WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 9, Issue 13, 942-952. Research Article ISSN 2277– 7105

ASSESSMENT OF PRESCRIPTION PATTERN AND RATIONAL USE OF ANTIBIOTICS – A PROSPECTIVE OBSERVATIONAL STUDY

Sanjay Sreekumar K.[1], Aiswarya Nair U.[2], Ashika P. P.*[2], Sumiya P. H.[2], Swetha A.[2], Nadeem Mahshooque T. C.[2]

[1]Assistant Professor, Devaki Amma Memorial College of Pharmacy, Chelembra Malappuram, Kerala. India.

[2]Pharm D, Devaki Amma Memorial College of Pharmacy, Chelembra Malappuram, Kerala, India.

Article Received on
01 September 2020,

Revised on 22 Sept. 2020,
Accepted on 12 October 2020

DOI: 10.20959/wjpr202013-19020

***Corresponding Author**
Ashika P. P.
Pharm D, Devaki Amma Memorial College of Pharmacy, Chelembra Malappuram, Kerala, India.

ABSTRACT

Background: Evaluate and assess the rational use of antibiotics and prescription pattern to maximise the drug safety. **Objective**: Drug use evaluation according to WHO prescribing indicators. To check the rationality of antibiotic drug use and to analyse the prevalence of sensitivity test in prescription of antibiotics. **Methodology**: A prospective observational study conducted at PVS Hospital (P) Ltd, Calicut. The necessary data were collected from patient medical charts by using the data collection forms. Patients treated with at least one antibiotics were included. **Results**: About12 categories of antibiotics were used in the prescriptions. Out of 120 cases taken,29 patients did their sensitivity tests. Rationality of antibiotics were checked 170(79.8%) of antibiotics are rational and the remaining 43(20.18%) of antibiotics were irrational. **Conclusion**: Antibiotics usage was found to be reasonable. When taking the prescription pattern of antibiotics, below 50% of antibiotics were prescribed from the essential drug list. Sensitivity pattern were checked only 29 out of 120 cases. Rationality of antibiotics to disease have no relation but it highly depends on drug and the prescribing pattern of antibiotics.

KEYWORDS: Rationality, Antibiotic Sensitivity, Prescribing Pattern.

INTRODUCTION

Antibiotics are drugs that either kill or inhibit the growth of bacteria: Bactericidal and bacteriostatic respectively.[5] Rational use of drugs requires that patient receive medications

appropriate to their clinical needs, in doses that meet their own individual requirements for an adequate period of time, at the lowest cost to them and their community.[7] As antibiotic resistance is not only a problem for the individual patient but also reduces effectiveness of established treatment and has become a major threat to public health by increasing complexity, cost of treatment and reducing the probability of successful outcome.[7] The rationality of antibiotics are the most controversial and debated issue in today's clinical practice. Promoting the rational use of medicines would definitely help mankind to fight the disease and the illnesses for a better tomorrow.[7] World Health Organization WHO estimates that more than half of all medicines are prescribed, dispensed or sold inappropriately and that half of all patients fail to take them correctly.[7]

PPMS are drug utilization studies focusing on prescribing, dispensing and administering of drugs.[3] They promote appropriate use of monitored drugs and reduction of abuse or misuse of monitored drugs.[3] The main objective of PPMS is to facilitate rational use of medicine to avoid over prescription of antibiotics or misuse of antibiotics as it may lead antibiotic drug resistance.[3] Prescription patterns explain the extent and profile of drug use, trends, quality of drugs, and compliance with regional, state or national guidelines like standard treatment guidelines, usage of drugs from essential medicine list and use of generic drugs. There is increasing importance of PPMS because of a boost in marketing of new drugs, variations in pattern of prescribing and consumption of drugs, growing concern about delayed adverse effects, cost of drugs and volume of prescription. Drug utilisation evaluation (DUE) studies are designed to assess drug usage appropriateness.[3] DUE is used to make objective evaluation and to analyse the work by health proffessionals.[3]

