



## A study on drug utilization pattern of antimicrobials in outpatient department of medicine at tertiary care hospital

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### ABSTRACT

Antimicrobials are the most frequently prescribed therapeutic agents, accounting for 30 to 50% of drug prescriptions. It represents approximately 30% of hospital drug expenditure. Surveys have shown that 22–65% of antibiotic prescriptions are either inappropriate or incorrect. Drug utilization studies are powerful exploratory tools to ascertain the role of drugs in society. A Cross Sectional study conducted in out-patient department of Medicine at Swai Man Singh (SMS) Medical College & Hospital, Jaipur, and Rajasthan. Altogether 606 patients, 370 (61.05%) males and 236 (38.94%) females were enrolled. Among these, highest rate of drug prescription was observed for patients aged between 21 to 30 years, which consist of 220 (36.31%) patients (176 males + 44 females). Highest rate of antimicrobial prescription was observed for patients of pulmonary infection which consist of 246 (61.81%) patients followed by general/Pyrexia Unknown Organism (PUO) and immunological reactions which consist of 15.58% and 13.32% respectively. Highest frequency of drug prescription was observed for Azithromycin which consist of 268 (60.22%) followed by Amoxicillin 32 (7.19%), Cifixime 29 (6.52%), Doxycycline 22 (4.94%). Overall 96.48% patients were treated with a monotherapy of antibiotics/antimicrobial, which lead to very less chance of resistance of antibiotic and adverse reactions. This study showed that average drug prescribed per prescription was 3.36. The extent of prescribing AMDs from NLEM was 89.18 %, which indicate that physician's more compliance toward NLEM. The study strongly highlighted the need of patient education and counseling on use of antimicrobial drugs (AMDs) and concomitant drugs.

**Key words:** Antimicrobial Drugs (AMDs), Drug utilization review (DUR), National List of Essential Medicine (NLEM).

## INTRODUCTION

Prescribing practices are a reflection of health professional's abilities to discriminate among the various choices of drugs and determine the ones that will most benefit their patient.<sup>1</sup> Nowadays drug utilization studies (DUS) are used as potential tool in the evaluation of healthcare systems. Drug utilization studies are powerful exploratory tools to ascertain the role of drugs in society. They create a sound socio-medical and health economic basis for healthcare decision making.<sup>2</sup> DUS is defined as "the marketing, distribution, prescription and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences".<sup>3</sup> Drug utilization becomes, as such, essential for elderly care,

although, the incorrect use of medicines is one of the greatest problems experienced by this population.<sup>4</sup> The elderly often use more than one drug, which may lead to drug interactions, adverse effects, concomitant use of other therapies and drug redundancy, and the use of drugs without therapeutic value. These events are, for the most part, related to pharmacodynamic and pharmacokinetic changes that occur at this age.<sup>5</sup> Studies on drug utilization focus on the factors related to prescribing, dispensing, administering of medication, its beneficial or adverse effects etc.<sup>6</sup> In the United States drug utilization research has been primarily developed at an institutional level or as a part of local health programs.<sup>7</sup> European drug utilization studies have been developed to describe and compare the

patterns of use of specific groups of drugs.<sup>8</sup> It is important to understand the interrelationships of the different domains as there are number of terms which have come into use such as Epidemiology, Pharmacoepidemiology, Pharmacosurveillance, Pharmacovigilance.<sup>9</sup> Antibiotics are the most commonly used therapeutic agents, accounting for majority of ambulatory care prescriptions. It represents approximately 30% of hospital drug expenditure and are prescribed for 20–50% of patients. Surveys have shown that 22–65% of antibiotic prescriptions are either inappropriate or incorrect.<sup>10</sup>

## MATERIALS AND METHOD

### RATIONALE OF STUDY –

This study was performed to determine the proportion of receiving AMDs for common illness and to understand the antimicrobial prescription pattern in a research outpatient department. The drug prescription patterns in research institute outpatient department, according to the WHO standard protocol, are lacking in North – West clinical setting of country. This study fills this gap to an extent.

### OBJECTIVES –

1. To identify the pattern of drug utilization of Antimicrobials in prescriptions of patients at outpatient department of Medicine, Swai Mansingh (SMS) Medical College & Hospital, Jaipur, Rajasthan.
2. To analyze the utilization of different classes of drugs.
3. To determine compliance rates of physicians to generics in terms of prescribing habits.
4. To estimate the level of adherence in prescribing from National Essential Medicine List (NEML).

