patient is catheterized. Up to 20% of catheterized patients will develop bacteriuria and up to 6% develop symptoms of UTI; therefore, it is the reason behind having such an incidence rate.

An indwelling urinary catheter can predispose a patient to a UTI in several different ways. Trauma occurring during instrumentation and host factors such as advanced age, general debilitation or the postpartum state, may also predispose a patient to an infection**.** Additionally, urinary tract infections can be caused by both endogenous and exogenous transmission. Normal flora from the gastrointestinal tract can spread to the urinary tract, or pathogens can be transmitted by caregivers carrying out tasks related to the catheter or drainage bag**.** Consequently, pathogens are transmitted through urologic equipment that has not been adequately disinfected.

Microbiologically, nosocomial urinary tract infections are usually caused by gram-negative pathogens, the most common being *Escherichia coli*, *Proteus mirabilis*, *Klebsiella spp*., and *P. aeruginosa*, other causal pathogens include *enterococci* and *Enterobacter spp*. The morbidity associated with UTIs makes treatment of these infections a serious problem because when choosing an appropriate agent to combat these infections, there are several factors for clinicians to consider the drug of choice that should have good *in vitro* and *in vivo* activity against many of the organisms known to cause UTIs, and should be able to achieve high and prolonged concentrations in the urine and surrounding urinary tract tissues without loss of activity**.** Therefore, UTIs are often treated with different broad-spectrum antibiotics when one with a narrow spectrum of activity may be appropriate because of concerns about infection with resistant organisms.

The extensive use of antimicrobial agents has invariably resulted in the development of antibiotic resistance, which is, in recent years, has become a major problem worldwide. A current phenomenon of great concern in the medical community is the rise in multi-drug resistant organisms, which are defined as bacteria with simultaneous resistance to three or more different classes of antibiotics, patients infected with such organisms experience significantly higher rates of treatment failures', prolonging antibiotics usage, and morbidity associated with infections.