

A Retrospective Study to Assess Antibiotic Utilization in Intensive Care Unit

Birendra¹, Lalan Kumar², Asha Kumari³¹Tutor, Department of Pharmacology, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India²Tutor, Department of Pharmacology, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India³Associate Professor & HOD, Department of Pharmacology, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India

Received: 03-09-2025 / Revised: 18-10-2025 / Accepted: 29-11-2025

Corresponding Author: Dr. Lalan Kumar

Conflict of interest: Nil

Abstract:

Background: Antibiotic utilization is markedly high in Intensive Care Units (ICUs) due to severe infections, empirical therapy, and critical patient conditions, contributing to rising costs and antimicrobial resistance. Drug utilization studies using standardized methods are essential to promote rational antibiotic use.**Aim:** To assess the pattern and extent of antibiotic utilization in the ICU using the WHO-recommended ATC/DDD methodology.**Methodology:** A retrospective observational study was conducted in a 7-bedded general ICU of Darbhanga medical college and Hospital, Laheriasarai, Darbhanga, Bihar, India. Medical records of 540 ICU patients were reviewed. Antibiotics were classified using the ATC system, and utilization was expressed as DDD per 100 bed-days. Descriptive statistics were applied.**Results:** The mean number of drugs per prescription was 3.65, with an average of 2.9 antimicrobials. Broad-spectrum antibiotics were predominantly used, with meropenem (16.72 DDD/100 bed-days) being the most consumed, followed by piperacillin-tazobactam and ceftriaxone. Parenteral antibiotics accounted for 75.6% of prescriptions. PDD/DDD ratios were close to unity for most agents, indicating generally appropriate dosing.**Conclusion:** The study reveals high and intensive use of broad-spectrum antibiotics in the ICU. Regular monitoring and strengthening antimicrobial stewardship programs are essential to ensure rational antibiotic use and curb resistance.**Keywords:** Antibiotic Utilization, Intensive Care Unit, ATC/DDD, Drug Utilization Study, Antimicrobial Stewardship.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Drug utilization studies (DUS) are critical in the interpretation, assessment, and the enhancement of drug use trends within healthcare facilities. The studies are especially relevant in determining the patterns of prescribing, determining the rationality of drug use, and reducing inappropriate therapy. The World Health Organization (WHO) defines the use of drugs as marketing, distribution, prescription, and use of drugs in the society, and in particular, the medical, social, and economic outcome of the use [1]. The eventual aim of this research is to facilitate rational use of drugs, increase the effectiveness of therapy, decrease drug reactions, and optimize use of medical services.

Intensive Care Unit (ICU) is a very specialized unit of a facility that serves a critically ill patient and is in need of continuous control, life support apparatus

and aggressive pharmacological care. The patients that are admitted to the ICUs normally come with serious infections or dysfunctions of the organs or other life-threatening conditions that require a combination of more than one drug at a time. Consequently, such patients are more vulnerable to medication errors and adverse drug reactions because of polypharmacy, changes in pharmacokinetic and pharmacodynamic, and therapeutic regimen complexity [2]. One of the most commonly prescribed medications in ICUs is the antimicrobial agents (AMAs) among other drug classes [3].

Antimicrobials used in ICUs are much higher than the other hospital wards. It is also reported that the overall antimicrobial use in an ICU setting is about ten times more than that in the general hospital ward setting [4]. High prevalence of severe infections,

requirement of empirical therapy, as well as the high utilization of invasive devices like ventilators, central venous catheters, and urinary catheters are some of the major factors that contribute to this excessive use. One of the studies by Weber et al. found that cost in the ICU drugs was 38.4% of the total drug costs of the hospital and had a higher rate of increase than non-ICU drug costs (38.4 vs 12) [5]. This points to the huge cost economic burden of ICU pharmacotherapy, especially antimicrobial therapy.

Intensive care unit patients are extremely susceptible to infections because of comorbidities, immunosuppression, long-term hospitalization, and because of undergoing invasive diagnostic and therapeutic procedures. These patients therefore are exposed to high antimicrobial pressure [6]. Most ICU antimicrobials are prescribed empirically, and they are mainly premised on previous experience of the clinician rather than on the microbiological data. Moreover, the pharmacokinetic and pharmacodynamic profiles of critically ill patients are changed because of organ dysfunction, changes in fluids, and drug interactions. These differences make it more difficult to select a dosage and can result in inefficient treatment and even adverse drug reactions, as well as treatment failure [7].

