

## ANTIMICROBIAL USE AND FACTORS INFLUENCING PRESCRIBING IN MEDICAL WARDS OF A TERTIARY CARE HOSPITAL IN MALAYSIA

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**Abstract:** To ascertain the pattern of antimicrobial use and to analyze the selected core drug use indicators – prescribing indicators – a prospective study was conducted in 2008 in medical wards of a tertiary care hospital in Malaysia. Every patient in the medical wards of the selected hospital who was being treated with antimicrobial(s) during the data collection period was considered a potential study subject for this study. The treatment charts of 209 admitted patients were reviewed. Pneumonia was the leading diseases among them (26.3%). The most commonly used antimicrobials were amoxicillin with clavulanate (augmentin), erythromycin, cefuroxime, ceftriaxone and ampicillin sodium with sulbactam sodium (unasyn). The level of generic prescribing of antimicrobials was just above the half of all prescribed courses (54.3%) and the intravenous route was the preferred method of administration (57.3%). The mean number antimicrobials received by the studied patients were 1.8 ( $\pm$  0.9). The majority of them (53.6%) received two or more antimicrobials for their treatments. The evident of high percentages of patients received antimicrobial treatment in combinations reflected the potential of higher proportion of inappropriate treatment of different diseases and suggested the ample scope for intervention to improve antimicrobial use in the hospital.

**Keywords:** Antimicrobial agent, use, medical wards, hospital, Malaysia.

## INTRODUCTION

Antimicrobials are one of the most common groups of drugs prescribed in hospitals. It has been estimated that up to a third of all patients receive at least one antimicrobial agent during hospitalization.<sup>1-5</sup> The extraordinary therapeutic effects of antimicrobials, the problems of resistant microorganisms, irrational prescribing, different untoward toxic-effects and high cost involved – up to 40% of a hospital's drug expenditure—are compelling reasons for concern about optimising and appropriate use of antimicrobials.<sup>6-18</sup> There have been numerous studies on patterns of antimicrobials use in hospitals. Many of these studies however conducted in developed countries. It is documented in literature that approximately 5% of hospitalised patients who were given antimicrobials experienced some adverse reactions to these drugs for which 20% required treatment.<sup>17,19</sup> A small-scale study of the pattern antimicrobials use in some teaching hospitals in a neighbouring country showed that 54% patient in medical wards, 81% in surgical wards and 96% in paediatric wards received antimicrobial therapy. More than 90% of antimicrobials were used empirically based on clinical ground only. This approach is more likely to lead to inappropriate use of these drugs. Data related to antimicrobials use from the rapidly developing country in South East Asia – Malaysia – and other developing countries are scarce.<sup>1,7,11,20</sup> Therefore, the present study was conducted in the medical wards of a tertiary care hospital in Pahang Darul Makmur, Malaysia. The main objectives of the study were to ascertain the pattern of antimicrobial use, to analyze the core prescribing indicators of antimicrobials and to find out the factors influencing prescribing in the medical wards of the studied tertiary care hospital.

