The Chittagong Univ. J. B. Sci.,Vol. 4(1 &2):165-168 , 2009.

SHORT COMMUNICATION

IMPACT OF HOSPITAL WASTES IN THE DEVOLOPMENT OF ANTIBIOTIC RESISTANT BACTERIA IN CHITTAGONG.

The spread of microbial drug resistance is a global public health challenge, which impairs the efficacy of antimicrobial agents and results in substantial increased illness and death rates and healthcare-associated costs *(*Byarugaba 2004, World Health Organization Report 2000, 2001). In low-resource countries, the extent and the impact of the phenomenon tend to be even larger than in industrialized countries. In fact, high resistance rates have often been reported in surveillance studies dealing with clinical isolates *(*Byarugaba 2004, Okeke *et al*. 1999, Shears 2001) Moreover, in low-resource countries the impact of antimicrobial drug resistance on illness and death rates tends to be greater because of the high prevalence of bacterial infections and the major role of antimicrobial agents in combating infectious diseases *(*Byarugaba 2004, World Health Organization 2001, Okeke *et al*. 1999, Col 1987, O'Brien 1992). The high antimicrobial drug resistance rates observed in low-resource countries are likely due to a combination of several factors, among which irrational antimicrobial drug use and conditions of poor sanitation are thought to play a major role, even if the relative importance of additional factors remains unclear *(*Byarugaba 2004, Okeke *et al*. 1999, Bartoloni *et al*. 2006, Walson *et al*. 2001).

Exposure to antibiotics at sub lethal doses can cause resistance development to certain bacteria. Because of huge numbers of patients are taking treatments in the hospitals, antibiotic use is extensive in these places. So, the bacteria are easily exposed to the antibiotics in the body of the patients and become resistant. Moreover, antibiotics are partially digested in human intestine and excreted through urine and faeces. For this, the sanitary tanks where the excreta are accumulated become a prime place for resistance development among bacteria. If not disposed properly, these wastes can contribute to the spread of microorganisms including various infectious bacteria, harmful pathogens, and most alarmingly antibiotic resistant bacteria. It is very much alarming in view of the fact that the resistance is transferable. So if the resistant bacteria are allowed to distribute in the environment they will most likely transfer the genotype to other bacteria of same species or different. Considering the above facts an attempt was made to observe the impact of Chittagong medical college hospital in the development of antibiotic resistant bacteria.

Samples were collected from Chittagong Medical College (CMC) hospital. In various ward of the hospital, the hospitalized patients released their discharges (stool, urine, etc.) in the toilet. From toilet these wastes passes through

a pipe into a septic tank.From septic tank these wastes are passing through an underground pipe in to a drain which is located at the back side of the hospital. From this drain, wastes passes in a second drain which is located out side of the hospital. From these drain the wastes passed to the different drain of the surrounding environment. These work based on the wastes of hospital patients to evaluate the effect of patients' wastes in the development of microbial resistance in the environment. So the hospital waste samples (sample1, sample2, sample3 and sample 4) were collected according to the wastes position.

Non medical Sample (sample5) was collected from the septic tank of Ala-ul- Hall of Chittagong University. About 500 students live in this hall. This sample was collected for comparing occurrence of antibiotic resistance in hospital sample with non hospital sample.

Ciprofloxacin (500 mg tablet) Antibiotic was taken in sterile distilled water in such an amount that the final concentration would be 10mg/ml (such as 0.1g in 10ml). The solution was mixed thoroughly. The product antibiotic (capsules/tablets) mixture might contain suspended particles and it was not water clear. The solution was then sterilized by milipore filter. Then the filtered solution was dispensed into different sterile screw-cap tubes. The tubes were then stored at 4^{o} C temperature in the refrigerator.

Total viable count was determined by pour plate method. In case of with *antibiotic* ciprofloxacin was added in to agar media before poured in to the plates.

Chittagong Medical College Hospital (CMCH) is the biggest hospital in Chittagong city. Ciprofloxacin is used as a fourth generation antibiotic in the wards Gyniatrics, Surgery and Orthopadics, Medicine, Heart and General ward. So, Ciprofloxacin resistant bacteria are most likely to be found in the wastes from the block containing these wards.The excreta disposal systems of CMCH is very poor. It has the direct connection with the Municipal sewage system, which travels whole through the city and falls into a canal and finally in the Karnafuli river.Thus there is a very favourable condition for distributing ciprofloxacin resistant bacteria throughout the city. Numerous Gram negative bacteria have the possibility of being transformed to resistance against ciprofloxacin everyday and is being distributed to the city through water from the CMCH wastes.

Occurrence of ciprofloxacin resistance in hospital waste samples (sample 1, 2, 3 & 4) were found too high than non hospital sample (sample 5). In sample 1, 12% bacteria were found resistant to ciprofloxacin .In sample 2, 1% isolated bacteria were found to be resistant to ciprofloxacin. In sample 5, only 0.0002% bacteria showed resistant against ciprofloxacin (Table 1). This high occurrence of ciprofloxacin resistance might be the result of extensive use of

ciprofloxacin antibiotic among hospital patients. The emergence of antibiotic resistant bacteria in hospital wastes may be due to their flourish in the patient's intestines, or increasing use or misuse of the particular antibiotics against which the resistance developed (Blondeau *et al*. 1996, Acar *et al*. 1997, Richard *et al*. 1994).