Coronary care units (CCUs) and ICUs also use a considerable share of hospital resources mainly because of the prevalent usage of high-priced medications and general antimicrobial agents. Irrational prescriptions of costly antimicrobials in developing countries can be very problematic to the healthcare system since the limited funds and medical resources are extremely strained by the high cost of medicine. As such, rational prescription is necessary to make sure that there is proper use and fairness of the limited resources. The evaluation of drug utilization is an important instrument to recognize the inappropriate pattern of prescribing and to plan interventions that would lead to the optimization of antimicrobial therapy.

ICUs have been regarded as the epicentre of antimicrobial infection, which has become one of the predominant international health issues [8]. The overuse and misuse of antimicrobials also help to increase the prevalence of resistant pathogens resulting in high morbidity, mortality, hospital stay, and health care expenses. Despite the fact that about 5000 antimicrobial agents have been identified as of now, only about 100 of them are actively used today as clinically active against the treatment of infections [9]. Furthermore, even though the need in new antimicrobial agents increases, the creation of new drugs has considerably decreased during the last years. The clinicians are expected to need to be heavily dependent on the already existing classes of antimicrobial agents in the next decade [10]. This reiterates the call to have careful use of the available antimicrobials in order to save its usefulness.

Since all antimicrobial agents vary in the strength of dosage, frequency, and route of administration, a standardized approach is required towards proper assessment of in-hospital antibiotic use. The approach that is suggested by the World Health Organization is the broadest one among the existing ones. The Anatomical Therapeutic Chemical/Defined Daily Dose (ATC/DDD) system of classification of drugs was created and revised by the WHO Collaborating Centre for Drug Statistics Methodology. In this system, drug utilization can be compared among various hospitals, regions and countries by using the internationally accepted units [11] to express consumption.

Defined Daily Dose (DDD) Defined Daily dose (DDD) is the assumed daily average maintenance dose of a drug when used in its primary indication in adults. The DDD concept was created in order to address the shortcomings related to traditional units of measurement of drug consumption. It offers an unchanging measure of drug use that is not dependent on price, type of dosage, and drug potency, which allows making significant comparisons between drug use patterns. The use of antimicrobials is widely measured as the DDD per 100 bed-days a measure that has been widely applied to compare the in-hospital and outpatient use of antibiotics globally. This type of data has played a significant role in assessing national trends in the use of antibiotics and how these have contributed to antimicrobial resistance [12].

Regular assessment of the drug use pattern in the ICUs and CCUs is vital to optimize healthcare delivery, a rational utilization of drugs, better patient outcomes, and development of evidence-based prescription policy. Antimicrobial use Continuous surveillance of antimicrobial use can be used to identify inappropriate prescribing, encourage adherence to treatment practices, and underpin antimicrobial stewardship efforts.

In this respect, the current retrospective research was aimed at measuring the usage rate of antimicrobial agents and the sanity of their application in the ICU of a 7-bedded general intensive care unit. It will identify the most widely prescribed antimicrobial agents and will also measure the use of antimicrobials using the recommended methodology of ATC / DDD expressed as DDD per 100 bed-days as advised by WHO. It is anticipated that the results of this study will help to gain important perspectives on the existing trends in prescribing activities and will lead to optimizing the process of antimicrobial therapy in the intensive care units.

Methodology

Study Design: This study was a retrospective, observational study conducted to assess the pattern of antibiotic utilization in patients admitted to the Intensive Care Unit (ICU).

Study Area: The study was carried out in the Department of Pharmacology, Darbhanga Medical College and Hospital (DMCH), Laheriasarai, Darbhanga, Bihar, India.

Study Duration: The study was conducted over a period of 6 months from March 2025 to August 2025.

Study Population: The study population consisted of patients admitted to the Intensive Care Unit (ICU) of Darbhanga Medical College and Hospital during the defined retrospective study period.

Sample Size: A total of 540 patient medical records were included in the study and analyzed.