## PATIENTS AND METHODS

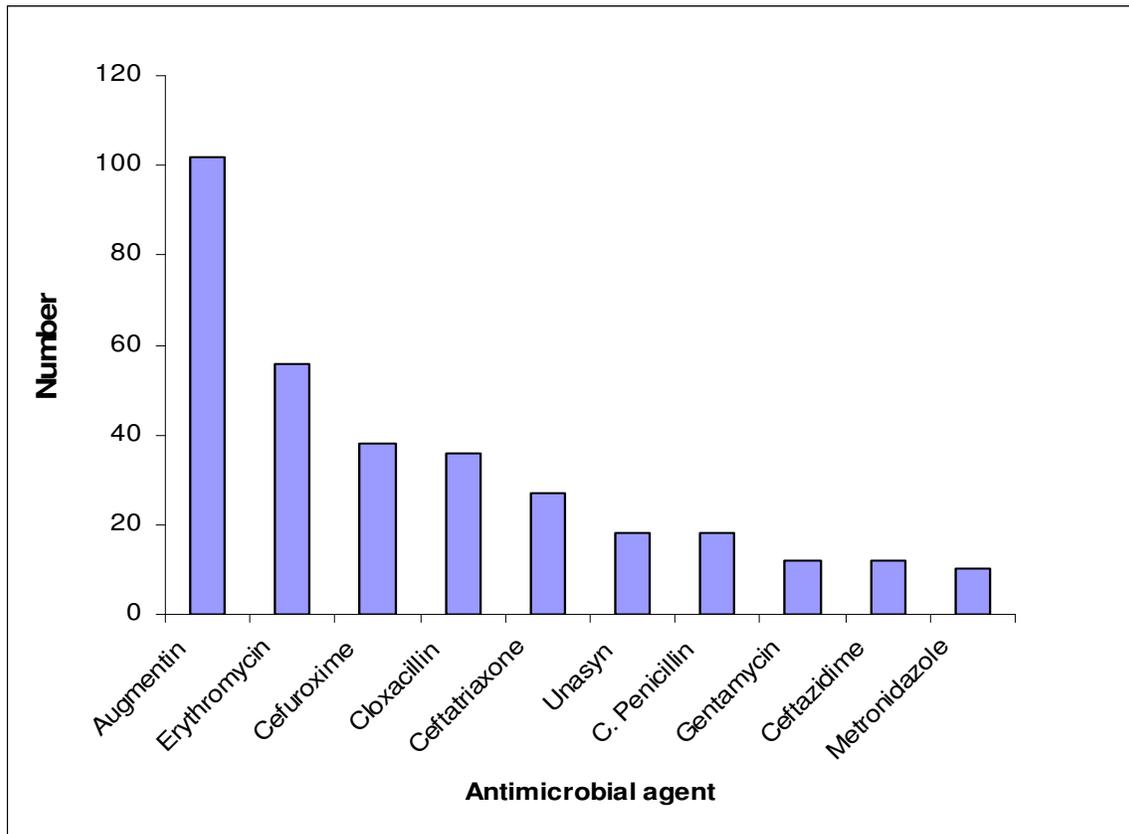
This was a prospective descriptive study during the period from March through June 2008. Ethical clearance was obtained from the Institutional Ethical Committee and the treatment charts of 209 admitted patients who were receiving antimicrobial therapy in the medical wards of the selected hospital at Pahang, Malaysia were reviewed. The wards of the hospital were visited daily by the research assistants and/or the researcher. The patients and

their treatment files were identified from each ward. The data collection forms (which contain patient's details such as age, gender, and specific issues related to antimicrobial use such as name of antimicrobials, their dosage schedule, route of administration, date of discontinuation, generic name, and related laboratory investigations) were completed by examining the patients' treatment files. Each patient was followed on a daily basis until his/her discharge from the hospital. After necessary processing, the data were entered into the computer-based statistical programme—Statistical Package for Social Science (SPSS), Version 15 for Windows for analysis. The processed data were analyzed accordingly. Inter alia, the proportion of the treatment files with single or combinations of antimicrobial drugs were calculated.

## **RESULTS**

A total of 209 admitted patients' treatment charts were reviewed. The majority of the admitted patients were males (64.1%). The ratio of male to female was 1.8:1. The duration of their hospital stay ranged from 1 day to 30 days with the median of 4 days. There were 29 different antimicrobials used for their treatment. The study results showed that amoxicillin with clavulanate (augmentin), erythromycin, cefuroxime, ceftriaxone and ampicillin sodium with sulbactam sodium (unasyn) were the most frequently used antimicrobials across the medical wards of the hospital (Figure 1). The mean number of antimicrobial agents used per patient was 1.8 ( $\pm 0.9$ ). The majority of the admitted patients (53.6%) received two or more antimicrobials in different combinations for their treatment; the intravenous route was the most preferred method (57.3%) used to administer the antimicrobials. The percentage of antimicrobials prescribed by generic name was 54.3%.

Figure 1 Commonly prescribed antimicrobial agents.



The data collection tools related to the factors influencing prescription in hospitals were distributed to the 35 clinicians and all of them were received, giving a response rate of 100%. The identified ten factors that usually contribute to prescribing practices were patients' factors (demand, culture/attitude and socio-economic status), prescribers' factors (pre-qualification training, in-service education, workload, and feedback from patient responses), drug factors (availability and cost) and influence of industry (medical detailing). Table 2 shows the rank of these factors based on the frequency of responses in terms of important influencing factors.