### STUDY SITE –

The Prospective Cross Sectional study conducted over period of 8 months from September 2011 to April 2012 in out-patient department of Medicine, Swai Man Singh (SMS) Medical College & Hospital, Jaipur, Rajasthan.

### TESTING TOOLS –

The prescription indicators recommended by the WHO used as a tool to assess the drug utilization pattern. The standard data entry formats used as an instrument for the assessment of pattern of drug utilization.

### INDICATOR FOR EVALUATION –

1. Average number of drugs per encounter.
2. Percentage of drugs prescribed by generic name.
3. Percentage of encounter with an antibiotic prescribed.
4. Percentage of encounter with an injection prescribed.
5. Percentage of drug prescribed from essential drug list or formulary.
6. Average contact time between patient and doctor.
7. Average duration of therapy.

## RESULTS

The findings of this study included 606 prescriptions which includes –

**Table – 1 (Sex distribution)**

S.N.	Male	Female	Total
1	370 (61.05%)	236 (38.94%)	606

### DEMOGRAPHIC OF STUDY POPULATION

**Table – 2 (Age and Sex distribution)**

S.N.	Age Group (In years)	Male	Female	Total	% of Patient in Group
1	11-20	54	33	87	14.36
2	21-30	176	44	220	36.31
3	31-40	63	59	122	20.13
4	41-50	19	55	74	12.21
5	51-60	29	9	38	6.27
6	61-70	13	23	36	5.95
7	71-80	15	13	28	4.62
8	81-90	1	0	1	0.15
	Total	370 (61.05%)	236 (38.94%)	606	

Highest rate of drug prescription was observed for patients aged between 21 to 30 years, which consist of 220 (36.31%) patients (176 males + 44 females). Lowest rate of drug prescription was observed with patient aged between 81 to 90 years, which consist of 1 (0.15%) male patient. Maximum and Minimum age was found to be 85 and 12 years respectively. Mean  $\pm$  Standard Deviation (SD) for age was found to be  $35.19 \pm 15.97$ .

### EDUCATIONAL QUALIFICATION

**Table – 3 (Educational Qualification status)**

S.No.	Qualification	Total No. of Patients	% of Patient in Group
1	Illiterate	152	25.08
2	6th - 12th	127	20.96
3	Graduate	287	47.36
4	Postgraduate	40	6.60
	<b>Total</b>	606	

Highest rate of drug prescription was observed for patients those either were graduate or graduating which consist of 287 (47.36%). Lowest rate of drug prescription was observed for patients those either were post graduate or post graduating which consist of 40 (6.60%).

### OCCUPATION

**Table – 4 (Occupation status)**

S.N.	Occupation	Total No. of Patients	% of Patients in Group
1	Business	98	16.17
2	Govt. Job.	79	13.04
3	House Wives	132	21.79
4	Private Job	20	3.30
5	Retired	25	4.12
6	Student	177	29.20
7	Farmer	75	12.38
	Total	606	

Highest rate of drug prescription was observed for patients those were student which consist of 177 (29.20%) patients followed by House wives which consist of 132 (21.79%)

patients. Lowest rate of drug prescription was observed for patients those were in private job which consist of 20 (3.30%) patients.

#### DISTRIBUTION OF THERAPEUTIC ANTIMICROBIAL USE BY SITE OF INFECTION

**Table – 5 (AMD use by Site of Infection)**

S. No.	Site of Infection	No. of Patients	Percentage
1.	Cardiovascular	3	0.76
2.	Dental	2	0.50
3.	Gastro Intestinal	7	1.76
4.	General /P.U.O.	62	15.58
5.	Immunological Reactions	53	13.32
6.	Metabolic Disorder	2	0.51
7.	Musculoskeletal	9	2.26
8.	Pulmonary	246	61.81
9.	Urinary tract	14	3.50
	<b>Total</b>	<b>398</b>	

Highest rate of antimicrobial prescription was observed for patients of pulmonary infection which consist of 246 (61.81%) patients followed by general/PUO infection and immunological reactions which consist of 15.58% and 13.32% respectively.

