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Drug utilization study of antibiotics in surgical ward of a tertiary care hospital

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ABSTRACT

This study was conducted to assess the patterns of antibiotic and to suggest necessary modifications in prescribing practices to achieve rational therapeutic practices. A prospective observational study was carried out at the 300 bedded medical surgical units of Narayana Hrudayalaya Multispecialty Hospital, Secunderabad, and Telangana from August 2014 to Febraury 2015. The demographic data, disease data and the utilization of different classes of antibiotics as well as individual drugs were analyzed using descriptive analysis. A total of 200 patients were enrolled in the study. Out of 200 patients included for the study, 108 (53%) were males and 94(47%) were females, 5 patients had an age of 0-10 years, 24 patients had an age of 10-20 years, 52 patients had an age of 20-30 years, 36 patients had an age of 30-40 years, 34 patients had an age of 40-50 years. 28 patients had an age of 50-60 years. 17 patients had an age of 60-70 years.6 patients had an age of 70-80 years Higher utilization of cephalosporins 161 (80.5%) and fluoroquinolones 76 (38%) was noticed, similar to Usluer G et.al study but, differed from Shankar et al in which penicillins were the commonest antimicrobial drug class prescribed. Followed by 44 (22%) patients were prescribed with Pencillins. 80(40%) patients were prescribed with aminoglycosides. 46(23%) patients were prescribed with Nitroimidazole antibiotics. The present study on antibiotics drug prescribing patterns in medical surgical unit can provide a framework for continuous prescription audit in the surgical unit. Overall extensive poly-pharmacy and poly-pharmacy among antimicrobial agents was noticed.

Keywords: Drug utilization, Antibiotics, Surgical unit, Polypharmacy.

1. INTRODUCTION

1.1. History of Antibiotics

S.A. Waksman introduced the term “antibiotic“in 1942. In forties to sixties, the term “antibiotic” was clearly differed from the term “chemotherapeutic drug”: antibiotics were natural drugs produced by several fungi or bacteria [1]. Chemotherapeutic drugs were man-made substances. Nevertheless the differences were abolished after chemical synthesis of some antibiotics has been realized and new drugs have been developed from the natural products with binding various side chains to the basic structure. From this point of view, the history of antibiotics begun in 1932 when the first sulfonamide [2] was prepared. The boom of sulfonamides appeared thereafter with about 5.000 substances developed during years 1932-1945. Sulfonamides were effective in urinary tract infections, shigellosis, and pneumococcal pneumonia and even in purulent meningitis. But the effect of sulfonamides was totally exceeded with penicillin and streptomycin. It was a happy chance that these two antibiotics covered the whole spectrum of bacteria [3].

The problem of resistance can be solved only with accepting following demands (the specification is not complete). Diminishing the overuse of antibiotics. The commonest mistake in the community is prescribing antibiotics to patients with an infection of (probable) viral origin and/or with a mild and easily self-limited disease [4]. The commonest mistake in hospitals is an unnecessary and/or too long antibiotic prophylaxis in surgery. Consistent preference of

narrow spectrum antibiotics whenever possible. Preference of a short course of higher dosed antibiotic to a long course of lower dosed drug. Isolation of inpatients or hospital staff in whom infection or colonization with multiresistant strain is recognized. Skilled experts must control prescription of antibiotics in both hospitals and community [5].

There has been no good evidence from properly controlled trials demonstrating that antibiotic formulary restriction and authorization requirement lead to patients' clinical outcomes, which are not inferior to those without such a strategy [6]. Several recent studies on this strategy were cross-sectional studies or time series analysis A prospective observational study was conducted to systematically assess the prescribing pattern of antihypertensive drugs. [7] Drug utilization has been defined by WHO as the marketing, distribution and use of drugs in a society with special emphasis on resulting medical, social and economic consequences. A prescription based survey is considered to be one of the most effective methods to assess and evaluate the prescribing attitude of physician and dispensing practice of pharmacists [8].