**Table 2** Factors influencing prescribing in hospital

Rank	Factor	Number	Percentage
1	Drug availability	34	97.1
2	Cost of drugs	31	88.6
3	In-service education	26	74.2
4	Feedback from patient responses	22	62.8
5	Clinician's workload	22	62.8
6	Patient culture (or attitude)	21	60.0
7	Pre-qualification training	19	54.3
8	Socio-economic status of patient	16	45.7
9	Patient's demand	15	42.8
10	Influence of pharmaceutical industry	14	40.0

## DISCUSSION

Indiscriminate and inappropriate prescribing of antimicrobials is a widespread problem imposing a substantial economic burden on health care systems. A study of prescribing patterns of antimicrobials is an effective way of reflecting appropriateness of antimicrobial use.<sup>21-23</sup> A prescription provides an insight into a prescriber's attitude to the disease being treated and the nature of health care delivery system in a community and/or a country. Both overprescribing and underprescribing of antimicrobials are harmful practices; overprescribing is associated with increased side-effects, excessive expense and, ultimately emergence of resistant organisms whereas underprescribing leads to ineffective treatment.<sup>24-28</sup>

This study results revealed the great diversity antimicrobials used for the treatment of the admitted patients in the medical wards of the selected hospital. In this study, the top most frequently used antimicrobials were amoxicillin with clavulanate (augmentin) followed by

erythromycin, cefuroxime, ceftriaxone and ampicillin sodium with sulbactam sodium (unasyn). This was consistent with the pattern of antimicrobial use observed in other studies conducted in both developed as well as developing countries.<sup>20, 29-31</sup> The selection of antimicrobials to prescribe for the patients may be the personal choice/preference of a particular physician in a hospital. The personal choice, limited experience and other influences on hospitals' physicians may lead to inappropriate prescribing of antimicrobials. Several other studies in hospitals both in developed and developing countries have shown that inappropriate prescribing of antimicrobials is widespread.<sup>20, 32-39</sup>

Hospitals' physicians preferred to prescribe antimicrobials in combination for the treatment of the admitted patients. The majority of the patients (56.1%) received two or more antimicrobials in combination for their treatments. The prescribing of antimicrobials in different multiple combinations is a practice commonly observed in Malaysia as well as in other countries.<sup>1,40</sup> Population-based<sup>41</sup> and tertiary level hospital-based<sup>12</sup> studies of antimicrobial utilisation patterns showed that 37.5% of patients and 36% of admitted patients respectively received two or more antimicrobials in combination.<sup>38,39,42</sup> In this survey the predominant use of a combination of antimicrobials may be due to the fact that hospitals' physicians trying to expand the possible spectrum of action of their treatments by prescribing multiple antimicrobials in different combinations in the hope that this would provide the best possible outcomes for their patients. These different combinations of antimicrobials have every possibility of producing more adverse reaction(s) and/or changing microbial ecology in addition to the increased costs of the therapy to the patients concerned as well as to the health care system.

The results of this study revealed, *inter alia*, that in the medical wards of the studied hospital, the physician prescribed multiple antimicrobials in different combinations that reflected the potential for higher proportion of inappropriate antimicrobials treatment of different diseases and prolong patients' hospital stay. As the study did not attempt to look into the cause(s) of inappropriate antimicrobial practices we can only speculate about cause(s) of such practices but some issues seem to be apparent. The most likely contributors to such practices appear to be availability of drug, a lack of confidence and/or disuse of microbiology laboratory services and absence of hospital policy on antimicrobial

use. However, such study would provide valuable information to enable positive measures to be taken towards rational antimicrobials.

## **CONCLUSION**

The polypharmacy of antimicrobial agents appears to be alarmingly high which predicts prolong patients' hospital stay. The polypharmacy, preferred intravenous route of administration and low generic prescription of antimicrobials based on its availability reflect the potential for higher proportions of inappropriate prescription of antimicrobials with ample scope for intervention to improve antimicrobial use in the hospital.

