

Original Article

Measurement of Antibiotic Utilization in the Internal Medicine Ward of a Tertiary Hospital in Bangladesh

T Begum¹, F Parveen², I Khan³, F Ara⁴, R R Shana⁵, J U Iqbal⁶

Abstract

Tertiary care hospitals are a potential source for development and spread of bacterial resistance. Excessive and inappropriate use of antibiotics contributes to the development of bacterial resistance. Information on D.D.D (Defined daily dose)/100 bed days of commonly used antibiotics in tertiary hospitals of Bangladesh is lacking. Hence, the present study has been designed to meet the demand. Descriptive cross sectional study was conducted in the department of medicine of Sir Salimullah Medical College and Mitford Hospital for 3 months from 1st January 2009 to 31st March 2009. Admitted patients

of medicine unit-1 who got antibiotics were included in the study. The DDD/100 bed days of commonly prescribed antibiotics were calculated. 500 out of 1563 patients were prescribed antibiotics. Total DDD/100 bed days of oral and parenteral antibiotics were 55.09 and 23.65 respectively. Total DDD/100 bed days of both oral and parenteral antibiotics were 78.74. Unnecessary use of antibiotics is expensive and potentially dangerous. So, continuous surveillance of antibiotic utilization should be carried out.

Introduction

Antimicrobial drug resistance is a growing problem worldwide. The widespread and often inappropriate use of broad spectrum antibiotics is recognized as a significant contributing factor to the spread of bacterial resistance and the

development of resistance to multiple drugs. The hospital setting is particularly conducive to the development of antibiotic resistance as patients who are severely ill, immuno-compromised or has devices or implants in them, are likely to receive frequent courses of empirical or prophylactic antibiotic therapy.

1. Dr. Tanzima Begum, Department of Pharmacology & Therapeutics, Sir Salimullah Medical College & Mitford Hospital, Dhaka.

2. Dr. Feroza Parveen, Professor, Head of the department, Department of Pharmacology & Therapeutics, Sir Salimullah Medical College & Mitford Hospital, Dhaka.

3. Dr. Md. Ismail Khan, Professor, Head of the department, Department of Pharmacology & Therapeutics, Dhaka Medical College, Dhaka.

4. Dr. Ferdous Ara, Associate Professor, Department of Pharmacology & Therapeutics, Sir Salimullah Medical College & Mitford Hospital, Dhaka.

5. Dr. Rekha Rani Shaha, Assistant Professor, Department of Pharmacology & Therapeutics, Sir Salimullah Medical College & Mitford Hospital, Dhaka.

6. Dr. Jalal Uddin Iqbal, Assistant Professor, Department of Pharmacology & Therapeutics, Sir Salimullah Medical College & Mitford Hospital, Dhaka.

Address of correspondence: Dr. Tanzima Begum Assistant Professor, Department of Pharmacology & Therapeutics, Delta Medical College, 26/2, Darus Salam Road, Mirpur-1, Dhaka-1216. E-mail address: drtanzima@yahoo.com

The clinical use of antibiotics was introduced in the early 1940s and a short time thereafter, their misuse and abuse potential were recognized.¹ Several studies performed in the 1970s demonstrated that antimicrobials were often used inappropriately in the hospital setting, and between 14% and 43% of all courses of antimicrobial therapy were deemed unnecessary because there was no evidence of infection²⁻⁵. Recent Studies have reported that 14-65% of the given antibiotic treatments were unnecessary and inappropriate.⁶⁻²⁰

At a symposium in Oslo in 1969 entitled "The Consumption of Drugs", it was agreed that an internationally accepted classification system for drug consumption studies was needed. By modifying and extending the European Pharmaceutical Market Research Association (EPhMRA) classification system, Norwegian researchers developed a system known as the Anatomical Therapeutic Chemical (ATC) classification. To deal with the objections against

Figure I

Percentage of patient got antibiotics

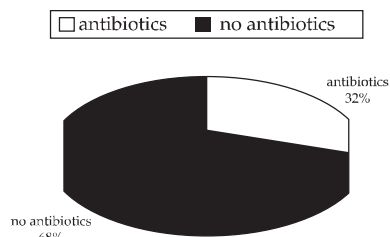


Figure I: Percentage of patient got antibiotics.