However information on drug utilization is lacking in our country. Systematic review of published literature showed that DUR studies are mostly hospital based, rather than community based do not use ATC/DDD system, have not analysed prescription patterns for deviations from standard treatment guidelines or safety warning, and evaluation of interventions to improve prescribing practices are lacking [9].

Therefore we conducted a study on pattern of antibiotic usage, distribution of antibiotics in surgical wards/units of tertiary care hospital. The present study analyzed the antibiotics drug utilization of a special population of patients admitted to the medical surgical unit of a super-specialty setting. The purpose of inpatient based prescription audit has advantage of minimizing the 'drop-outs' as patients had to purchase and take the prescribed drugs and limitation of the study was qualitative assessment of antimicrobial drug utilization was not performed.

2. METHODOLOGY

The study was conducted in the Department of General Surgery of Malla Reddy and Narayana Hrudayalaya Hospital Secunderabad, India. The study was designed to be a Prospective Observational Study of six months. The sample size was 200 patients. The participants enrolled in the study involved out-patients and in patients coming to the hospital, only after filling a properly written informed consent. Basic demographic information and details of the prescribed antibiotics and their prescribing patterns, diseases for which they were indicated, dosage form of antibiotics and whether mono- or multi-therapy is used, were documented in all patients. In view of collecting the aforementioned details, the data from outpatients/in patients was obtained every day from the clinical assessment records, including medical records and other relevant information sources as documented, including laboratory investigations. Descriptive analysis was carried out for the data obtained.

2.1. Study Design

A hospital base prospective and observational study.

2.2. Study Site

The study was conducted in the Department of General Surgery of Malla Reddy and Narayana Hrudayalaya Hospital Hyderabad.

2.3. Study Period

August 2014-to February 2015.

2.4. Study Population

200 post- operative inpatients. In this study the data was collected in the data collection form and current prescribing patterns of antibiotics in post-operative patients was reviewed.

2.5. Inclusion Criteria

Any age. Patients of either sex. Patients who have been through a surgery. Patients to whom antibiotics prescribed in post-operative ward. Patients with Co-morbid conditions. Patients operated in emergency.

2.6. Exclusion Criteria

Pregnant women. Patients who were failing to come for a follow up days since the day of discharge., Outpatients.

3. RESULTS AND DISCUSSION

All inpatients admitted to the medical surgical unit during the study period were included as the study population. Patients who get transferred to other specialty ICUs from medical ICU within 24 hours of admission were excluded from the study population. Permission to collect the data and accompany physicians on ward rounds in the medical surgical unit was taken from the head of general surgery before starting the study. The relevant data was collected while accompanying the clinicians 6 days in a week and also from the inpatient medical records. We have reviewed all the prescriptions and the details

were collected during that particular hospital stay. To evaluate the drug prescribing pattern a specially designed proforma containing relevant details such as demographics (age, sex and outcome of the patient), clinical data (Clinical diagnosis and associated co-morbid conditions, length of ICU stay), and drug data was used. Drugs prescribed (generic/brand name), dosage, route, frequency of administration were collected as per proforma.

3.1. Statistical analysis

The data was subjected to descriptive analysis using Microsoft Excel. Drugs were classified into different groups based on WHO-ATC classification. Utilization of different classes of drugs as well as individual drugs was analyzed and presented as percentage.

A total of 200 patients were enrolled in the study. Out of 200 patients included for the study, 108 (53%) were males and 94(47%) were females find in table 1. Out all patients 5 patients had an age of 0-10 years, 24 patients had an age of 10-20 years, 52 patients had an age of 20-30 years, 36 patients had an age of 30-40 years, 34 patients had an age of 40-50 years. 28 patients had an age of 50-60 years. 17 patients had an age of 60-70 years. 6 patients had an age of 70-80 years (Table 2).

