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A Retrospective study on culture and sensitivity test: Devastating rising of antibiotics resistance reported

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ABSTRACT: Throughout the developed work there is public and governmental concern about the increasing prevalence of antibiotics resistance in bacteria that cause disease in humans. There is a worry that many antibiotics currently available to treat human disease will no longer be effective. This ineffectiveness is expected to lead to difficulties in treating some human infections as well as increasing health costs. There is a parallel concern that the development of resistance among bacteria is being outstripped by the ability of the pharmaceutical industry to develop new antibacterial agents. To find out the present status of antibiotic resistance in Chittagong city we conducted a retrospective study on the culture report from September 2012 March 2012 on a population of 287 reports. The total population was divided into six equal groups. It was found that only 9% of the total population was sensitive to all antibiotics under study. The rest 91% were resistant to at least one antibiotic. Tetracycline is one of the most commonly used antibiotics. It was found that among the population 40% patient were resistant to tetracycline.

Key words: Antibiotics resistance, Retrospective study & Tetracycline.

INTRODUCTION

Microbial resistance to antibiotics is a global issue that amounts to what some health professionals consider a crisis. This is reflected in the stand taken by the World Health Organization (WHO) in its world health report statement (WHO 1998). Drug resistance is an example of evolution in microorganisms. Individuals that are not susceptible to the drug effects are capable of surviving drug treatment, and therefore have greater fitness than susceptible individuals. By the process of natural selection, drug resistant traits are selected for in subsequent offspring, resulting in a population that is drug resistant [1, 2].

Multiple drug resistance

Multiple drug resistance or Multidrug resistance is a condition enabling a disease-causing organism to resist distinct drugs or chemicals of a wide variety of structure and function targeted at eradicating the organism. Organisms that display multidrug resistance can be pathologic cells, including bacterial and neoplastic (tumor) cells. [3]

Antibiotic & Bacterial resistance to antibiotics

Antibiotics are the subgroup of anti infective that are derived from bacterial sources and are used to treat bacterial infection. So it has tremendous effect against bacterial disease. Various microorganisms have survived for thousands of years by their ability to adapt to antimicrobial agents. They do so via spontaneous mutation or by DNA transfer. It is this very process that enables some bacteria to oppose the assault of certain antibiotics, rendering the antibiotics ineffective. These microorganisms employ several mechanisms in attaining multidrug resistance:

- No longer relying on a glycoprotein cell wall

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- Enzymatic deactivation of antibiotics
- Decreased cell wall permeability to antibiotics
- Altered target sites of antibiotic
- Efflux mechanisms to remove antibiotics [4]
- Increased mutation rate as a stress response [5]

Many different bacteria now exhibit multidrug resistance, including staphylococci, enterococci, gonococci, streptococci, salmonella, Mycobacterium tuberculosis and others. In addition, some resistant bacteria are able to transfer copies of DNA that codes for a mechanism of resistance to other bacteria, thereby conferring resistance to their neighbors, which then are also able to pass on the resistant gene.

Possible way of drug resistance

Antibiotic	Mode of action
Chloramphenicol	Reduced uptake into cell
Tetracycline	Active efflux from the cell
β-lactams, Erythromycin, Lincomycin	Eliminates or reduces binding of antibiotic to cell target
β-lactams, Aminoglycosides, Chloramphenicol	Enzymatic cleavage or modification to inactivate antibiotic molecule
Sulfonamides, Trimethoprim	Metabolic bypass of inhibited reaction
Sulfonamides, Trimethoprim	Overproduction of antibiotic target (titration)

Tetracycline

Tetracyclines are a group of broad-spectrum antibiotics whose general usefulness has been reduced with the onset of bacterial resistance. Tetracycline inhibits cell growth by inhibiting translation. It binds to the 16S part of the 30S ribosomal subunit and prevents the amino-acyl tRNA from binding to the A site of the ribosome. The binding is reversible in nature. Cells become resistant to tetracycline by at least three mechanisms: enzymatic inactivation of tetracycline, efflux, and ribosomal protection. Inactivation is the rarest type of resistance, where an acetyl group is added to the molecule, causing inactivation of the drug. In efflux, a resistance gene encodes a membrane protein that actively pumps tetracycline out of the cell. This is the mechanism of action of the tetracycline resistance gene on the artificial plasmid pBR322. In ribosomal protection a resistance gene encodes a protein which can have several effects depending on what gene is transferred. Six classes of ribosomal protection genes/proteins have been found, all with high sequence homology suggesting a common evolutionary ancestor.

Possible mechanisms of action of these protective proteins include:

1. blocking tetracyclines from binding to the ribosome,
2. binding to the ribosome and distorting the structure to still allow t-RNA binding while tetracycline is bound, and
3. binding to the ribosome and dislodging tetracycline.