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## **REFERENCES**

1. Lim VKE, Cheong YM, Sulciman. Pattern of antibiotic usage in hospitals in Malaysia, Singapore Medical Journal 1993; 34: 525 – 528.
2. Cooke D, Salter AJ, Phillips I. Antimicrobial misuse, antibiotic policies and information resources. Journal of Antimicrobial Chemotherapy 1980; 6: 435 – 443.
3. Hirschman SZ, Meyers BR, Bradbury K, Mehl B, Gendelman S, Kimelblatt B. Use of antimicrobial agents in a university teaching hospital. Evolution of a comprehensive control program. Archives of Internal Medicine 1988; 148: 2001-2007.
4. Patel SJ, Oshodi A, Prasad P, Delamora P, Larson E, Zaoutis T, Paul DA, Saiman L. Antibiotic use in neonatal intensive care units and adherence with centers for

- disease control and prevention 12 step campaign to prevent antimicrobial resistance. *Paediatric Infectious Disease Journal* 2009; 28: 1047 – 1051.
5. Saurabh MK, Yadav AK, Gupta P, Singhai A, Saurabh A. Comparative study of prescribing behaviours of government doctors of teaching hospital and private practitioners in Jhalawar City (Rajasthan). *Journal of Pharmaceutical Sciences and Research* 2010; 2: 208 – 215.
  6. Ghimire S, Sushil N, Bhandari S, Prabha N, Palain S. A prospective surveillance of drug prescribing and dispensing in a teaching hospital in Western Nepal. *Journal of Pakistan Medical Association* 2009; 59:726-731.
  7. Grand AL, Hogerzeil HV, Haaijer- Ruskamp FM. Intervention research in irrational use of drugs: a review. *Health Policy and Planning* 1999; 14: 89-102.
  8. Vaccheri A, Silvani MC, Bersaglia L, Motola D, Strahinja P, Vargiu A, Poluzzi E, Montanaro N. A 3 year survey on the use of antimicrobial agents in five Italian hospitals. *Journal of Antimicrobial Chemotherapy* 2008; 61: 953 – 958.
  9. Achong MR, Wood J, Theal HK, Goldberg R, Thompson DA. Changes in hospital antibiotic therapy after a quality-of-use study. *Lancet* 1977; 2: 1118–1122.
  10. Kunin CM, Lipton HL, Tupasi T, Sacks T, Scheckler WE, Jivani A, et al. Social, behavioural, and practical factors affecting antibiotic use worldwide: report of Task Force 4. *Reviews of Infectious Diseases* 1987; 9 (supplement 3): S270–S285.
  11. Levy SB. Microbial resistance to antibiotics. An evolving and persistent problem. *Lancet* 1982; 2: 83–88.
  12. Ballin JC, Dykes MHM, Jerome JB, Kosman ME, Lewis JR, Schiffman DO. In Comment. Reasons for increase in antibiotic usage. *Journal of the American Medical Association* 1974; 227: 1029–1030.
  13. Simmons HE, Stolley PD. Commentary. This is medical progress? Trends and consequences of antibiotic use in the United States. *Journal of the American Medical Association* 1974; 227: 1023–1028.
  14. Kunin CM. In comment. *Journal of the American Medical Association*, 1974; 227: 1030–1032.

15. Liss RH, Batchelor RF. Economic evaluations of antibiotic use and resistance—a perspective: report of Task Force 6. *Reviews of Infectious Diseases* 1987; 9 (supplement 3): S297–S312.
16. Sinclair BL, Clark DWJ, Facoory BD, Silva PA. Medication use in nine year olds: types of medicines used and recall of advice given. *New Zealand Medical Journal* 1990; 103: 263–265.
17. Grimwood K, Cook JJ, Abbot GD. Antimicrobial prescribing errors in children. *New Zealand Medical Journal* 1983; 96: 785–787.
18. Counts GW. Review and control of antimicrobial usage in hospitalized patients: a recommended collaborative approach. *Journal of the American Medical Association* 1977; 238: 2170–2172.
19. Kunin CM, Tupasi T, Craig WA. Use of antibiotics. A brief exposition of the problem and some tentative solutions. *Annals of Internal Medicine* 1973; 79: 555–560.
20. Rashid HU, Chowdhury SAR, N Islam. Patterns of antibiotic use in two teaching hospitals. *Tropical Doctor* 1986; 16: 152–154.
21. McCafferty JA, Lang SDR. An audit of restricted antibiotic use in a general hospital. *New Zealand Medical Journal* 1988; 101: 210–211.
22. Editorial. Antibiotic audit. *Lancet* 1981; 1: 310–311.
23. Cooke DM, Salter AJ, Philips I. The impact of antibiotic prescribing in a London teaching hospital: a one-day prevalence survey as an indicator of antibiotic use. *Journal of Antimicrobial Chemotherapy* 1983; 11: 447-453.
24. Straand J. How often do general practitioners prescribe antibiotics for otitis media and the most common respiratory tract infection? *Norwegian Journal of Epidemiology* 2001; 11: 67-72.
25. Erah PO, Olumide GO, Okhamafe AO. Prescribing practices in two health care facilities in Warri, southern Nigeria: A comparative study. *Tropical Journal of Pharmaceutical Research* 2003; 2: 175-182.