Table I: DDD/100 bed days Oral Antibiotic

Name of antibiotic	ATC code	DDD/100 bed days
Amoxicillin	J01CA01	31.54
Ciprofloxacin	J01MA02	6.05
Tetracycline	J01AA07	5.99
Cloxacillin	J01CF02	1.25
Metronidazole	J01XD01	0.96
Cephadrine	J01MA12	1.01
Levofloxacin	J01MA12	3.75
Quinine	P01BC01	0.35
Flucloxacillin	J01CF05	0.37
Cefixime	J01DD08	0.67
Amoxyclav	J01CR02	0.63
Phenoxymethyl penicillin	J01CE02	0.29
Azithromycin	J01FA10	1.63
Clarithromycin	J01FA09	0.58
Doxycyclin	J01AA02	0.02

traditional units of measurement, a technical unit of measurement called the Defined Daily Dose (DDD) to be used in drug utilization studies was developed.

The basic definition of D.D.D by the WHO Collaborating Centre for Drug Statistics Methodology Oslo (Norway), is-

"The D.D.D is the assumed average maintenance dose per day for a drug used for its main indication in adults."

A DDD will only be assigned for drugs that already have an ATC code. It should be emphasized that the defined daily dose is a unit of measurement and does not necessarily reflect the recommended or prescribed daily dose. However they provide a fixed unit of measurement independent of price and formulation and enable the researcher to perform comparisons between population groups. DDD/100 bed-days provide a rough estimate of consumption of drugs among hospital inpatients. Information on D.D.D (Defined daily dose)/100 bed days of commonly used antibiotics in tertiary hospitals of Bangladesh is lacking. Hence, the present study has been designed to meet the demand.

Table II: DDD/100 bed days Parenteral Antibiotic

Name of Antibiotic	ATC code	DDD/100 bed days
Ceftriaxon	J01DD04	11.21
Amoxicillin	J01CA01	8.58
Metronidazole	J01XD01	1.25
Gentamycin	J01GB03	1.11
Cloxacillin	J01CF02	0.55
Ciprofloxacin	J01AA02	0.69
Flucloxacillin	J01CF05	0.26

Materials and Methods

Descriptive cross sectional study was conducted in the department of medicine of Sir Salimullah Medical College and Mitford Hospital for 3 months from 1st January 2009 to 31st March 2009. Admitted patients of medicine unit-1 who got antibiotics were included in the study. All the information was taken from the patient's treatment record file.

The DDD/100 bed days of commonly prescribed antibiotics in the internal medicine ward was calculated. The DDD/100 bed days of individual antibiotics were added together to get the total antibiotic consumption. DDD/100 bed days was calculated by the following formula

D.D.D/100 bed days

$$= \frac{\text{no. of units administered in a given period (mg)} \times 100}{\text{DDD (mg)} \times \text{no of days in the period} \times \text{no of beds} \times \text{occupancy index}}$$

DDD (mg) of individual drug was collected from the website of "WHO Collaborating Centre for

Drug Statistics and Methodology". (<www.whocc.no/atcddd>).

No. of days in the period was 90 days and no. of beds was 42. Occupancy Index was 1.

Results

During the study period, 1563 patients were admitted in the internal medicine ward under unit-I. 500 patients were prescribed antibiotics. Antibiotic prescribing rate was 31.98%. Total DDD/100 bed days of oral and parenteral antibiotics were 55.09 and 23.65 respectively. Total DDD/100 bed days of both oral and parenteral antibiotics were 78.74.

Discussion

This study found that 31.98% of admitted patients of unit 1 of internal medicine ward got antibiotics. Several studies in developed countries showed that, this rate was lower in some countries. For example, in Switzerland (University Hospital Basel) it was 19.4%.²¹ In Scotland (Acute Medicine Assessment Unit in Aberdeen, Scotland) it was 17%.²² In Norway, (Norwegian University Hospital) it was 16.6%.²³ In eight (8) Swiss non university hospitals, this rate was 25%.²⁴ In Netherlands this rate was 22.9%.¹⁶

In a developing country like Bangladesh, prevalence of infections diseases is higher than the developed countries. That is why; our antibiotic utilization rate was higher than that of developed countries.

In a study, at Manipal teaching hospital in Nepal, this rate was 29.5%.²⁵ This rate is very similar to our rate. In India St. John's Medical College Hospital, Bangalore this rate was 56%.²⁶ Other Indian studies report figures of 20% to 42%.²⁷⁻³⁰

Antibiotic utilization rate was higher in some countries of the world also. For example, in Italy, it was 45.5%.³¹ In Turkey, 36% of hospitalized patients were under antibiotic treatment. 32 Three years before, antibiotic use in the same hospital was 42.8%.³³

According to the literature, nearly one-third of all hospitalized patients were given antibiotics in general,³⁴⁻³⁶ Nevertheless, different rates can also be seen with respect to the country and the hospital in which these studies were conducted. For instance, rate of antibiotic use was reported as

77.8% in a university hospital in China, while it was reported as 65% in a study conducted in Costa Rica.^{7,37}

