A report on Pathogens and its clinical significance

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Infection are caused by various pathogenic microorganisms, if not cured or prevented can cause mortality and morbidity in human. The infection can be spread through different sources like animal, agriculture, environment. Generally to treat infections antibiotics are given primarily to the patients which either kill or inhibit the pathogens in clinical settings.

Nowadays antibiotic resistance has become the major threat globally and a socioeconomic challenge to the health care industries. The antibiotic resistance arise due to inappropriate use of drugs, overuse of antibiotics and through nosocomial infections.

On the basis of different bacterial strains the mechanism of antimicrobial resistant has been classified chromosomal mediated resistance, plasmid mediated resistance and combination of both resistance mechanism these mechanism covered resistance to various drugs named as b-lactams, quinolones, aminoglycosides, tetracyclines, folate pathway. 3RNA-mediated mechanisms is also the factor which lead to antibiotic resistance, including drug uptake, active drug efflux, drug target modifications, biofilms, cell walls, and lipopolysaccharide (LPS) biosynthesis. 4

Last but not the least plasmid plays a major role in the mechanism of resistant and there are many common plasmid which may lead to horizontal exchange if gene among the hospital pathogen 2 The genes regulation also having important role in the mechanism of antimicrobial resistance. T3S (Type three secretion system) plays an important role in pathogenesis of Pseudomonas aeruginosa and others bacteria also these T3S intoxicate host innate immune cells that is macrophages and neutrophils and prevent the bacteria from phagocytosis which lead to dissemination from the site and persistence of bacteria.

As, per WHO report there are many pathogens which showed resistant to many antibiotics and the mechanism of resistance adopted by them will help the researchers to emphasis on discovery of new antibiotics, against Enterococcus faecium, S. aureus, Klebsiella pneumonia, Acinetobacter baumannii P.aeruginosa and Enterobacter spp. Collectively termed as ESKAPE, which is group of Gram positive and Gram negative bacteria and are the major cause of nosocomial infection. The nosocomial infection are the most commonly occur in Urinary tract, surgical sites and blood stream infections. In hospital, patients which are immune-compromised are more susceptible to Nosocomial infections. Both Gram positive bacteria and Gram negative bacteria are responsible for hospital acquired infection includes methicillin-resistant Staphylococcus aureus (MRSA), vancomycin-resistant enterococci (VRE), Streptococcus pneumonia, Enterobacteriaceae, , and AcinetobacterA as, per global scenario it has been
seen that Gram positive bacteria are most common seen in western world in comparison to India and Asia Pacific region. In most of the studies it has been shown that the ESKAPE pathogens are causing more blood stream infection as comparison to the Non –ESKAPE pathogens which leads to the high mortality rate and the care of cost is directly proportional to the pathogenesis. One of the commonest Gram negative antibiotic resistant bacteria which is leads to highly mortality rates is Pseudomonas aeruginosa which causes nosocomial infection, infection in wounds and burns and catheter associated urinary tract infection. Acinetobacte baumannii is one of the opportunistic bacteria which is causing nosocomial infection and is the pathogen included in ESKAPE pathogen. This bacteria causes pneumonia, ventilator-associated pneumonia, bacteremia, surgical wound site infections, skin and soft tissue infections, meningitis, intra-abdominal abscesses, and urinary tract infections. A. baumannii and P. aeruginosa are more frequently become resistant to used many antibiotics also known as multi-drug resistance (MDRs), the major cause leading to MDR is self-drug prescription by patients and poor awareness, efflux pump, Target site mutation, drug permeability. These organisms consistently “escape” the effects of commonly used antibiotics and are a critical threat to public health and hospital care units. The infection caused by ESKAPE pathogens are difficult to treat due to the high rate of antimicrobial resistance (AMR) but one of systematic review shows that it’s not compulsory that ESKAPE pathogens are always AMR, but it’s usually associated with significantly higher economic burden. As there is a burden of multi drug resistance (MDR), Pan Drug Resistance PDR, EDR is increasing rapidly the first thing which can be done by the researcher is to collect the data to show which ESKAPE pathogens are on higher rate to cause nosocomial infection, out of the data collected which of the pathogens are XDR, MDR and PDR by using the antimicrobial Susceptibility test, once these resistant bacteria has been identified there is the most important thing need to know the mechanism of the bacteria how it is getting resistant so, that the new therapies can be developed to reduce this resistant bacterial burden. Soon, it is likely that no treatment options will be available for the “ESKAPE” pathogens, which comprise Enterococcus faecium, S. aureus, Klebsiella pneumoniae, Acinetobacter baumannii, P. aeruginosa, and Enterobacter spp.

To reduce the burden of AMR, the researchers have developed many of the substitute therapy so that the infections can be treated caused by the Acinetobacter baumannii several drugs are used and this bacteria is also MDR, so the Minocycline is the drug used against the Multidrug resistance in Acinetobacter. One of the therapy named as antilock therapy reduced the burden LTCV infection caused by MDR pathogen named as Staphylococcus. Aureus in cancer patient. The common therapy used against AMR is combinational therapy, inhalation combination therapy of ceftazidime and combination with inhaled amikacin was used to treat carbapenem resistant Acinetobacter baumannii and P. aeruginosa.
Government plans for new drug development with novel mechanism of action to encounter the emergence of drug resistance are under trials so, that the burden of AMR can be reduced. Systematic review was published by in 2019 and the data collected by them shows that the government policy which has been used in various field are the best way to reduce AMR.

References