The common reason for admission in general surgery ward is 28(14%) patients had appendicitis, 29(14.5%) patients had Hernia,14 (7%) patients had Abscess, 6(3%) patients had cholelithiasis, 7(3.5%) patients had Cellulitis, 8(4%) patients had fibro adenoma of breast,5(2.5%) had Diabetic foot, Fistula in Ano, renal calculi (Table 3).

Out of 200 patients included for study, 161 (80.5%) patients were prescribed with Cefalosporins. 76 (38%) patients were prescribed Fluoroquinolones. Followed by 44 (22%) patients were prescribed with Pencillins. 80(40%) patients were prescribed with aminoglycosides. 46(23%) patients were prescribed with Nitroimidazole antibiotics. Majority of the patients prescribed with cephalosporin may be having lesser adverse reactions (Table 4).

Out of 200 study patient population most of them were under treatment with cefotaxim (n=102, with a percentage of 51.5% followed by ofloxacin (n-42, with a percentage of 21%. Other antibiotics includes ceftrioxone 40 patients with a percentage20%,Amoxcillin+ClavulanicAcid31(15.5%),amikacin38(19%)Metronidazole46(23%),Cefixime15(7.5%)Ciprofloxacin29(14.5%),Piperacillin+Tazobactum13(6 5),Cefeperazone4(2%), Gentamycin11(5.5%), Sulfamethoxazone1(0.5%) Levofloxacin 5(2.5%), Cefeperazone 4(2%) find out (Table 5).

Majority of the study participant were prescribed with more than two antibiotics or polypharmacy. Out of 200 prescriptions included for the study, 25 (12.5%) prescriptions had antibiotic Monotherapy, 95 (47.5%) prescriptions had two antibiotic drugs combinations, 60 (30 %) prescriptions had three antibiotic drugs combinations, 20 (10%) prescriptions were more than three antibiotic drug combinations (Table 6).

In this study we have taken the educational and occupational status of the study participants .Out of 200 study participants most of them were illiterates n=70(35%) and n=30(15%) have done primary education and n=60(30%) have done secondary education and participants with higher education were n=20 (10%), study most of them were farmers n=75(37.5%) followed by daily labours n=45(22.5%) and n=40 (20%) of them were households and others i.e. (Table 7 and 8).

Table - 1: Gender Categorization

No of male patients	No of female patients	Total patients
108	94	202

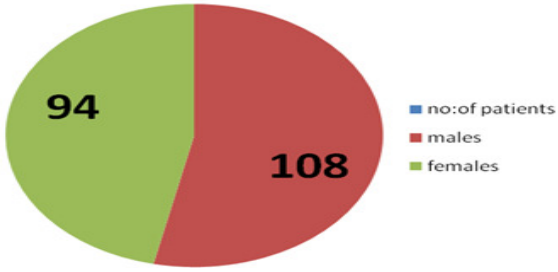

Figure - 1: Representing the gender distribution of patients undergoing antibiotic surgery.

Table - 2: Age Group Categorization

Age Group	No Of Patients
0-10	5
10-20	24
20-30	52
30-40	36
40-50	34
50-60	28
60-70	17
70-80	6

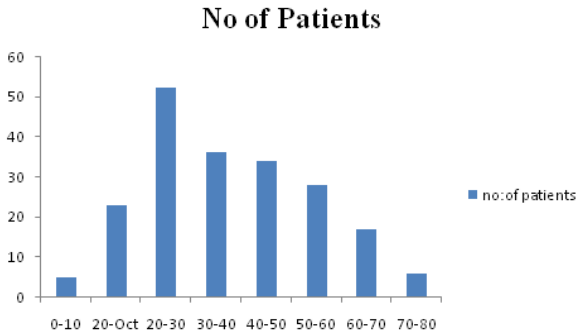

Figure - 2: Representing the age distribution of study population.