The total antibiotic use in our study was 78.74 DDD/100 bed days. In a Nepali Study; it was 108.5 DDD/100 bed days.²⁵ In Israel, Raveh reported 124 DDD/100bed days.³⁸ Castro reported that the use of antibiotics in Brazilian hospital had increased from 83.8 DDD/100 bed days in 1990 to 124.6 DDD/100 bed days in 1996.³⁹ In Europe Vlahovic-Palcevsky, found that DDDs were 45.9 in a university hospital.⁴⁰ In a teaching hospital in Netherlands DDD/100bed days was 32.1 in 2001, 37.7 in 2003 and 42.6 in 2004.¹⁶ Kiivet reported antibiotic use were 41DDD/100bed days, 51DDD/100bed days and 47 DDD/100bed days in three university hospitals in Estonia, Spain and Sweden respectively.⁴¹ In 15 hospitals of 14 countries of Europe antibiotic consumption were 29.6 to 110.8 DDD/100 bed days.⁴²

Conclusion

Unnecessary use of antibiotics is expensive and potentially dangerous. Antibiotic may alter a patient's endogenous flora which favors the development or emergence of resistant strains. Antibiotic use may also result in allergic or other serious side effects. So, continuous surveillance of antibiotic utilization should be carried out.

References

1. Polk RE, Fishman NO. Antimicrobial management: cost and resistance. In: Mandell GL, Bennett JE, Dolin R, editors. Principles and Practice of Infectious Diseases. 6th ed. Philadelphia: Churchill Livingstone Inc; 2005. pp. 611-9.
2. Maki D G, Schuna A A: Study of antimicrobials misuse in a University hospital. Am J Med Sci, 1978. 275:271-282.
3. Castle M, Wilfert C M, Cate T R et al: Antibiotic use in Duke University medical centre. JAMA, 1977. 237: 2819-2822.
4. Kunin C M, Tupassi T, Craig W A et al: use of antibiotics a brief exposition of the problem and some tentative solutions. Ann. Inter Med, 1973. 79: 555.
5. Scheckler W E, Bennett J V: Antibiotic uses in seven community hospitals. JAMA, 1970. 213: 264.
6. Hecker M T, Aron D C, Patel N P et al: Unnecessary use of antimicrobials in hospitalized