Irrational antibiotic usage is a global problem resulting in a increased emergence of resistance to most common bacteria, higher cost of treatment, prolonged hospitalisation and adverse drug reactions. Antibiotics are important tool in modern medicine.[6] Antibiotic resistance is a matter of worldwide concern.[6] They are the most commonly prescribed drugs hence their excessive and inappropriate use contributes to development of bacterial resistance.[6] The rising incidence of bacterial resistance to common antibiotics has prompted the need to use them judiciously in the practise.[6] Optimal and judicious selection of antimicrobials for the therapy of infectious diseases requires exact clinical judgement and detailed knowledge of pharmacological and microbiological factors.[6] Antibiotics are used in two way as empirical therapy and as definitive therapy.[6] When used as empirical therapy the drug must cover all

the likely pathogens, since the organism has not yet defined whereas in definitive therapy a narrow spectrum, low-toxicity regimen is needed to complete the course of treatment.[6] Initially when antibiotics were discovered rapidly, microbes lagged behind in accuring resistance. But now the space of microbes acquiring resistance is more than the speed with which new antibiotics are discovered. So it become mandatory to check ourselves from over and injurious use of antibiotics. Thus sensitivity testing is essential to identify resistant species of microorganisms.

MATERIALS AND METHODS

Study setting: The study was conducted at PVS Hospital (P) Ltd, a 350 bedded multi-specialty tertiary care hospital, Calicut.

Study design: Prospective observational study.

Study population and sample size: All inpatients attending the hospital with antibiotic prescription during November 2018 to April 2019. The eligible patients who fulfilled following inclusion and exclusion criteria were enrolled in the study.

Inclusion criteria: All inpatient group with antibiotic prescription.

Exclusion criteria: Casuality or emergency units.

Data collection: A random selection and evaluation of case sheet and prescriptions from all inpatients units will be carried out. By comparing with the hospital antibiogram the prevalence of sensitivity test of antibiotics will be carried out. On assessing each case sheet/prescription the datas are entered into the data collection form from the observations irrational use of antibiotics are assessed and evaluated using suitable statistical techniques.

The data collection form includes following data: No of antibiotics prescribed, details of drugs prescribed, no of antibiotics in generic name, no of drugs from essential drug list, no of antibiotics given as monotherapy, no of drugs prescribed with an injection, more than one antibiotic prescribed, total no of antibiotics prescribed, age distribution of patients, prescribing frequency of antibiotics and dosage form of antibiotics. Along with these information the rationality of the prescription is justified by Gyssens category (2001), comparing with National Formulary of India (NFI).

Statistical analysis: The datas collected were formulated into tables,pie charts,bar graph,line graph,chi square test,prevalence was also calculated.

RESULTS

Thestudy was conducted on inpatient unit of PVS hospital (P) LTD a 350 bedded tertiary care hospital. The study was a prospective observational study and was carried out for a period of 6months from November 2018- April 2019. A total of 120 cases were taken for the study on prescription pattern, rationality and sensitivity of antibiotics.

Demographic Characteristics

Among 120 patients participated in the study, 68(56.6%) patients were male and 52(43.3%) were female. Out of these the age ranged between 0-10 were 30 (25%), 11-30 were 13(10.8%), 31-50 were 18 (15%) and >51 were 59 (49.1%)[3].

Table 1: Demographic profile.

Sl. No	Variables	Category	Frequency	Percentage
1.	Gender	Male	68	56.6%
		Female	52	43.3%
2.	Age	0-10 years	30	25 %
		11-30 years	13	10.8 %
		31-50 years	18	15 %
		>51 years	59	49.2 %

Patterns of use of various class of antibiotics

About12 categories of antibiotics were used in the prescriptions.

Table 2: Usage of antibiotics.

Sl no	Category	Usage (Percentage)
1	Penicillin	60 (28%)
2	Cephalosporin	65 (30.5%)
3	Macrolide	28 (13%)
4	Fluroquinolones	14 (6.5%)
5	Nitrofurantoin	4 (1.8%)
6	Nitroimidazole	10 (4.6%)
7	Tetracyclines	5 (2.3%)
8	Aminoglycoside	18 (8.4%)
9	Linezolid	4 (1.8%)
10	Mupirocin	1 (0.4%)
11	Carbapenams	2 (0.9%)
12	Polypeptide antibiotics	2 (0.9%)

Table 3: WHO prescribing indicators.