Table - 3: Disease Pattern Reported

Diagnosis	No of Patients	Percentage of Patients
Appendicitis	28	14%
Hernia	29	14.5%
Abscess	14	7%
Cholelithiasis	6	3%
Cellulitis	7	3.5%
Fibroadenoma of Breast	8	4%
Diabetic Foot	5	2.5%
Fistula In Ano	5	2.5%
Renal Calculi	5	2.5%

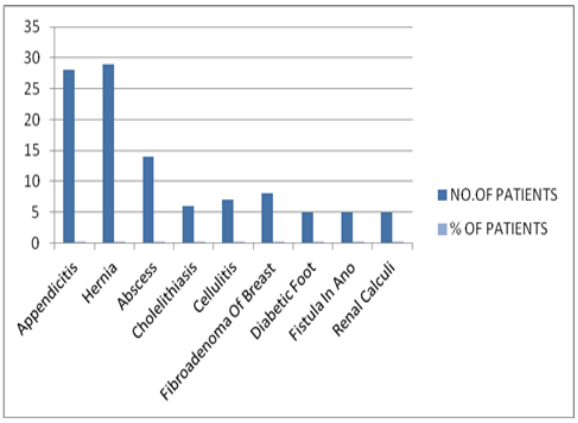

Figure - 3: Disease Pattern Reported.

Table - 4: Distributions of antibiotics according to Class

Name of the antibiotic Class	No of patients	Percentage (%)
Cefalosporins	161	80.5%
Fluoroquinolones	76	38%
Pencillins	44	22%
Aminoglycosides	80	40%
Nitroimidazole	46	23%

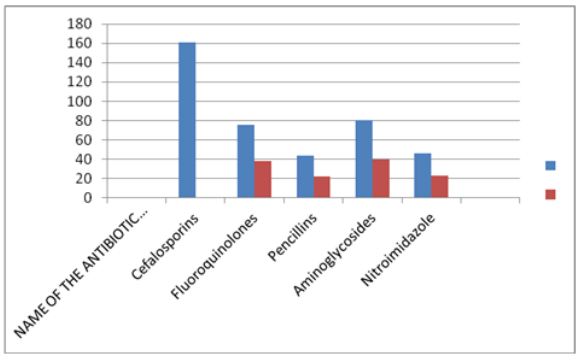

Figure - 4: Distributions of antibiotics according to class.

Table 5: Distributions of Antibiotics in Study Population

Name of the Antibiotic	No of Patients	Percentage (%)
Cefotaxim	102	51.5%
Ceftriaxone	40	20%
Amoxcillin+Clavulanic Acid	31	15.5%
Amikacin	38	19%
Metronidazole	46	23%
Cefixime	15	7.5%
Ciprofloxacin	29	14.5%
Cefeperazone	4	2%
Ofloxacin	42	21%
Gentamycin	11	5.5%
Piperacillin+Tazobactum	13	6.5%
Levofloxacin	5	2.5%
Sulfamethoxazone	1	0.5%

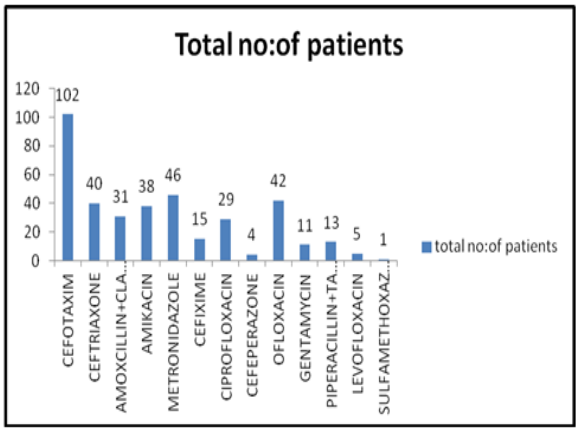

Figure - 5: Distribution of antibiotics in study population.