26. Shanker PR, Dubey AK, Rana MS, Mishra P, Subish P, Vijaya Bhaskar P. Drug utilization with special reference to antimicrobials in a subhealth post in western Nepal. *Journal of Nepal Health Research Council* 2005; 3: 65 – 69.
27. Bapna JS, Tekur U, Gitanjali B, Shashindran CH, Pradhan SC, Thulasimani M, Tomson G. Drug utilization at primary health care level in southern India *European Journal of Clinical Pharmacology* 1992; 43: 413 – 415.
28. Pujate E, Vigante D, Vingre I, Kockina E, Pavlovska D, Mironovska A, Nikitina O, Kula M, Zeidaka L, Lucenko I, Perevockovs J, Dumpis U. Prevalence study of antimicrobial use and hospital infections in Latvia 2005; 6:35 – 39.
29. Moss F, McNicol MW, McSwiggan DA, Miller DL. Survey of antibiotic prescribing in a district general hospital –pattern of use. *Lancet* 1981; ii: 349 – 352.
30. Raymond PM, Robertson MB, Mashford ML. A decade of antibiotic use in a teaching hospital. *Medical Journal of Australia* 1989; 150: 619 – 624.
31. Obaseiki-Ebor EE, Akerele JO, Ebea PO. A survey antibiotic outpatient prescribing and antibiotic self medication. *Journal of antimicrobial chemotherapy* 1987; 20: 759 – 763.
32. Choudhury AKA, Hossain MH, Bhuiya MDH, Islam MA. A study report on prescribing pattern in diarrhoeal disease in three districts of Bangladesh. Unpublished, 1991: 7.
33. Barman A, Ahmad J, Ahmed AU. Treatment pattern of watery diarrhoea in primary health care level of Bangladesh. *Teachers Association Journal (Rajshahi)* 1994; 7 (2): 80–82.
34. Sultan-Ul-Alam M, Barua PC, Rashid DMH, Islam AFMS. A survey of the pattern of drug utilization for watery diarrhoea at Primary Health Care level of Chittagong division. *Hygeia* 1993; 7 (1): 15–18.
35. Choudhury SAR, Baqui QBOF. Improvement of prescribing practices after launching ARI project. An oral presentation, International Conference on Improving Use of Medicines, April 1–4, 1997; Chiang Mai, Thailand.
36. Choudhury AKA , Khan OF, Matin A, Haque Z, Bhuiya AL. Impact of standard treatment guidelines and small group training on prescribing for diarrhoea in under

- five children in Thana Health Complexes in Bangladesh. An oral presentation, International Conference on Improving Use of Medicines, April 1-4, 1997; Chiang Mai, Thailand.
37. Reinman HA, D'Ambola J. The use and cost of antimicrobials in hospitals. *Archives of Environmental Health*, 1966; 13: 631–636.
  38. Stein CM, Todd WTA, Parirenyatwa D, Chakonda J, Dizwani AGM. A survey of antibiotic use in Harare primary care clinic. *Journal of Antimicrobial Chemotherapy* 1984; 14: 149–156.
  39. Harvey KJ, Stewart R, Hemming M, Moulds RFW. Use of antibiotic agents in a large teaching hospital. *Medical Journal of Australia* 1983; 2: 217–221.
  40. Ashraf A., Choudhury S., Streefland P. Health, disease and health-care in rural Bangladesh. *Social Science and Medicine* 1982; 16: 2041–2054.
  41. Islam MN. A study on prescribing pattern of antibiotic by registered medical practitioners in private chamber in a selected district, Bangladesh [Dissertation]. Department of Public Health and Hospital Administration, the National Institute of Preventive and Social Medicine (NIPSOM), Mohakhali, Dhaka, Bangladesh, 1994, 59.
  42. Girish MB, Kumer TN, Srinivas R. Pattern of antimicrobials used to treat infected diabetic in a tertiary care hospital in Kolar. *International Journal of Pharmaceutical and Biomedical Research* 2010; 1: 48 – 52.