Prescribing indicators	Number of drugs(percentage)
Total number of prescription analysed	120 cases
Total number of antibiotics prescribed	213 drugs
Number of antibiotics prescribed by generic name	28 (13%)
Number of antibiotics prescribed from essential drug list	92 (43%)
Number of antibiotics prescribed in parentral form	139 (65%)
Number of antibiotics prescribed in oral form	74 (34%)
Number of antibiotics given as monotherapy	134 (62%)

Sensitivity Analysis

In the study population, Out of 120 cases taken, 29 patients did their sensitivity tests.

Table 4: Pattern of sensitivity test.

Total number of cases	Total number of organism identified	Sensitivity done	Percentage
120	9	29	24%

Table 5: Resistance patterns of commonly isolated organism (No. of specimens resistant /No. of specimens tested (% resistant).

Organism	Penicillin	Erythromycin	Oflox acin	Levofloxacin	Ciprofloxacin	Azithromycin	Ampicillin	Amox/Clavu	Cefepime	Ceftazidime	Cefoxitine	Co-trimoxazole	Cefuroxime	Cefixime	Nalidixic acid	Cefazolin	Ceftriaxone	Cefoperazone	Nitrofurantoin	Amikacin	Tetracycline	Gentamycin	Piperac/tazo
Streptococcus	4/9 (44.4)	5/9 (55)	4/9 (44.4)	5/9 (55)	4/9 (44.4)	nt	3/9 (33)	3/9 (33)	nt	nt	nt	2/2 (100)	nt	2/9 (22)	2/2 (100)	1/2	nt	nt	1/3 (33)	nt	nt	nt	nt
Staphylococcus	3/3 (100)	2/3 (66)	nt	nt	nt	2/3 (66)	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Enterococcus	1/2	1/2	nt	2/2 (100)	1/2	nt	2/2 (100)	½ (50)	1/1 (100)	1/1 (100)	1/1 (100)	1/1 (100)	nt	1//1 (100)	1/1 (100)	1/1 (100)	nt	nt	nt	nt	2/2 (100)	½ (50)	Nt
E.coli	1/1 (100)	1/1 (100)	nt	3/3 (100)	4/4 (100)	nt	4/4 (100)	3/5 (60)	2/3 (66)	1/3 (33)	½ (50)	2/3 (66)	½ (50)	1/3 (33)	1/1 (100)	4/4 (100)	2/3 (66)	2/2 (100)	nt	¼ (25)	½ (50)	nt	nt
Candida species	nt	nt	nt	nt	2/3 (66)	nt	3/3 (100)	2/3 (66)	2/3 (66)	2/3 (66)	2/3 (66)	3/3 (100)	½ (50)	nt	nt	3/3 (100)	2/3 (66)	1/1 (100)	2/3 (66)	½ (50)	1/1 (100)	1/3 (33)	2/3 (66)
Klebsilla	nt	nt	nt	1/3 (33)	nt	nt	nt	2/2 (100)		nt	2/3 (66)	2/4 (50)	1/3 (33)	nt	2/4 (50)	¾ (75)	nt	nt	2/2 (100)	nt	½ (50)	nt	nt
Pseudomonas	nt	nt	nt	1/1 (100)	1	nt	nt	nt	nt	nt	nt	nt	1/1 (100)	1/1 (100)	nt	nt	nt	nt	nt	nt	nt	nt	nt
Salmonella typhi	nt	nt	nt	nt	1/1 (100)	nt	1/1 (100)	1/1 (100)	1/1 (100)	1/1 (100)	1/1 (100)	1/1 (100)	1/1 (100)	nt	nt	1/1 (100)	1/1 (100)	nt	1/1 (100)	nt	nt	nt	nt
Protease	nt	nt	nt	nt	1/1 (100)	nt	1/1 (100)	1/1 (100)	1/1 (100)	1/1 (100)	1/1 (100)	1/1 (1000	1/1 (100)	nt	1/1 (100)	nt	nt	nt	1/1 (100)	nt	nt	nt	nt

Rationality assessment

When rationality of antibiotics were checked 170(79.8%) of antibiotics are rational and the remaining 43(20.18%) of antibiotics were irrational.