#### TOTAL ANTIMICROBIAL PRESCRIBED

**Table – 6 (Prescribing pattern of AMDs)**

S.No.	Drug	Frequency of Drug Prescribed	Percentage
1.	Amoxicillin	32	7.19
2.	Azithromycin	268	60.22
3.	Cifixime	29	6.52
4.	Ofloxacin	15	3.37
5.	Ciprofloxacin	14	3.15
6.	Doxycycline	22	4.94
7.	Neomycin Oint.	1	0.22
8.	Levofloxacin	12	2.70
9.	Co-trimoxazole	1	0.22
10.	Inj. Amoxicillin + Pot. Clav.	7	1.57
11.	Nitrofurantoin	5	1.12
12.	Albendazole	4	0.90
13.	Matronidazole	2	0.45
14.	Ornidazole	15	3.37
15.	Mefloquine	6	1.35
16.	Artesunate	2	0.45
17.	Chloroquine	10	2.26
	<b>Total</b>	<b>445</b>	

Highest frequency of drug prescription was observed for azithromycin which consist of 268 (60.22%) followed by Amoxicillin 32 (7.19%), Cifixime 29 (6.52%), Doxycycline 22 (4.94%). Lowest frequency of drug prescription was observed for Co-trimoxazole and Neomycin Ointment which consist of 1 (0.22%) for both. Topical antimicrobial consist of Neomycin which was prescribed for 1 (0.22%) time only. Injectable antimicrobial consist of combination of Amoxicillin and Potassium Clav. which prescribed for 7 (1.57%) time. Total number of patients with therapeutic prescriptions of antimicrobial were 398 (65.67%) out of total 606

prescriptions, which consist of 445 (23.36%) antimicrobial drug out of total 1905 prescribed drug.

#### OTHER MAJOR CONCOMITANT THERAPY

**Table – 7 (Prescribing pattern of other concomitant therapy)**

S.No.	Drug	Frequency of Drug Prescribed	Percentage
1.	Cap. Vitamin B Complex	60	3.15
2.	Tab. Iron and Folic acid	34	1.79
3.	Tab. Cal+ Vit D3	62	3.25
4.	Cap. Omeprazole	75	3.94
5.	Cap. Pantoprazole	35	1.84
6.	Cap. Rabeprazole	19	0.99
7.	Tab. Domperidone	60	3.15
8.	Lactulose Syrup	11	0.58
9.	Inhaler Salmeterol + Fluticasone	51	2.68
10.	Inhaler Beclomethasone + Levosalbutamol	12	0.63
11.	Inhaler Budosende	27	1.41
12.	Inhaler Salbutamol	59	3.10
13.	Tab. Levocetizine	120	6.30
14.	Tab. Montileukast	98	5.14
15.	Tab. Cetirizine	40	2.10
16.	Tab. Theophylline + Etophylline	46	2.41
17.	Tab. Chlorpheniramine	56	2.94
18.	Tab. Prednisolone	15	0.78
19.	Tab. Paracetamol	87	4.56
20.	Tab. Clopidogrel	22	1.15
21.	Tab. Atenolol	12	0.63
22.	Tab. Propranolol	15	0.78
23.	Tab. Losartan	23	1.20
24.	Tab. Fluoxetine	26	1.36
25.	Tab. Sertraline	29	1.52
26.	Tab. Alprazolam	45	2.36
27.	Tab. Glibenclamide	8	0.42
28.	Tab. Glimepride	14	0.73
29.	Tab. Metformin	9	0.47
30.	Inj. Insulin 30/70	9	0.47
31.	Tab. Thyroxin	14	0.73

Highest frequency of drug prescription for other major concomitant therapy was found for Levocetizine which consist of 120 (6.30%) followed by Montileukast 98 (5.14%), Paracetamol 87 (4.56%), Omeprazole 75 (3.94%), Calcium 62 (3.25%), Vitamin B complex 60 (3.15%), Domperidone 60 (3.15%), Salbutamol 59 (3.10%), Chlorpheniramine 56 (2.94%), Salmeterol + Fluticasone 51 (2.68%), Theophylline + Etophylline 46 (2.41%), Alprazolam 45 (2.36%), Cetirizine 40 (2.1%), Pantoprazole 35 (1.84%), Iron and Folic acid 34 (1.79%), Sertraline 29 (1.52%), Budosende 27 (1.41%), Fluoxetine 26 (1.36%), Losartan 23 (1.20%), Clopidogrel 22 (1.15%), Rabeprazole 19 (0.99%), Prednisolone 15 (0.78%), Propranolol 15 (0.78%), Glimepride 14 (0.73%), Thyroxin 14 (0.73%), Beclomethasone + Levosalbutamol 12 (0.63%), Atenolol 12 (0.63%), Lactulose 11 (0.58%), Metformin 9 (0.47%), Insulin Injection 9 (0.47%), Glibenclamide 8 (0.42%).

