Antibiotic Susceptibility Pattern among Streptococcus pneumoniae Isolates

Thesis

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List of Abbreviations

ARMed.....Antibiotic Resistance Surveillance & Control in the Mediterranean Region

AST.....Antimicrobial susceptiblity test

CAP .....Community acquired pneumonia

CHD.....Coronary heart disease

CLSI .....Clinical and Laboratory Standards Institute

COPD.....Chronic Obstructive Pulmonary Disease

CPS.....Capsular Polysaccharide

CWPS.....Cell Wall Polysaccride

DD .....Disk Diffusion

DM.....Diabetes Mellitus

DNA .....Deoxyribonucleic Acid

DRSP .....Drug Resistant S. Pneumoniae

ELISA .....Enzyme-Linked Immunosorbent Assay

FDA .....Food and Drug Administration

HAP .....Hospital Acquired Pneumonia

HCB ..... Hospital Central da Beira

HIV .....Human Immunodeficiency Virus

HUS .....Hemolytic Uremic Syndrome

ICT .....Immunochromatographic Membrane Test

IDSA .....Infectious Disease Society of America

IPD .....Invasive Pneumococcal Disease

LA.....Latex Agglutination

LRT .....Lower Respiratory Tract

MALDI-TOF MS ....Matrix-Assisted Laser Desorption-Ionization Time-Of-Flight Mass Spectrometry

List of Abbreviations

MDR .....Multidrug Resistant

MHA .....Muller Hinton Agar

MIC.....Minimal Inhibitory Concentration

MLSb .....Macrolide, Lincosamide, Streptogramines

PBP.....Penicillin Binding Protein

PCR .....Polymerase Chain Reaction

PCV .....Pneumococcal Polysaccharide Conjugate Vaccine

PERCH .....Pneumonia Etiology Research for Child Health

PPSV.....Purified Pneumococcal Polysaccharide Vaccine

PRP.....Penicillin Resistant S. Pneumoniae

S. Pneumoniae.....Streptococcus Pneumoniae

S. viridans.....Streptococcus Viridans

SMG.....Streptococcus Mitis Group

SXT .....Trimethoprim-Sulphamethoxazole

UTI .....Urinary Tract Infection

VGS .....Viridans Group Streptococc

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Abstract

Streptococcus pneumoniae is the leading cau1se of community-acquired pneumonia around the world and in Severe pneumococcal disease is associated with a high mortality in adults. Antimicrobial resistance of S. pneumoniae against the most commonly used antimicrobial drugs is increasing worldwide, principally affecting β-lactam, macrolide and sulfonamide sensitivity. β-lactam antibiotics، and penicillin in particular, are amongst the most widely used antimicrobial drugs for empirical treatment of pneumonia 1. Evaluation of antimicrobial resistance of S. pneumoniae is fundamental to guide the empirical treatment of PID, as well as to encourage reflections to support immunization policies2 .

This study was done on 50 strptococcus pneumoniae isolates recovered from samples referred to the Central Microbiology Laboratory, Ain Shams University Hospitals, for routine culture and sensitivity. the mean value of their ages was 45.8+-16.3. they were 37 males and 13 females. antibiotic susceptibility test was done by disk diffusion method and viktek method.there was a significant association between the disk diffusion method and vitek method (p=0.022) except for penicillin .

In this study the resistance rate of MDR isolates by vitek method was (16/50) 32% .the percentage of PRP was (19/50) 38%. The percentage of MLSb is (8/50) 16%. the percentage of vancomycin resistant S.pneumonia was (6/50) 12%.

Keyword: Antibiotic, Streptococcus pneumonia, Clinical Pathology

INTRODUCTION

Streptococcus pneumoniae (*S.pneumoniae*) is a leading cause of invasive and noninvasive bacterial pneumonia, meningitis, and sepsis in infants, children, and adult worldwide. However, many countries lack national estimates of disease burden. To support local and global policy decisions on pneumococcal disease prevention and treatment, country-specific incidence of serious cases and deaths was estimated in children younger than 5 years. *S. pneumoniae* causes around 11% of all deaths in children younger than 5 years. Child mortality reduction can be accelerated by prevention and treatment of pneumococcal disease, especially in regions of the world with the greatest burden ***(Kumar, 2015).***

Although there are varieties of antibiotics for treatment of (*S. pneumoniae*), but the pneumococcal multidrug resistance (MDR) has become a serious concern in the treatment of invasive pneumococcal diseases globally ***(Song and Wayne, 2013).*** The percentage of multidrug-resistant strains have reached up to 95.6% ***(Kim et al., 2012; Song and Wayne, 2013).***

Globally the percentage of *S. pneumoniae* resistant strains is 100% for erythromycin and cotrimoxazole, 86.9% for clindamycin, 82% for cefuroxime, 42,6% for penicillin, 36.1% for meropenem, 18% for ceftriaxone, and 13% for cefotaxime ***(Liu et al. (2013).***

A retrospective multicenter study conducted in 5 hospitals in Egypt revealed an increase in penicillin resistance (37%), and little resistance to ceftriaxone (84% susceptible) and ciprofloxacin (82% susceptible) among CSF isolates ***(El Kholy et al., 2003).***

Another sentinel meningitis surveillance program showed a marked increase in penicillin resistance (50%) among CSF isolates in Egypt ***(Wasfy et al., 2005).***

Also***, Afifi et al. (2007),*** reported high rates of multidrug resistance (MDR) in *S. pneumoniae,* reached 8 out of the 206 isolates tested (4%).

Additionally, a surveillance report of the Antibiotic Resistance Surveillance & Control in the Mediterranean Region (ARMed) project which started in 2003 and continued for 2 years in the southeastern Mediterranean, reported 30% penicillin resistance and 25% erythromycin resistance among the *S. pneumoniae* Egyptian isolates ***(Borg et al., 2009).***

Generally, serotype 19A seemed to have a higher resistance rate than other serotypes. Serotype 19A is not a serotype that is covered by the pneumococcal conjugate vaccine (PCV-7), which should be of concern. Studies in many countries have shown that use of PCV-13 decreased the overall incidence of invasive pneumococcal disease (IPD) among children ***(Weil-Olivier et al., 2012).***

Extensive studies are required to continually update antimicrobial susceptibility patterns. The unregulated use of antibiotics in developing countries is common, stressing the importance of surveillance for antibiotic resistant pathogen to guide empirical treatment ***(Borg et al., 2009).***

For *S. pneumoniae* isolated from CSF, penicillin, cefotaxime, ceftriaxone and meropenem should be tested by a reliable Minimal inhibitory concentration (MIC) method. Such isolates can also be tested against vancomycin using the MIC or disk diffusion. For non-meningitis isolates oxacillin zone or penicillin (MIC) can predict susceptibility to β-lactams. Inducible clindamycin resistance can be detected by disk diffusion using the D-zone test or by broth microdilution using the single-well test (containing both erythromycin and clindamycin) ***(Clinical and Laboratory standards Institute "CLSI", 2017).***

Aim of the Work

The aim of this work is to detect the antibiotic susceptibility pattern among *S. pneumoniae* isolates which recovered from clinical samples referred to the Central Microbiology Laboratory, Ain Shams University Hospitals.