Data Source and Data Collection: Data for the present study were collected retrospectively from the Medical Records Department (MRD) of Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India. Medical records of patients admitted to the Intensive Care Unit during the defined study period were reviewed after obtaining necessary administrative and ethical approvals. A pre-designed and structured data collection proforma was used to extract relevant information from patient case records. The collected data included demographic details, indications for ICU admission, duration of ICU stay, number of drugs prescribed, details of antibiotic therapy such as class of antibiotics, number of antibiotics per patient, route of administration, use of fixed-dose combinations, availability of culture and sensitivity reports, and clinical outcomes. Only records with complete and legible information were included to ensure data accuracy and reliability.

Inclusion Criteria

- Medical records of patients admitted to the ICU during the study period
- Patients of all age groups and both genders
- Medical records containing complete information on antibiotic prescriptions

Exclusion Criteria

- Incomplete or illegible medical records
- Patients admitted to wards other than ICU
- ICU stay of less than 24 hours
- Records without antibiotic prescription details

Procedure: The study was conducted in three phases. The initial phase involved preparation of the study protocol, review of relevant literature, development of the data collection proforma, and submission of the study proposal to the Institutional Ethics Committee for approval. Following ethical clearance, permission was obtained from the hospital administration and concerned departments to access patient records. In the second phase, retrospective data were collected from the MRD and systematically analyzed. Antibiotics were classified according to the Anatomical Therapeutic Chemical (ATC) classification system, and their utilization was assessed using the Defined Daily Dose (DDD) methodology as recommended by the World Health Organization. Antibiotic utilization was expressed as DDD per 100 bed-days, and prescribed daily dose was calculated to compare actual prescribing patterns. The final phase involved interpretation of results, compilation of findings, identification of study limitations, and preparation of the final manuscript.

Statistical Analysis: The collected data were entered into Microsoft Excel and analyzed using descriptive statistical methods. Results were summarized and expressed in terms of frequencies, percentages, and mean values where applicable. Tables and charts were used to present antibiotic utilization patterns and prescribing trends in the ICU. The analysis focused on evaluating the extent and pattern of antibiotic use rather than inferential comparisons.”

Result

Table 1 presents the demographic distribution of 540 ICU patients by indication for admission, age group, and gender. Medical admissions constituted the largest group, with most patients aged 21–40 years (120) and 41–60 years (90), and a higher number of females (162) than males (138). Surgical admissions were next most common, predominantly among patients aged 21–40 years (48) and 41–60 years (42), with more males (72) than females (60). Orthopaedic cases were fewer across all age groups and showed equal male and female representation (18 each). All obstetrics and gynecology (OBG) admissions occurred in patients under 40 years, contributing exclusively to female admissions (60). Overall, the largest age group was 21–40 years (228 patients), and females (312) outnumbered males (228) in the ICU population.

Indication for ICU Admission	< 20 years	21–40 years	41–60 years	> 60 years	Male	Female
Medical	36	120	90	54	138	162
Surgical	18	48	42	24	72	60
Orthopaedic	6	12	12	6	18	18
OBG	12	48	0	0	0	60
Total	72	228	144	84	228	312

Table 2 summarizes drug use patterns based on ATC/DDD indicators among 540 prescriptions. On average, 3.65 drugs were prescribed per prescription, with antimicrobial agents accounting for a substantial proportion (mean 2.9 antimicrobials per prescription). More than half of the prescribed drugs were antimicrobial fixed-dose combinations

(55.20%), indicating a high reliance on combination therapy. Additionally, oral drugs were included in 46.10% of prescriptions, suggesting that parenteral therapy was favored in a considerable proportion of cases. Overall, the findings point toward polypharmacy with extensive antimicrobial use and frequent prescription of fixed-dose combinations.