**INDICATOR USED FOR EVALUATION –****Indicator for evaluation used as follow according to WHO:**

1. Average number of drugs per encounter – 3.36 per prescription
2. Percentage of drugs prescribed by generic name – 89.86 % (As out of 606 prescriptions which contain 1905 drug. Into which 58 prescription which contain 193 prescribed drug, prescribed by brand name)
3. Percentage of encounter with an antibiotic prescribed – 21.05 %
4. Percentage of encounter with an injection prescribed – 0.84 %
5. Percentage of drug prescribed from essential drug list or formulary – 89.18 %
6. Average Consultation time – 3.61 Minutes
7. Average Duration of therapy – 7.52 Days

**DISCUSSION**

DUE is an inexpensive, flexible and simple method to assess the utilization pattern of drug. DUE has defined potential benefits both for patient and for clinical practice in carrying out a well – planned audit of prescribing drug.<sup>9</sup> This study was conducted in order to evaluate and improve the rate of appropriate use of antimicrobials. This prospective cross sectional study was conducted on 606 patients. The demographic profile showed higher male (61.05%) to female (38.94%) proportion in this study which indicate that males were predominantly coming than females for consultation; the probable reasons may be the sociological factors in this part of the country. Since the immunity of older patients is generally poorer than that of younger adult patients, antibiotic usage might well be more frequent in the older patients.<sup>11</sup> However, in the present study we found that patients of 21-30 years received more prescriptions for antibiotics than patients of older years. Result indicates the highest number of patients was found to be between the age group of 21 to 30 years (36.31%) and the lowest number was between the age group of 81 to 90 years (0.15%). Result indicated that Macrolide, Broad spectrum penicillin and Cephalosporin were the choice of prescribed AMDs. Which consist of Azithromycin (60.22%), followed by Amoxicillin (7.19%), Cifixime (6.52%) respectively. Beside these Doxycycline (4.94%), Ofloxacin (3.37%), Ornidazole (3.37%), Ciprofloxacin (3.15%), Levofloxacin (2.70%), Chloroquine (2.25%), Mefloquine (1.35%), Nitrofurantoin (1.12%), Albendazole (0.9%), Matranidazole (0.45%), Artesunate (0.45%), Neomycin ointment (0.22%), Co-trimoxazole (0.22%) were prescribed. There was a low incidence of prescriptions which contained antibiotics which were prescribed as injections; only Amoxicillin + Potassium clavulanate was prescribed by IV/IM which consist of 1.57 % from total prescribed antimicrobials. However, in Ghana, that percentage was extremely high and the percentage of injections which was prescribed was as high as 80.0%.<sup>12</sup> The overuse of antibiotic prescribing is common as in some prescriptions; Inappropriate antibiotic

use is a well-documented risk factor for the infection or colonization of resistant pathogens.<sup>13-15</sup> It was reported that the antibiotic prescription habits of doctors in developing countries called for concern and that a lot of money could be saved without compromising the quality of care, if policies were formulated and promoted on the rational antibiotics prescription in developing countries. These should focus on promoting infectious control with the

rational antibiotic prescription and utilization being aimed at minimizing the future emergence of bacterial resistance.<sup>16</sup> In this study, Majority of prescription contain antibiotics which consist 65.67% of total prescriptions and 21.05% from the total number of prescribed drugs. However there were no reports about drug-drug interactions or adverse drug reactions. A similarly high percentage was reported in Sudan (30 to 60%).<sup>17</sup> A study which was performed in different general public health facilities in Yemen showed that the percentage of prescriptions which contained antibiotics was 61.0%.<sup>18</sup> A study was also performed in other district hospitals of Yemen with the average percentage of antibiotics of 48.3% encounters with prescriptions and 21.5% from the total number of prescribed drugs.<sup>19</sup> A higher percentage (65.0%) of antibiotic use was recorded in Ghana<sup>12</sup> and between 30.0% and 60.0% of the patients in the primary health care centers received antibiotics in the developed and the developing countries.<sup>20</sup> Similarly, a study which was carried out in Cambodia showed that the percentage of antibiotics which was used ranged from 10.0% to 66.0%.<sup>21</sup> However, the average percentage of the antibiotics which was used in Malaysia was lower (23.2%).<sup>22</sup> and even lower percentages of antibiotic use were reported in Mongolia (20.6%).<sup>23</sup> Officially, in most of the countries, antibiotics are considered as a prescription only medicine (POM) but in practice, in most of the developing countries, they are widely available as over-the-counter (OTC) drugs in many pharmacies, and even street corners, which may lead to their misuse.<sup>24</sup> Antibiotics are safe when they are selected properly at the appropriate dosage for a recommended period of time and the prescribing of antibiotics is assumed to be more rational if these indicators have lower values.<sup>24</sup> Most important finding of this study include that there was a lowest incidence of prescribing antibiotics and other concomitant therapy with a brand name which consist of 89.86% of total drugs prescribed by generic name. The reason for this was implementation of Chief Minister free medicine scheme started by Government of Rajasthan from October 02, 2011. All drugs/prescription which prescribed after the implementation of the scheme have 100% generic prescription. From this study, the most common indication for treatment was respiratory tract infection including common cold. The respiratory tract comprises the upper and lower parts: the upper respiratory tract comprises the sinuses, middle ear, pharynx, epiglottis and larynx, while the lower respiratory tract consists of the structures below the larynx – the bronchi, bronchioles and alveoli.<sup>25</sup> It is well known that the etiology of common cold is viral.<sup>25</sup> For most patients with the diagnosis of common cold, antibiotic usage is unnecessary, especially for adult

