A Study on Antibiotic resistance in southern state of India

1. INTRODUCTION

Antibiotics are used to treat infectious diseases, and the term antibiotic resistance refer to resistance developed by an organism due to misuse and negligence in antibiotic usage. The antibiotic resistance has attained top priority in developed country as well as in developing country due to rapid spread of organisms from one part of the world to another (Day M et. al. 1998).

The increasing availability of life-saving antibiotics in the developing world and lack of antibiotic regulation has become a concern around the globe. The overuse of these drugs is creating resistant strains of deadly bacteria. Thus even after all the advances in therapeutics and the availability of a large number of antibiotics, a person can die due to infection with resistant bacteria (Goldmann DA et. al. 1996).

There are many factors that could contribute for the increase in antibiotics resistance in developing countries, like combination of a heavy disease burden, huge populations, and rapid spread through crowding, poor sanitation and inappropriate use of the available drugs. This is further complicated by the availability of antibiotics in open markets without proper prescriptions in majority of these countries. Many a time, the amount of antibiotics given is inadequate to treat serious infections due to poverty or lack of education (Kounteya Sinha. 2014).

As India is placed under developing country with huge population, hence higher incidence of infectious disease can be observed when compared to the rest of the world, so there by consumption of huge amount of antibiotics takes place, which may be either prescribed or directly purchased from a pharmacy to fight the infections. The antibiotic thus taken is adding to antibiotic resistance in bacteria (Gustafson RH et. al. 1997).

As per a report published by scientists from Princeton University, which states that India’s antibiotic consumption has gone up by 62%, the use went up from eight billion units in 2001 to 12.9 billion units in 2010 putting India as the world's largest consumer of antibiotics (Kapil A. 1998). Thus the chances of developing resistance
also will go up many folds, hence indicating the need for the study of antibiotic resistance.

The resistance developed by the Bacteria may be due to the result of chromosomal mutation or by exchange of genetic materials, which carry resistance genes, through transformation, transduction or conjugation by plasmids (Kaplan JM et. al. 1990).

The mechanism of resistance to antimicrobial agents can be due to non-permeability of the drug, alteration in target molecules, enzymatic drug modifications, and lactamase family of enzymes, resulting in a microbiologically ineffective compound (Kunin CM et. al. 1973).

The microorganism may attain resistance due to chromosomal mutations or genetic transfer or due to both. The resistance thus attained are called as transferable resistance, it possesses a great threat as it can spread rapidly or the genetic change will be carried forward. This transferable resistance is carried on the R plasmids. A single plasmid can carry a number of genes coding leading to multiple drug resistance, finally causing ineffectiveness to the particular class of antibiotic drugs (Kunin CM. 1993).

The resistant microorganism is becoming a major concern due to the use of antibiotic itself, which is responsible for rise in resistant strain of in the pathogenic bacteria. Such development may be due to the following contributing factors:

1. Lack of education: The combination of poverty and ignorance leads to resistance development as people take antibiotic without prescription or due to inability to purchase adequate quantity of antibiotics or to pay a physician’s fees due to poverty (Levy SB. 2001).

2. Nosocomial infections: also called “Hospital acquired infection”, can be defined as an infection acquired in hospital by a patient who was admitted for some other reason at the time of admission. Factors promoting infection in hospitals are; decreased immunity among patients, the increasing variety of medical procedures and invasive techniques creating potential route of infection; and the transmission of multi drug resistant bacteria from the crowded hospital populations, where poor infection control practices are followed. The virulence of the microorganism, susceptibility of the patient,
environmental settings and the resistance of the organism are the important factors influencing the development of infection. The most commonly observed nosocomial infections are urinary tract infection followed by surgical site infection and nosocomial pneumonia (Neu HC 1992 & Opal SM et. al. 2000).

3. Use of antibiotics in agriculture or aquaculture: Antibiotics are used widely in agriculture and aquaculture for therapeutic, prophylactic and growth promoting purposes. During the process some antibiotic remains in the flesh of the animals which in turn leads to human exposure. Top of that the presence of low levels of antibiotics may escalate resistant bacteria in the intestines of animals intended for human consumption. Also some time animals get contaminated with faecal bacteria during the slaughter process leading to contaminated meat reaching the consumer (Rice LB, Bonomo RA 1996). Also there are reports of antibiotics resistant bacteria on fruits and vegetables which may be cultivated and collected near sewage or a sewage mixed soil it’s also known that some cultivators use antibiotics directly on fruit and vegetable crops (Ganguly NK 2011).

4. Environmental factors: A study in different parts of the world revealed the alarming situation of presence of antibiotic resistant bacteria in fresh water. These organisms in nature would have resulted contamination of soil by antibiotics used in animals, plants or from the waste products of treated animals or humans. These organisms may get transferred into rivers and other fresh water sources through waste disposal system or by drainage or rain water from farm land (Willis C et. al. 1999).

5. Use in household products: the use of antimicrobial agents to clean the house in one or the other way is similar to that of antibiotics, which indirectly tends to rise resistant strains of microorganism (Willis C 2000).

The situation in India also follows the above criteria with little or no access to health care facility, access to drugs, health expenditure and poverty, poor sanitation (including waste disposal) condition in hospitals leading to nosocomial infections (Gustafson RH & Bowen RE 1997).
In the year 2009 about 65% of Indians did not have reliable access to essential medicines, compared to 30% of people worldwide, but the situation has drastically changed by the year 2010, where the Indians are able to access antibiotics which might be both appropriate and inappropriate leading to increased drug resistance.

Another major challenge is the absence of a good monitoring or surveillance system for prescription and dispensing practice involving antibiotics in India, where many pharmacies are not owned or run by qualified pharmacists. Thus the problem of malpractice takes place in drug dispensing, for financial gains, leading to supply of antibiotics along with other drugs without prescription (Gustafson RH & Bowen RE 1997).

Thus it becomes important for us to appropriately use antibiotics with keeping in mind the safety and efficacy of antibiotic, it will be also important to observe antibiotic resistance in a particular region and prescribe antibiotics with maximum effectiveness as per the culture report obtained from the laboratory.