Table - 6: Pattern of use of antibiotics in surgery patients during study period

Prescribing pattern	No of prescriptions	% of prescriptions
Monotheraphy	25	12.5%
Two Drugs Combinations	95	47.5%
Three Drugs Combinations	60	30%
More Than Three Drugs Combinations	20	10%

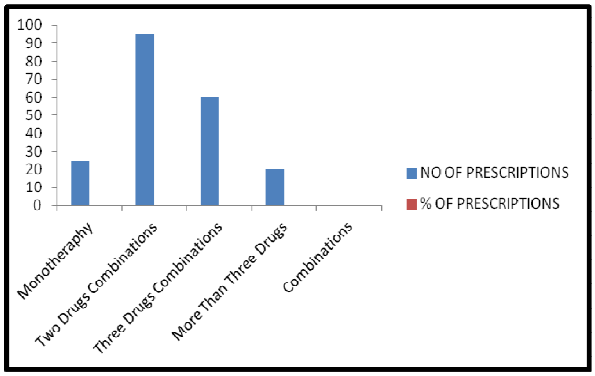

Figure – 6: Pattern of use of antibiotics in surgery patients during study period.

Table - 7: Educational Statuses Of The Study Participants

Educational Status	No of Participants	Percentage
Illeterate	70	35%
Primary education	30	15%
Secondary education	60	30%
Higher education	20	10%
Others	20	10%

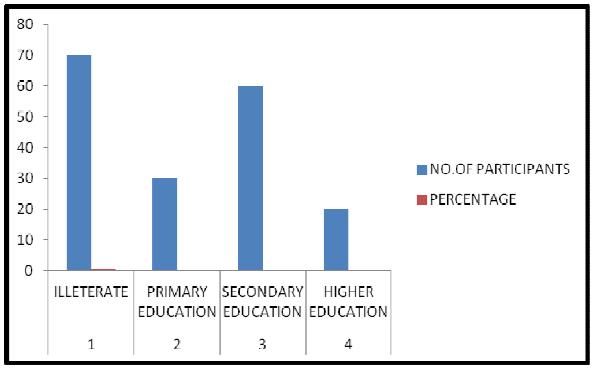

Figure - 7: Educational statuses of the study participant.

Table - 8: Occupational Statuses Of The Study Participants

Occupation	No of participants	Percentage
Farmers	75	37.5%
Daily labour	45	22.5%
House hold	40	20%
Others	40	20%

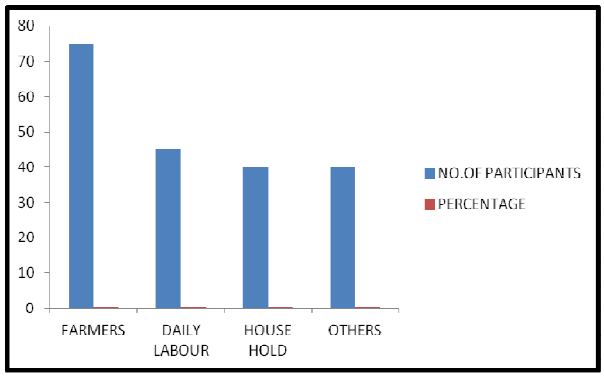

Figure – 8: Occupational Statuses Of The Study Participants.

Table - 9: Dosage forms used in the study

Dosage forms	No of prescriptions	Percentage
Oral	85	42.5%
Intravenous	60	30%
Intramuscular	15	12.5%
Capsules	40	20%

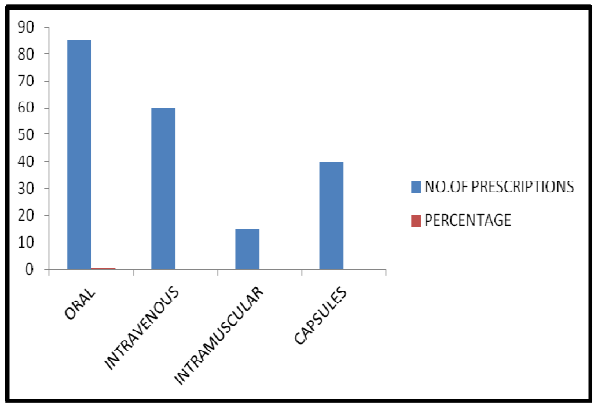

Figure – 9: Dosage forms used in the study.