- patient. *Arch Intern Med*, 2003. 163: 972-978.
7. Hu S, Liu X, Peng Y. Assessment of antibiotic prescription in hospitalized patients at a Chinese university hospital. *J Hosp Infect* 2003; 46: 161-3.
 8. Knox K, Lawson W, Dean B, Holmes A. Multidisciplinary antimicrobial management and the role of the infectious diseases pharmacist - a UK perspective. *J Hosp Infect* 2003; 53: 85-90.
 9. Tunger O, Dinc G, Ozbakkaloglu B, Atman UC, Algun U. Evaluation of rational antibiotic use. *Int J Antimicrob Agents* 2000; 15: 131-5.
 10. Thuong M, Shortgen F, Zazempa V, Girou E, Soussy CJ, Brun- Buisson C. Appropriate use of restricted antimicrobial agents in hospitals: the importance of empirical therapy and assisted reevaluation. *J Antimicrob Chemother* 2000; 46: 501-8.
 11. Dunagan WC, Woodward RS, Medoff G, Gray JL 3rd, Casabar E, Smith MD et al. Antibiotic misuse in patients with positive blood cultures. *Am J Med* 1989; 87: 253-9.
 12. Isturiz RE, Carbon C. Antibiotic use in developing countries. *Infect Control Hosp Epidemiol* 2000; 21: 394-403.
 13. Demirturk N, Demirdal T, Kuyucuoglu N. Evaluation of inappropriate antibiotic use in a university hospital. *Klimik* 2006; 19: 18-21.
 14. Unal S. Nosocomial infection control programs and rational antibiotic use. *ANKEM* 1996; 10: 241-6.
 15. Erbay A, Colpan A, Bodur H, Cevik MA, Samore MH, Ergonul O. Evaluation of antibiotic use in a hospital with an antibiotic restriction policy. *Int J Antimicrob Agents* 2003; 21: 308-12.
 16. Ina Willemsen, Anneke G, Diana B et al. Appropriateness of Antimicrobial Therapy Measured by Repeated Prevalence Surveys, Antimicrobial agents and chemotherapy, Mar. 2007, p. 864-867 Vol. 51, No. 3
 17. Kshirsagar M J, Langade D , S. Patil S & P. S. Patki Prescribing patterns among medical practitioners in Pune, India *Bulletin of the World Health Organization*, 1998, 76 (3): 271-275
 18. A K Das, Roy K, Kundu K K et al: study of rational utilization and cost analysis of antibiotic in a government teaching hospital. *Ind. J Pharmacology*, 2002. 34:59-61.
 19. Kumar I K S, S J Chandy, L Jeyaseelan et al: Antimicrobial prescription pattern for common acute infections in India. *Ind J Med Res*, 2008. August 165-171.
 20. Chen Feng-en, Wang Hua: Investigation on Antibiotic Use in A Hospital of Xinxiang City in 2008 (Xinxiang First People's Hospital, Henan, 453000, China)
 21. Julian M, Mathew S, Pedram S et al: Empirical use of antibiotic and adjustment of empirical therapies in a university hospital. *BMC Infect Dis*, 2007. 7:21.
 22. Kumarasamy Y, Cadwgan T, Gillanders I A et al: Optimizing antibiotic therapy- the Aberdeen experience. *Clin Microbiol Infect*, 2003. 9: 406-411.
 23. Berild D, Ringertz S H, Lelek M: Appropriate antibiotic use according to diagnosis and bacteriological findings. *Scan J Infect Dis*, 2002. 34: 56-60.
 24. Bugnon- Reber A, de Torrente A, Troillet N et al: Antibiotic misuse in medium sized Swiss hospitals. *Swiss Med wkly*, 2004. 134: 481-485.
 25. Ravi P S, Praveen P, Nagesh K S et al: Prescribing pattern of antibiotics and sensitivity pattern of common microorganisms in the internal medicine ward of a teaching hospital in western Nepal. *Ann of clin Micro and Antimicro*, 2003. 2: 7-16
 26. Srishyla M V, Naga R M A, Venkataraman B V: Drug utilization of antimicrobials in the Inpatient setting of a tertiary hospital. *Ind J pharmacol*, 1994. 26: 282-287.
 27. Vishwanathan N, Gandhi IS, Shashindran CH et al Drug utilization study of antimicrobial agents. *Indian J Med Res* 1981; 74:772-8.
 28. Kulshrestha S, Agarwal K K. Survey of pattern of antimicrobial uses in a teaching hospital. *Indian J Pharmacol* 1984; 16 (Suppl 1):39.
 29. Chauhan CK, Shahani SR. Antimicrobial utilization pattern in a teaching hospital. *Indian J Pharmacol* 1990; 22 (Suppl 1):16.
 30. Pradhan SC, Shewade DG, Tekur U et al. Changing pattern of antimicrobial utilization in an Indian teaching hospital. *Int J Clin Pharmacol Ther Toxicol* 1990; 28:339-43.
 31. Porretta A, Giullianil L , Vegni F E et al: Prevalence and pattern of antibiotic prescribing in Italian hospitals. *Infection*, 2003. 31, Suppl 2: 16-21.
 32. Yilmaz G R, Cemal Bulut, Fatih Yildiz et al Examining Antibiotic Use at an Education and Research Hospital in Turkey: Point Prevalence Results* *Turk J Med Sci* 2009; 39 (1): 125-131

33. Tuncer Ertem G, ?im?ek H, Ate? Ar?ca N, et al. Evaluation of daily antibiotic usage in Ministry of Health Ankara Training and Research Hospital. *Turk J Infect* 2004; 18: 283-6.
34. Thomas M, Govil S, Moses BV, Joseph A. Monitoring of antibiotic use in a primary and tertiary care hospital. *J Clin Epidemiol* 1996; 49: 251-4.
35. Singh N, Yu VL. Rational empiric antibiotic prescription in the ICU. *Chest* 2001; 117: 1496-9
36. McGowan JE Jr, Gerding DN. Does antibiotic restriction prevent resistance? *New Horiz* 1996; 4: 370-6.
37. Mora Y, Avila-Agüero ML, Umana MA et al. Epidemiologic observations of the judicious use of antibiotics in pediatric teaching hospital. *Int J Infect Dis* 2002; 6: 74-7.
38. Raveh D, Levy Y, Schlesinger Y et al: Longitudinal Surveillance of antibiotic use in the hospital. *Q J M* 2001. 94: 141-152.
39. Castro MS, Pilger D, Ferreira et al: Trends in antimicrobial utilization in a university hospital 1990-1996. *Rev Saudia publica* 2002. 36:553-558.
40. Viahovic-palcevski V, Morovic m, Palcevski G : Antibiotic utilization at the university hospital after introducing an antibiotic policy. *Eur J Clin pharmacol*, 2000. 56: 97-101.
41. Kiivet R a; Dahl M L.; Llerena a et al: Antibiotic use in 3 European University hospitals *Scandinavian journal of infectious diseases* ISSN 0036-5548
42. Henrik W, Christina S Z, Vibeke T R, Sarisa Study Group. *Microbial Drug Resistance*. June 2004, 10(2): 169-176.