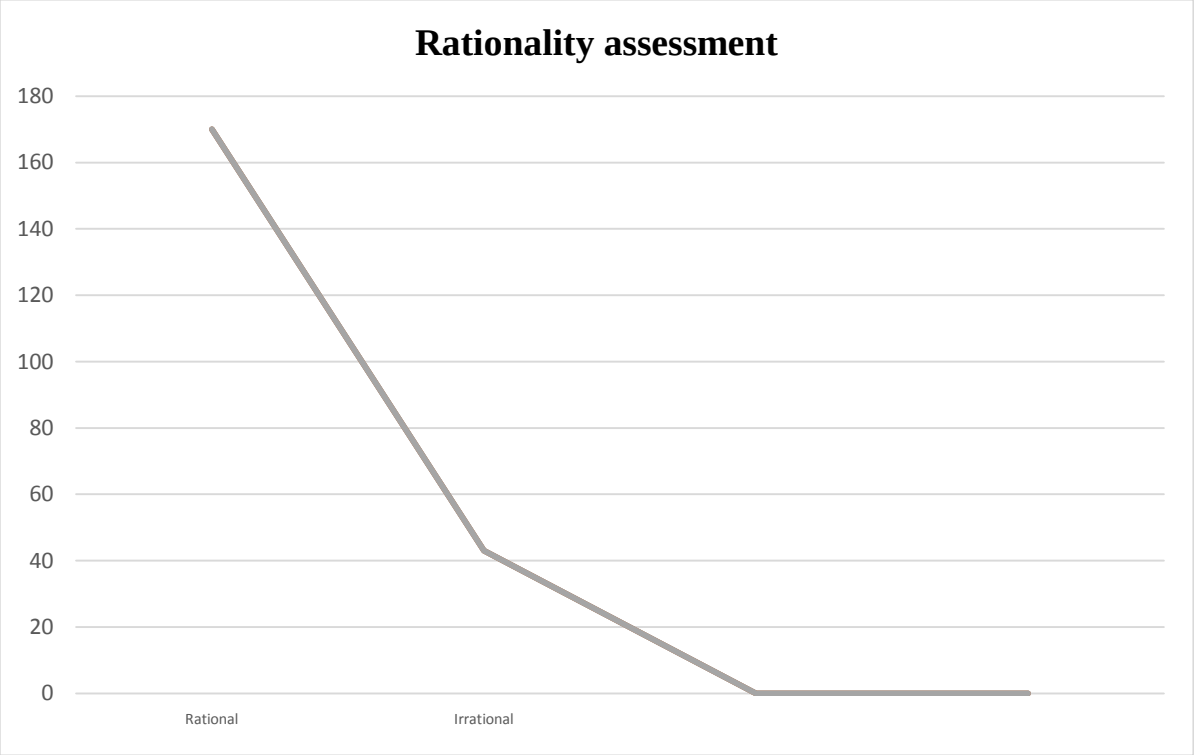

Figure 1: Rationality Assessment.

Table 6: Rationality of antibiotics based on Gyssens category (2001).

The category of therapy Rationality	Total N (%)
0=Rational	43(20.18%)
1=Not on time	2(0.93%)
II A=Not exactly dose	6(2.81%)
II B=Not exactly interval	2(0.93%)
II C=Not exactly administration	2(0.93%)
III A=Giving too long	3(1.4%)
III B=Giving too short	
IV A=More effective antibiotics	10(4.69%)
IV B=More toxic antibiotic	12(5.63%)
IV C=Cheaper antibiotics	10(4.69%)
IV D=More specific antibiotics	14(6.57%)
V=Antibiotics without indication	17(7.98%)

Analysis of dependency between different types of Diseases and Rationality

Here, we analyze the dependency of different types of diseases (Respiratory Tract Infection, Viral Infection, Urinary Tract Infection, Acute Gastroenteritis, Diabetic Complications, Skin Infection, Acute Febrile Illness, Meningitis, Typhoid, and Other Diseases) and Rationality(Rational and Irrational).The Chi-Square test of independence is used to determine if there is a significant relationship between two categorical variables. The frequency of each

category for one nominal variable is compared with the second nominal variable. Here the null hypothesis for this test is that there is no relationship between different types of Diseases and Rationality. The alternative hypothesis is that there is a relationship or association between different types of Diseases and Rationality.

Table 7: Cross-tabulation of different types of Diseases and Rationality.