In our study we also taken an account different antibiotic dosage forms used by the patient population Out of 200 prescriptions included for the study, most of the patients n=85 (42.5%) were administered by oral antibiotics. Followed by intravenous antibiotics n=60 (30%). And intramuscular forms were given to n=15 (7.5%). Followed by capsules n=40 (20%) (Table 9).

Although major characteristics of the patients in both groups were comparable, some characteristics of the patients were significantly different, especially comorbidities, unknown site of infections, and microbiologically documented infections [9].

Higher utilization of cephalosporins 161 (80.5%) and fluoroquinolones 76 (38%) was noticed (table4), similar to [10]Usluer G et.al study but, differed from Shankar et al [11] in which penicillins were the commonest antimicrobial drug class prescribed. Cephalosporins are commonly prescribed due to their relativelylower toxicity and broader spectrum activity. Cephalosporins often used in combination with aminoglycosides due synergistic activity and broader coverage of organisms for several serious gram negative infections. Followed by 44 (22%) patients were prescribed with Pencillins. 80(40%) patients were prescribed with aminoglycosides. 46(23%) patients were prescribed with Nitroimidazole antibiotics [12].

Majority of study patient population most of them were under treatment with cefotaxim (n=102, with a percentage of 51.5% followed by ofloxacin (n-42, with a percentage of 21%. Other antibiotics includes ceftrioxone 40 patients with a percentage20%,Amoxcillin+ClavulanicAcid31(15.5%),amikacin38(19%)Metronidazole46(23%),Cefixime15(7.5%)Ciprofloxacin29(14.5%),Piperacillin+Tazobactum13(6.5),Cefeperazone4(2%),Gentamycin11(5.5%),Sulfamethoxazone1(0.5%) Levofloxacin 5(2.5%), Cefeperazone 4(2%).

The number of drugs received by patients in the present study Out of 200 prescriptions included for the study, 25 (12.5%) prescriptions had antibiotic Monotherapy, 95 (47.5%) prescriptions had two antibiotic drugs combinations, 60 (30 %) prescriptions had three antibiotic drugs combinations, 20 (10%) prescriptions were more than three antibiotic drug combinations was comparable to [13]Smythe et al study1 (12±7.6 drugs) but higher compared to report from Nepal in 2005 which recorded a mean of 5.1±2.7 drugs7. It was noticed that most of the antimicrobial agents were prescribed by brand name (70%) which requires revision of current prescribing practice [13]. Extensive polypharmacy (100%) that is more than three drugs were prescribed in all the patients. Polypharmacy is defined as concomitant use of five or more drugs and it could enhance drug interactions and drug related problems. It is difficult to treat patients in the general surgery with multiple co-morbidities with less number of drugs as they require drugs for treatment of specific condition as well as for prophylaxis, but it is also essential to keep a balance between the number of drugs and effective pharmacotherapy [14].

A wide spectrum of clinical diagnoses was observed including Out of 200 patients included for study, 28(14%) patients had appendicitis, 29(14.5%) patients had Hernia,14 (7%) patients had Abscess, 6(3%) patients had cholelithiasis, 7(3.5%) patients had Cellulitis, 8(4%) patients had fibro adenoma of breast,5(2.5%) had Diabetic foot, Fistula in Ano, renal calculi Nina et al had reported that ICU contributes 20-30% of the nosocomial infections in the hospital.