All of these changes to ribosomes are reversible (non-covalent) because ribosomes isolated from tetracycline resistant and susceptible organisms both bind tetracycline equally well *in vitro*.

The study was conducted to see the culture and sensitivity test of different antibiotics for different group of patients.

MATERIALS AND METHODS

Retrospective Study

Subjective

The study was conducted over a population of 287. The antibiotics under survey included Cephradine, Ceftazidine, Ceftriaxone, Tetracycline, Nitrofurantoin, Nalidixic acid, Ciprofloxacine, Pefloxacine, Gentamycine. The data of culture and sensitivity test over the

period of September to 2011 to March 2012 were collected from different diagnostic centre in Chittagong for retrospective study.

Inclusion criteria

Age limit: From 0-90 years.

Frequently tested antibiotics were included in the study.

Bacterial sample from only urine, blood and pus were included.

Patient resistant to at least one antibiotic is considered as resistant patient.

RESULTS & DISCUSSION

The study was conducted over a population of 287 where 91% patients were found to be resistant to at least one group of antibiotic & only 9% sensitive to all the antibiotics (Figure-1). The antibiotics under survey included Cephradine, Ceftazidine, Ceftriaxone, Tetracycline, Nitrofurantoin, Nalidixic acid, Ciprofloxacine, Pefloxxacine, Gentamycine.

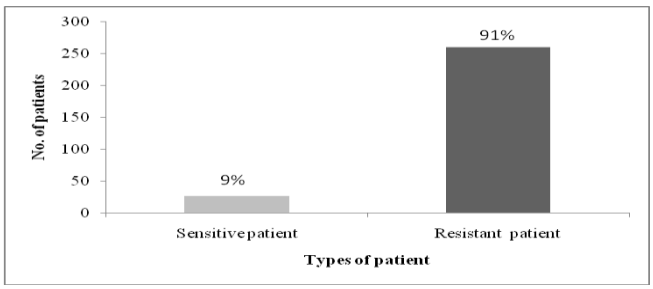

Figure 1: The bar diagram portray that only 9% patients are sensitive to all the antibiotics included in this study & 91% patients were resistant to different group of antibiotic.

Number of patient resistant to different groups of antibiotics

From the 287 Culture and sensitivity test report it was found that 27 patient were sensitive to all of the following antibiotics. The rest of the population were resistant to at least one antibiotic. 171 patients were found resistant to Cephradine, 56 patients were found resistant to Ceftazidine, 92 patients were found resistant to Ceftriaxone, 113 patients were found resistant to Tetracycline, 37 patients were found resistant to Nitrofurantoin, 156 patients were found resistant to Nalidixic acid, 127 patients were found resistant to Ciprofloxacin, 132 patients were found resistant to Pefoxacin and 37 patients were found resistant to Gentamycine. (Figure 2)

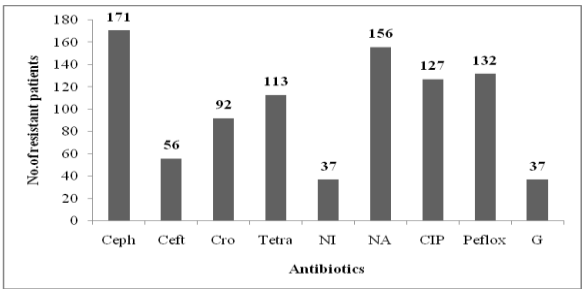

Figure 2: The bar diagram give a picture of - **number of patient resistant to different groups of antibiotics. Here, Ceph:**Cephalexin, **CEFT:**Ceptazidine, **CRO:** Ceftriaxone, **Tetra:** Tetracycline**, NI:** Nitrofurantoin, **NA:** Nalidixic acid, **CIP:**Ciprofloxacilin, **PEF:** Pefloxacillin, **G:**Gentamycine.

Different age groups and number of resistant patients

We had categorized the total population into six groups depending on their age by dividing the age range into six equal groups and find out the prevalence of antibiotic resistance in different age group-result illustrated in figure-3.

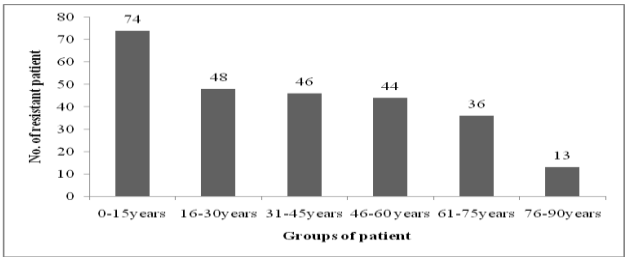

Figure 3: The relationship between different age groups & number and percent of resistant patients**.** It was found that in the group 0-15 yrs 28% patients were resistant to at least one antibiotic, in the group 16-30 yrs 18% patients were resistant to at least one antibiotic, in the group 31-45 yrs 18% patients were resistant to at least one antibiotic, in the group 46-60 yrs 17% patients were resistant to at least one antibiotic, in the group 61-75 yrs 14% patients were resistant to at least one antibiotic, in the group 76-90 yrs 5% patients were resistant to at least one antibiotic.