			Rationality		Total
			Rational	Irrational	
Diseases	Respiratory Tract Infection	Count	62	14	76
		Expected Count	60.7	15.3	76.0
	Viral Infection	Count	3	1	4
		Expected Count	3.2	.8	4.0
	Urinary Tract Infection	Count	17	8	25
		Expected Count	20.0	5.0	25.0
	Acute Gastroenteritis	Count	18	3	21
		Expected Count	16.8	4.2	21.0
	Diabetic Complications	Count	16	4	20
		Expected Count	16.0	4.0	20.0
	Skin Infection	Count	4	0	4
		Expected Count	3.2	.8	4.0
	Acute Febrile Illness	Count	2	0	2
		Expected Count	1.6	.4	2.0
	Meningitis	Count	4	1	5
		Expected Count	4.0	1.0	5.0
	Typhoid	Count	5	1	6
		Expected Count	4.8	1.2	6.0
	Others	Count	39	11	50
		Expected Count	39.9	10.1	50.0
Total		Count	170	43	213
		Expected Count	170.0	43.0	213.0

Table 8: Chi-Square Tests for independence of attributes of different types of Diseases and Rationality.

	Value	Df	p-value
Pearson Chi-Square	4.490	9	.876
Likelihood Ratio	5.478	9	.791
Linear-by-Linear Association	.011	1	.918
N of Valid Cases	213		

By Chi-Square test of independence, the p-value of Pearson Chi-Square is .876.

DISCUSSION

A greater number of male patients were admitted during the period of the study. Maximum age group were from>51 years representing 49.2% out of the total sample size and the least

age group administering antibiotics were from age group 11-30 years representing 10.8%. 213 antibiotics were prescribed and the most commonly used antibiotic were cephalosporin 65(30.5%), followed by penicillin 60(28%),macrolide 28(13%). In fixed dose combination,the most commonly prescribed antibiotics were amoxicillin+clavulonic acid followed by piperacillin+tazobactum.[3] The most commonly prescribed parenteral antibiotic were amoxicillin+clavulonic acid. Out of 213 antibiotics prescribed 134 (62%) antibiotics given as monotherapy,139(65%) antibioticswere administered parenterally, followed by oral about 74(34%).Number of antibiotics prescribed by generic name is 28(13%).number of antibiotics from essential drug list is 92(43%).Most commonly used oral antibiotic were Azithromycin (22)[3]. The major organism identified were streptococcus species, E.coli, klebsilla pneumonia, staphylococcus species, candida species, enterococcus species. Penicillin and levofloxacin were found to be more resistant to these species.[7] When resistance pattern of commonly isolated organism is analysed, majority of organisms shows resistance to the prescribed drugs. P value of Chi Square test is greater than .05. Therefore we have to accept the null hypothesis. So there is no relationship between different types of Diseases and Rationality.

CONCLUSION

The study concluded that antibiotics usage was found to be reasonable.[3] When taking the prescription pattern of antibiotics, below 50% of antibiotics were prescribed from the essential drug list. Majority of the antibiotics are given as parentral therapy. Antibiotics prescribed in generic name is only a few percentage. When sensitivity pattern were checked only 29 out of 120 cases did their sensitivity test and majority of the given drugs shows resistance to particular organisms. Rationality of antibiotics to disease have no relation but it highly depends on drug and the prescribing pattern of antibiotics.

Prescribers should be suggested to prescribe the drugs by their generic names.[3] Prescribing the drugs by its generic names can reduce prescribing & dispensing errors; and also benefit inventory control.[3] There is a need to emphasize the switch over to other routes of administration as soon as possible and also to be investigated if the practice of switching from parenteral to oral drug administration when the clinical condition permits would reduce the cost associated with the drug therapy.[3] Prescribers should prescribe the antibiotics based on the essential drug list (EDL) for rational drug selection.[3] There is a vital need for microbiological investigation before treatment of infections.[7] The results of this study

clearly demonstrate that majority of antibiotics were complying with the criteria developed for the assessment of rationality.

ACKNOWLEDGEMENTS

We are extremely grateful to Dr. SIRAJ SUNDARAN, Professor and head, Department of Pharmacy Practice, Devaki Amma Memorial College of Pharmacy, Chelembra, for his zealous guidance, encouragement, support and dedication during the entire period of this thesis work.