patients. The symptoms resolve without antibiotic treatment within a week. However in this study Azithromycin was prescribed with highest frequency for respiratory tract infection which alone contributes for about 60.22% of total prescription of AMDs. Pulmonary infection (61.81), General Infection/PUO (15.58%), Immunological reactions (13.32%) were the most common diagnoses followed by Urinary Tract Infection (3.52%), Gastro Intestinal Tract Infection (1.76%), Cardio Vascular (0.76%), Metabolic disorder (0.51%) and Dental infection (0.5%). The highest co morbid condition was Hypertension; others included DMII and Arthritis. Accuracy in the patient's case diagnosis is very important for prescribing drugs rationally. Surveys carried out on the management of sick children revealed that many were not properly assessed and treated and their parents were poorly advised.<sup>23</sup> Public attitudes and expectations also contribute to irrational prescribing.<sup>26</sup> Maximum treatment prescribed in this study include empirical treatment as in majority of cases patient neither went for complete diagnosis as suggested by physician or that may be due to non affordability of high diagnostic fees. This study showed that average drug prescribed per prescription was 3.36, this is a praiseworthy fact as it lowers the risk of prescribing errors and also reduce the cost of the drug per prescription. Overall 96.48% patients were treated with a monotherapy of antibiotics/antimicrobial, which lead to very less chance of resistance of antibiotic and adverse reactions. The extent of prescribing AMDs from NLEM was 89.18 %, which indicate that physician's more compliance toward NLEM is a praiseworthy prescribing habit of physician. This study also conclude that tablet was a choice of dosage form in all group of patients, this is because easy handling and administration of drug. As socio-economic patients coming to outpatient department was not so strong, most of them were poor. This was excellent prescribing habit of physician keeping in mind their financial and concerned patients safety simultaneously.

## CONCLUSION

The study was aimed to determine prescribing pattern at outpatient department of medicine of tertiary care hospital in Rajasthan, North West India, using WHO recommended indicators. The drug utilization pattern was studied on a total of 606 prescriptions. There was predominance of middle age group in the study sample. The average number of drug prescribed was found to be 3.36 per prescription. Maximum number of patients (96.48%) patients was treated with a monotherapy of antibiotic/antimicrobial, No polypharmacy was noted. More of the half of the total prescription contains antimicrobials; almost one fourth of the total drug prescribed in all prescriptions contained antimicrobials. Azithromycin was found most prevalent drug among all prescribed drug (60.22%). Respiratory tract infections and Immunological reaction were the most frequent indications for antibiotic use in this study. There was greater compliance of physician toward the drug prescribed from NLEM (89.18%) and the maximum drug

prescribed by generic name (89.86%). The present study had provided useful findings which can be used as evidence for the prescribing pattern and the use of the antimicrobial drug at an outpatient department of tertiary care hospitals for this part of country. The results of this survey revealed that there is the need for an antibiotic formulary or clinical guidelines. The Hospitals Drugs and Therapeutics committee can play an important role in this regard and also perform drug utilization studies and prescription reviews to improve drug use in general and management. The study strongly highlighted the need of patient education and counseling on use of AMDs and concomitant drugs.