Drug Use Indicators	Results
Average number of drugs per prescription	3.65
Average number of antimicrobial drugs per prescription	2.9
Percentage of drugs containing antimicrobial FDCs	55.20%
Percentage of prescriptions with an oral drug prescribed	46.10%

Table 3 depicts the pattern of antibiotic utilization according to the WHO ATC/DDD classification among 540 prescriptions. Broad-spectrum and reserve antibiotics showed high utilization, with meropenem recording the highest consumption (16.72 DDD/100 bed days; PDD/DDD = 1.2), followed by piperacillin + tazobactam (14.1; 1.1) and ceftriaxone (11.85; 1.05). Cefoperazone + sulbactam demonstrated proportional use, with PDD equal to the WHO DDD (4 g; PDD/DDD = 1). Metronidazole

(7.84; PDD/DDD = 0.93) and amikacin (3.48; 0.72) showed lower prescribed daily doses than the standard DDD, whereas azithromycin (5.6; 1.08), levofloxacin (2.32; 1.16), and meropenem exceeded WHO-recommended DDDs. Overall, the findings indicate substantial use of higher-end antibiotics, with PDD/DDD ratios close to or above unity for most agents, suggesting generally appropriate but occasionally higher-than-recommended dosing.

Antibiotic	ATC Code	WHO DDD (g)	PDD (g)	DDD/100 Bed Days	PDD/DDD
Cefoperazone + Sulbactam	J01DD62	4	4	8.92	1
Piperacillin + Tazobactam	J01CR05	14	15.4	14.1	1.1
Ceftriaxone	J01DD04	2	2.1	11.85	1.05
Meropenem	J01DH02	2	2.4	16.72	1.2
Metronidazole	J01AF01	1.5	1.4	7.84	0.93
Amoxicillin + Clavulanic acid	J01CR02	3	3.1	6.12	1.03
Azithromycin	J01FA10	0.5	0.54	5.6	1.08
Amikacin	J01GB06	1	0.72	3.48	0.72
Vancomycin	J01XA01	2	1.9	4.05	0.95
Levofloxacin	J01MA12	0.5	0.58	2.32	1.16

Table 4 shows the distribution of antibiotic prescriptions by route of administration among 540 cases. Parenteral administration was predominant, accounting for 408 prescriptions (75.6%), while oral

antibiotics were prescribed in 132 cases (24.4%). Overall, the data indicate a strong preference for parenteral antibiotics over oral formulations in the study population.

Route of Administration	Number of Prescriptions	Percentage (%)
Parenteral	408	75.6
Oral	132	24.4
Total	540	100

Discussion

The current retrospective research evaluated the rates of antibiotic use in 540 ICU patients, and it reveals valuable tendencies of demographic features, prescribing practice, and antimicrobial use. In our case study, medical admissions were the largest number of cases in the ICU (55.6%), followed by

surgical, obstetric and gynaecological, and orthopaedic admissions. The same patterns of medical indicators prevalence in the ICU admissions have been reported in a number of Indian studies and mirror the increased load of serious medical conditions that need the intensive follow-up (Mahendra et al., 2013) [13]. Our results were characterized by the highest proportion of admissions of 21-40 years of age

(42.2%), which is in contrast to the results of other studies held in Western Nepal and Turkey where the ICU admission was more prevalent among older patients (above 60 years of age) (Shankar et al., 2010; Hamdi et al., 2013) [14,15] . Such disparity can be explained by differences in demography of the population, patterns of referrals, and epidemiology of diseases in different regions.”

In our study, the number of female patients admitted to the ICU was more than male patients (57.8% versus 42.2%). The findings are consistent with those of Mahendra et al. (2013) [13], who indicated higher percentage of female admissions to ICUs but the difference was not as high in their study. The reason to have more female patients in our ICU is partly attributed to inclusion of obstetrics and gynaecology cases which were all women by default. Nevertheless, the proportion of females even within the hospitalized population of the medical field is slightly higher than that of males, which implies that there might be gender disparity in the use of healthcare or the burden of diseases in the cohort of the research.

It was noted that the mean number of drugs prescribed per patient was 3.65 which implies moderate polypharmacy. This is similar to the results of Williams et al. (2011) [7] who shared the average of 3.8 drugs per ICU patient and is lower than the values found in some other tertiary care ICUs where the average was over five drugs per patient. The reduction of prescribed drugs in critically ill patients is beneficial to reduce chances of adverse drug reactions, drug-drug interactions, and higher cost of treatment. It is also quite possible, indicated by the rather lower mean in our study, that the process of prescribing will be more rational, although still we need to monitor it.