The demographic results of patients admitted to the medical ICU over a period of 12 months revealed female preponderance with a mean age of around 40 years similar to a study carried out in Nepali 2005. Out of 200 patients included for the study, 5 patients had an age of 0-10 years, 24 patients had an age of 10-20 years, 52 patients had an age of 20-30 years, 36 patients had an age of 30-40 years, 34 patients had an age of 40-50 years. 28 patients had an age of 50-60 years. 17 patients had an age of 60-70 years.6 patients had an age of 70-80 years. In contrast, [16]Smythe et al. study showed equal number of male and female patients admitted general surgical ward with a mean age of 45 years. In the Indian scenario it is noticed that female populations are reluctant to utilize health care faculties even if they are critically ill and especially by the lower socio economic strata [15].

4. CONCLUSION

In conclusion, a wide spectrum of clinical diagnoses and a variety of drugs were utilized from various drug classes. Overall, scope for improving rational use of antibiotics exists. The present study on antibiotics drug prescribing patterns in medical surgical unit can provide a framework for continuous prescription audit in the surgical unit. Longitudinal surveillance of antibiotic drug use in medical surgical units/wards can be carried out to create a database to compare the future trends in utilization of antibiotics. Pharmacoeconomic studies in the surgical units can encourage cost effective antibiotics drug therapy. This will help in rationalizing prescribing practices based on the feedback from these studies and practices between institutions, regions and countries can be compared. Our study suggests that there is a considerable scope for improving prescribing pattern among the practitioners and minimizing the use of antibiotics in order to reduce the risk of antibiotic resistance of microbes. Formulation of an antibiotic policy for hospitals and by providing education to prescriber and hospital formulary is required.

5. REFERENCES

1. Kollef MH. Optimizing antibiotic therapy in the intensive care unit setting. **Crit Care**, 2001; 5: 189-195.
2. Niederman MS. Appropriate use of antimicrobial agents challenges and strategies for improvement. **Crit Care Med.,** 2003; 31: 608-616.
3. Carlet J. Epidemiology and control of antibiotic resistance in the intensive care unit. **Curr Opin Infect Dis**., 2004; 17: 309-316.
4. Rubin USE. Evaluation of new antiinfective drugs for the treatment of UTI. **Clin Infect Dis**., 1992; 15: 216.
5. Rubin UH. Shapiro ED, with a modification by a European Working Party (Norrby SR). General Guidelines for the evaluation of new anti-infective drugs for the treatment of urinary tract infection. Taufkirchen, Germany: **The European Society of Clinical Microbiology and Infectious diseases,** 1993; 240-310.
6. Wagenlehner Florian ME. Antibiotic Stewardship, a call for action by the urological community. **Eur Urol**., 2013; 64: 358-60.
7. Rubin RJ. The economic impact of *Staphylococcus aureus* infection in New York City hospitals. **Emerg Infect Dis**., 1999; 5: 9-17.
8. Laxminarayan R. Battling resistance to antibiotics and pesticides: an economic approach. Washington DC: **RFF Press,** 2002: 119–133.
9. Laxminarayan. Extending the cure: policy responses to the growing threat of antibiotic resistance.Washington DC. **Resources for the Future,** 2007.
10. Burke JF. The effective period of preventive antibiotic action in experimental incisions and dermal lesions. **Surgery**, 1961; 50: 161-168.
11. Shapiro M. A decisive period in the antibiotic prophylaxis of cutaneous lesions caused by Batpois, fuxilis in guinea pigs. **J Infect Dis**., 1980; 141: 532.
12. Polk HC Jr and opez-Mayor JE. Postoperative wound infection: a prospective study of determinant factors and prevention. **Surgery**, 1969; 66: 97- 103.
13. Stone HH. Antibiotic prophylaxis in gastric, biliary and colonic surgery. **Annals of Surgery**, 1976; 184: 443452.
14. Classen DC. The timing of prophylactic administration of antibiotics and the risk of surgical-wound infection. **England Journal Med**., 1992; 326: 281-286.
15. Masterton RG. The new treatment paradigm and the role of carbapenems. **International Journal of Antimicrobial Agents,** 2009; 33: 105–110.