Culture and sensitivity test of tetracycline

Among the all antibiotics resistant history we predominantly focused in this study on culture and sensitivity test of tetracycline-to see the pattern tetracycline resistant among the general population.

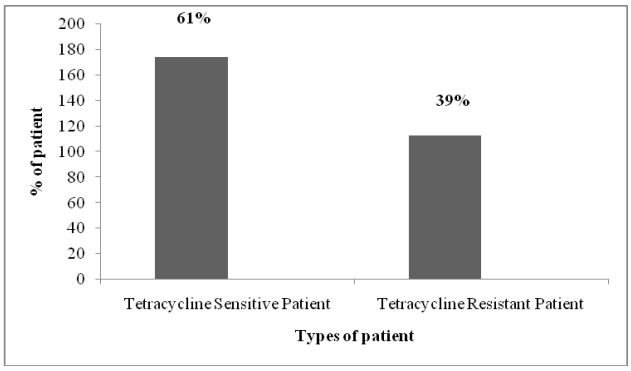

Figure 4: It is observed that 61% patients are sensitive & 39% patients are resistant to tetracycline.

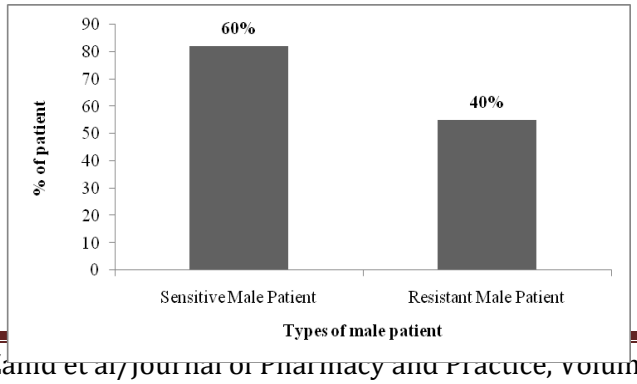

Figure 5: It is observed that among the whole male population, 40 % male patient are tetracycline resistant.

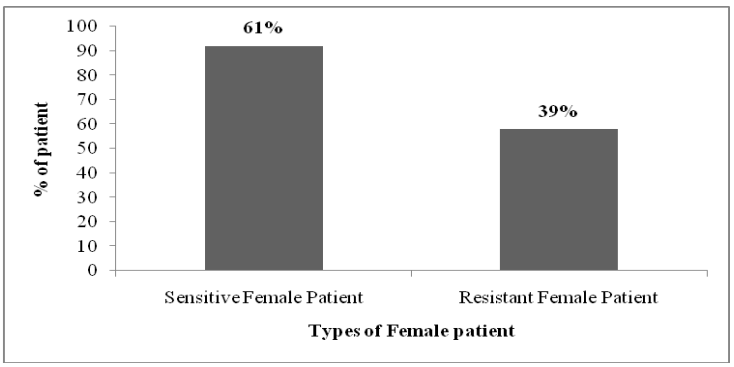

Figure 6: It is observed that among the whole female population 39% patient are tetracycline resistant.

Tetracycline antibiotic resistant male and female patient

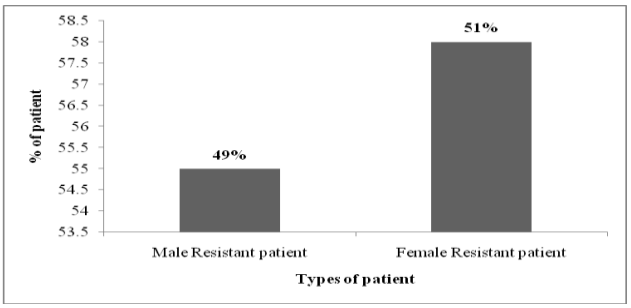

Figure 7: among tetracycline resistant patient 49% are Male & 51% patients are female. It was observed male and female both

comparatively resistant to tetracycline but female are more resistant than male.

CONCLUSION

From the present study it can be concluded that, the percentage of resistant people (91%) is very alarming. It was found that maximum amount of resistant person belong to the age group 0-15 yrs. So people are becoming resistant in very early ages. Some neonates were also found to be resistant. This indicates that resistance may be transferred from mother to the infant. Greater concern should be given to this. Females from their early age must be very much cautious in using antibiotics. To control the present status of antibiotic resistance, we must now focus on the proper diagnosis. As there was no communication with the patients, actual causes of resistance were unknown. As the sample size is very small, further study is necessary to find out actual status of antibiotic resistance in Bangladesh.

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