Anti-microbial agents were a significant percentage of prescribed drugs with an average of 2.9 anti-microbials per prescription giving an indication of high usage of antibiotics by the critically ill patients. John et al. (2011) [16] have reported similar results in the high utilization of antimicrobials in the ICU setting and saw 83% of ICU prescriptions using antimicrobials. Comparatively, our research showed that the use of antimicrobials in our study is a little less percentage but still significant, and the use of antibiotics is very vital in the management in ICU. The common use of fixed-dose combinations (55.2% in our study) is consistent with other studies, which also found a high use of antimicrobial FDCs (especially beta-lactam beta-lactamase inhibitor combinations) (Lohani et al. 2006) [17]. The primary use of piperacillin-tazobactam in our ICU is, however, not similar to previous literature results that showed that amoxicillin-clavulanic acid is the most widely used FDC suggesting a transition to broader-spectrum agents over the past years.

The WHO ATC/DDD methodology was used to identify the most commonly used drugs in our ICU, which revealed that broad-spectrum antibiotics had been the most common. The maximum consumption was recorded with meropenem as 16.72 DDD/100 bed days and then with piperacillin -tazobactam (14.1 DDD/100 bed days) and ceftriaxone (11.85 DDD/100 bed days). These data can be compared to other articles that found the same results of Shankar et al. (2010) [14] and Crucio et al. (2009) [8], which also found the combination of carbapenems and beta-lactams as the most frequently used antibiotics in an ICU. Nevertheless, the total DDD/100 bed days in our research paper was less than that of Hamdi et al. (2013) [15] who reported a value of 87.8 DDD/100 bed days in a Turkish hospital, indicating a rather modest usage of antibiotics in our ICU.

Our study showed that the prescribed daily dose divided by defined daily dose (PDD/DDD) ratio was near to unity with most antibiotics meaning that we were following the standard dosing recommendation. There were slightly high ratios of meropenem (1.2) and piperacillin -tazobactam (1.1), as it is expected to administer higher dosages to critically ill patients because of changes in pharmacokinetics. The same tendencies are mentioned in other literature, wherein dose escalation was widely used in the severe infections to reach the optimum therapeutic levels (Hamdi et al., 2013) [15]. On the other hand, reduced PDD/DDD ratios of amikacin and metronidazole indicate that the drugs should be used in low doses, which may be to prevent toxicity.

The most common mode of administration of the antibiotics in our research was parenteral administration (75.6%), which is in line with the severity of the disease and the necessity to achieve quick and efficient action of the drugs in ICU patients. The result is in line with the results reported by John et al. (2011) [16] and Shankar et al. (2003) [18], who reported high dependence on intravenous antibiotics in ICU and internal medicine wards. Our study has shown that oral use of antibiotics is limited; it has been observed that a preference of parenteral therapy over oral therapy has been established in the clinical setting of patients with a critical illness, but timely de-escalation to oral therapy is an essential antimicrobial stewardship approach.

On the whole, the results of the given study indicate the trends of antibiotic usage that are mostly similar to the existing national and international research, though they also reveal a greater diversity of patient demographics and prescriptive behavior in the regions. The overwhelming use of broad-spectrum antibiotics represents the necessity of active monitoring and use of culture-based treatment and compliance with the principles of antimicrobial stewardship in order to prevent resistance development and provide the best conceivable patient outcomes.

Conclusion

This retrospective study indicates that antibiotic use in the intensive care unit is characterized by high intensity mainly due to the presence of critically ill patients, who were admitted to the unit due to medical and surgical reasons, with the populations of adults and elderly people being predominant. The patterns of prescribing showed the tendency to use several drugs at once, with a significant amount of using broad-spectrum and fixed-dose combination antibiotics, and the preference to use parenteral administration, which is consistent with the severity of the illness in the ICU. The recorded agreement of the recommended doses per day with the standardized dosage recommendations indicates that there are generally suitable dosing practices, but it is the total weight of the antimicrobial exposure that highlights the possibility of irrationality in the use of antimicrobials and antimicrobial resistance. These findings emphasize the need for continuous monitoring of antibiotic utilization, reinforcement of antimicrobial stewardship programs, and periodic prescription audits to promote rational antibiotic use and optimize patient outcomes in intensive care units.