TABLE 1: BACTERIAL COUNTS OF FIVE SAMPLES WITH AND WITHOUT ANTIBIOTICS (CIPROFLOXACIN).

Sample Number	Total Viable Count	Total Resistant Bacterial Count	Percentage of resistance
1	1.14×10^8	1.54×10^7	12
2	5.20×10^7	7.52×10^4	1
3	1.41×10^7	8.20×10^3	0.06
4	9.20×10^6	9.33×10^3	0.10
5	5.20×10^7	9.80×10	0.0002

It is very much alarming in view of the fact that the resistance is transferable. So if the resistant bacteria are allowed to distribute in the environment they will most likely transfer the genotype to other bacteria of same species or different. The occurrence of ciprofloxacin resistant bacteria from sample 1, 2, & 3 indicated that ciprofloxacin resistance spread in and around Chittagong Medical College that might be a serious environmental hazard.

Simple improvements in public health measures can go to a long way towards preventing infection. Such approaches include more frequently hand washing by health–care workers, quite identification and isolation of patients with drug-resistant infections, and improving sewages systems and water purity in developing nations . The basic principle is to avoid using antibiotics unnecessarily i.e. case of curing common flu or viral diseases. Presently there is no national guideline for using antibiotics. Actually to counter the potential problem we should be, at first strictly specific. We should use the most specific antibiotic with proper dose. Some suggestions could be made as: we should talk with the health care provider about antibiotic resistance, a patient should be treated by a registered doctor, a patient should ask the doctor whether an antibiotics is likely to be beneficial for his /her illness, some of the antibiotics should not be saved for the next time we get sick, an antibiotic that is prescribed for someone else should not be taken, unused antibiotics should never be kept and saved and we should never share antibiotics with the family and friends. It will do more harm than good. We should remember that partial solutions are better than none and most importantly prevention is better than cure.

REFERENCES

ACAR, J.F. AND GOLDSTEIN, F.W. 1997. Trends in bacterial resistance to fluoroquinolones. *Clin Infect Dis.***24**:67-73.

BARTOLONI, A., BENEDETTI, M., PALLECCHI, L., LARSSON, M., MANTELLA, A. AND STROHMEYER, M. 2006. Evaluation of a rapid screening method for detection of antimicrobial resistance in the commensal microbiota of the gut. *Trans R Soc Trop Med Hyg.* **100**:119–25.

BLONDEAU, J.M. AND YASCHUK Y. 1996. Canadian ciprofloxacin susceptibility study. Comparative study from 15 medical centers. *Antimicrob Agents Chemother.* **40**:1729-32.

BYARUGABA, D.K. 2004. A view on antimicrobial resistance in developing countries and responsible risk factors. *Int. J. Antimicrob Agents.***24:**105–10**.**

COL, N.F. AND OCONNOR, R.W. 1987. Estimating worldwide current antibiotic usage: report of Task Force 1. *Rev Infect Dis.* **9**:232–43.

O'BRIEN, T.F. 1992. Global surveillance of antibiotic resistance. *N Engl J Med.* **326**:339

OKEKE, I.N., LAMIKANRA, A. AND EDELMAN, R. 1999. Socio-economic and behavioral factors leading to acquired bacterial resistance to antimicrobrial agents in developing countries. *Emerg Infect Dis.* **5:**18–27.

RICHARD, P., DELANGLE, M.H., MERRIEN, D., BARILLE, S., REYNAUD, A. AND MINOZZI, C. 1994. Fluoroquinolone use and fluoroquinolone resistance: Is there an association? *Clin Infect Dis.* **19**:54-9.

SHEARS, P. 2001. Antibiotic resistance in the tropics. Epidemiology and surveillance of antimicrobial resistance in the tropics. *Trans R Soc Trop Med Hyg.* **95:**127–30.

WALSON, J.L., MARSHALL, B., PPKHREL, B.M., KAFLE, K.K.AND LEVY, S.B. 2001. Carriage of antibiotic-resistant fecal bacteria in Nepal reflects proximity to Kathmandu. *J. Infect Dis.* **184**:1163–9.

WORLD HEALTH ORGANIZATION. Global strategy for containment of antimicrobial resistance. Geneva: The Organization; 2001 [cited from 2006 Jan 27**.** Available from internet at, http://www.who.int/drugresistance/en/

A.M.MASUDUL AZAD CHOWDHURY, MD ANWAR HOSSAIN[1], AND M.N.ANWAR[*].
Department of Microbiology, University of Chittagong, Chittagong-4331,Bangladesh.[1]
Department of microbiology, University of Dhaka, Dhaka,Bangladesh.

Manuscript received on 6. 1. 10 Accepted on 6. 6. 10
The Chittagong University Journal of Biological Sciences, Vol. 4(1 & 2): Page No : 165-168

Corresponding author.