## REFERENCES

1. Gujar A, Tiwari P. Antimicrobial drug use in hospitalized children. *Current Research & Information on Pharmaceutical Sciences* 2008;9(1):2-6.
2. Bakssas I, Lunde PK. National drug policies: the need for drug utilization studies. *Trends In Pharmacological Sciences* 1986;7:331-334.
3. How to investigate drug use in health facilities: selected drug use indicators. WHO / DAP, Geneva 1993;1:1-87.
4. Loyola Filho AI, Uchoa E, Firmo JOA, et al. A population-based study on use of medications by elderly Brazilians: the Bambu- Health and Aging Study (BHAS). *Cadernos de Saude Publica* 2005;21:545-553.
5. Braga TBT, Pfaffenbach G, Weiss DPL, et al. Point prevalence of drug prescriptions for elderly and non-elderly inpatients in a teaching hospital. *Sao Paulo Medical Journal* 2004;122:48-52.
6. Lunde PKM, Baksaas I. Epidemiology of Drug Utilization : Basic Concepts and Methodology. *Acta Medica Scandinavica* 1987;222:7-11.
7. Guillemot D. How to evaluate and predict the epidemiologic impact of antibiotic use in humans: the pharmacoepidemiologic approach. *Clinical Microbiology and Infection* 2001;7:19-23.
8. Gama H. Drug utilization studies. *Arquivos De Medicina* 2008;22:69-74.
9. Sjoqvist F, Birkett D. Drug utilization. WHO publications 1975;5:39-50.
10. Niederman MS. Appropriate use of antimicrobial agents: Challenges and strategies for improvement. *Critical Care Medicine* 2003;31:608.
11. Chang SC, Chang HJ, Lai MS. Antibiotic usage in primary care units in Taiwan. *International Journal of Antimicrobial Agents* 1999;11:23-30.
12. Bosu WK, Ofori-Adjei D. An audit of prescribing practices in health care facilities of the Wassa West district of Ghana. *West African Journal of Medicine* 2000;19:298-303.

13. Tan TQ, Mason EO, Kaplan SL. Penicillin-resistant systemic pneumococcal infections in children: a retrospective case-control study. *Pediatrics* 1993;92:761-767.
14. Clavo-Sanchez AJ, Girn-Gonzalez JA, Lapez-Prieto D, et al. Analysis of risk factors for infection due to penicillin-resistant and multidrug-resistant *Streptococcus pneumoniae*: a multicenter study. *Clinical Infectious Diseases* 1997;24:1052-1059.
15. Dowell SF, Schwartz B. Resistant pneumococci: protecting patients through judicious use of antibiotics. *American Family Physician* 1997;55:1647.
16. Akande TM, Ologe M, Medubi GF. Antibiotic prescription pattern and cost at University of Ilorin teaching hospital, Ilorin, Nigeria. *International Journal of Tropical Medicine* 2009;4:50-54.
17. Sachs L, Tomson G. Medicines and culture--a double perspective on drug utilization in a developing country. *Social Science & Medicine* 1992;34:307-315.
18. Abdo-Rabbo A, Haaijer-Ruskamp F, Bashrahil K. Baseline prescribing and health facility indicators in Yemen. *Journal of the Faculty of Medicine, Baghdad* 2000;42:824-829.
19. Al-Shami AM, Mohamed Izham MI, Abdo-Rabbo A, et al. Evaluation of the Quality of Prescriptions with Antibiotics in the Government Hospitals of Yemen. *Journal of Clinical and Diagnostic Research* 2011;5(4):808-812.
20. Quick JD. Essential medicines twenty-five years on: closing the access gap. *Health policy and planning* 2003;18:1-3.
21. Chareonkul C, Khun VL, Boonshuyar C. Rational drug use in Cambodia: study of three pilot health centers in Kampong Thom Province. *South Asian Journal of Tropical Medicine and Public Health* 2002;33(2):418-424.
22. Saleh K. Malaysian Pharmaceutical Situation: Accessibility, Quality, Rational use and Evidence Based Evaluation. PhD Thesis. University Sains Malaysia; 2004;230-242.
23. WHO. Drug use indicators in Magnolia – Essential drugs and medicine policy. World Health Organization 2003.
24. Farrar WE. Antibiotic resistance in developing countries. *The Journal of Infectious Diseases* 1985;152:1103-1106.
25. Edwards C, Walker R, Clinical and applied therapeutics. Churchill livingstone, london 2003;3<sup>rd</sup> /e:519.
26. Belongia EA, Naimi TS, Gale CM, et al. Antibiotic use and upper respiratory infections: a survey of knowledge, attitudes, and experience in Wisconsin and Minnesota. *Preventive Medicine* 2002;34:346-352.