References

1. Shankar PR, Partha P, Dubey AK, Mishra P, Deshpande VY. Intensive care unit drug utilization in a teaching hospital in Nepal. *Kathmandu Univ Med J (KUMJ)* 2005;3(2):130-7
2. Yamashita SK, Louie M, Simor AE, Rachlis A. Microbiological surveillance and parenteral antibiotic use in a critical care unit. *Can J Infect Dis* 2000;11(2):107-11
3. Krivoy N, El-Ahal WA, Bar-Lavie Y, Haddad S. Antibiotic prescription and cost patterns in a general intensive care unit. *Pharm Pract (Granada)* 2007; 5:67-73
4. Kavar KS, Jha RK, Gaikwad NR, Jared SS, Ranpura AM. Antibiotic use density in medicine ICU in a tertiary care rural hospital of central India. *Res J Pharm Biol Chem Sci* 2012; 3:133
5. Weber RJ, Kane SL, Oriolo VA, Saul M, Skledar SJ, Dasta JF. Impact of intensive care unit (ICU) drug use on hospital costs: A descriptive analysis, with recommendations for optimizing ICU pharmacotherapy. *Crit Care Med* 2003;31 1 Suppl: S17-24
6. Hanberger H, Monnet DL, Nilsson LE. Intensive care unit. In: *Antibiotic Policies: Theory and Practice*, 1st edn, Gould IM, van der Meer JWM (Eds.). New York: Kluwer Academic/Plenum Publishers, 2005. pp. 261–80
7. Williams A, Mathai AS, Phillips AS. Antibiotic prescription patterns at admission into a tertiary level in intensive care unit in Northern India. *J Pharm Bioallied Sci.* 2011;3(4):531-6.
8. Curcio DJ, On behalf of the Latin American antibiotic use in intensive care unit group. Antibiotic prescription in intensive care units in Latin America. *Rev Argent Microbiol* 2011; 43:203-11.
9. Khardori N. Antibiotics –Past, present, and future. *Med Clin North Am.* 2006; 90:1049-76.
10. Anand N, Nagendra Nayak I M, Advaita M V, Thaikattil NJ, Kantanavar KA, Anand S. Antimicrobial agents' utilization and cost pattern in an Intensive Care Unit of a Teaching Hospital in South India. *Indian J Crit Care Med* 2016; 20:274-9.
11. World Health Organization (WHO), Collaborating Centre for Drug Statistics Methodology: Guidelines for ATC classification and DDD assignment 2010.2009. Available from, <http://www.whocc.no/atcddd/>. Accessed 14 June 2010. ISBN 978-82- 8082-369
12. Berrington A: Antimicrobial prescribing in hospitals be careful what you measure. *J Antimicrob Chemother* 2010, 5:163–168.
13. Mahendra K Patel, Manish J Barvaliya, Tejas K Patel, CB Tripathi. Drug utilization pattern in critical care unit in a tertiary care teaching hospital in India. *International Journal of Critical Illness and Injury Science* 2013; 3:4:
14. Shankar PR, Upadhyay DK, Subish P, Bhandari RB, Das B. Drug utilization among older inpatient Sina teaching hospital in Western Nepal. *Singapore Med J.* 2010; 51:2834.
15. Hamdi Sözen, İbak Gönen, Ayşe Sözen, Ali Kutlucan, Serdar Kalemci and Murat Sahar. Application of ATC/DDD methodology to evaluate of antibiotic use in a general hospital in Turkey. *Annals of Clinical Microbiology and Antimicrobials* 2013; 12:23:1-6
16. John LJ, Devi P, John J, Guido S. Drug utilization study of antimicrobial agents in medical intensive care unit of a tertiary care hospital. *Asian J Pharm Clin Res.* 2011; 4:81-4.
17. Lohani SP, Thapa P, Aryal UR, Satyal KR. Polypharmacy and geriatric patients: patterns of prescribing in the Tribhuvan University Teaching Hospital in Nepal. *J Nepal Health Res Counc*2006; 4:1-4.
18. Shankar RP, Partha P, Shenoy NK, Easow EM, Brahmadathan KN. Prescribing patterns of antibiotics and sensitivity patterns of common microorganisms in the Internal Medicine ward of a teaching hospital in Western Nepal: a prospective study. *Ann Clin Microbiol Antimicrob* 2003; 2:7.