REFERENCES

1. Teti Sutriyati Tuloli, Dewi R Moo. "Study on rationality of antibiotics therapy towards children with typhoid fever". Asian journal of pharmaceutical and clinical research, 2018; 11(7): 185-88.
2. Nikhil Peter, Nissy Cherian, Sagy Thomas, Sneha George, Junior Sundresh N. "Study of prescription pattern and use of antibiotics in the management of infection". Asian J Pharm Clin Res., 2017; 10(2): 210-13.
3. Sneha Pallavi P, TejaSree B and KrishnakanthPV."Study of prescription patterns of antibiotics in tertiary care hospital". International Journal of Biomedical Research, 2016; 7(6): 372-4.
4. Akram Ahmad, MeghaRevanker, IrfanulHaque, Pravina A, Rahul Ivan, Ram Dasari, SheetalKuriakose, IshaPatel. "Study the Prescription Pattern of Antibiotics in the Medicine Department in a Teaching Hospital: A Descriptive Study". International Journal of Toxicological and Pharmacological Research, 2014; 6(2): 43-6.
5. Maheswari P, Praveen D, Ravichandiran V. "A Study on patients awareness on rational use of antibiotics and it's resistance". Asian J Pharm Clin Res., 2015; 8(3): 204-6.
6. Rajendra B.Pawade, Rahul R. Kunkulol, Purushottam A. Giri "Antibiotic sensitivity pattern of commonly encountered pathogens and evaluation of antimicrobial usage". International Journal of Healthcare and Biomedical Research, 2015; 03: 227-35.
7. B. Rajalingam, Achsah Susan Alex, Adreen Godwin, Chinnu Cherian, Clincy Cyriac. "Assessment of Rational Use of Antibiotics in a Private Tertiary Care Teaching Hospital". Indian Journal of Pharmacy Practice, 2016; 1(9): 14-8.
8. Hanmant A, Priyadarshini K."Prescription analysis to evaluate rational use of antimicrobials". International Journal Of Pharma And Bio Sciences, 2011; 2(2): 314-9.

9. World Health Organization.“Rational use of medicines. The World Medicines Situation”. Geneva World Health Organization, 2004; 75–91.
10. Ravi Pathiyil Shankar, Praveen Partha, Nagesh Kumar Shenoy, JoshymaducolilEasow, Koffullur N. “Prescribing patterns of antibiotics& sensitivity patterns of common microorganisms in the Internal medicine ward of teaching Hospital in western Nepal : A prospective study”. Annuals of clinical microbiology &Antimicrobiotic, 2001; 2: 1-13.
11. Srishyla MV, Naga Rani MA, Venkataraman BV.“Drug utilization of antimicrobials in the in-patient setting of a tertiary hospital”. Indian J Pharmacol, 1994; 2(6): 282-7.
12. Kourkouta L, Kotsiftopoulos CH,Papageorgiou M, et al “The Rational Use of Antibiotics Medicine”. Journal of Healthcare Communications, 2: 2472-1654.
13. Essential Drugs. Practical Guidelines, edition, 2013.
14. Hans V. Hogerzeil. “Promoting Rational Prescribing: An International Perspective”. Br J Clin Pharmac, 2008; 3(9): 1-6.
15. Rajasree G, Pratyusha N, Hiremath D. “Assessment Of Drug Dispensing Practices Using Who Patient Care And Health Facility Indicators In A Private Tertiary Care Teaching Hospital”. Int J Pharm Pharm Sci., 2013; 5(4): 368-72.
16. WHO Model Lists of Essential Medicines 19 thedn. Geneva: World Health Organization, 2015.
17. Behera B and Mathur P. “High levels of antimicrobial resistance at a Tertiary Trauma Care Centre of India”. The Indian Journal of Medical Research, 2011; 133(3): 343.
18. Saravanam R and Raveendarin V. “Antimicrobial resistance pattern in a Tertiary Care Hospital: An observational study”. J of Basic and Clinical Pharmacy, 2013; 4(3): 56-63.
19. Jamshidi M, Javadpour S, Eftekhari TE, Moradi N, Jomehpour F. “Antimicrobial resistance pattern among intensive care unit patients”. Afr J Microbiol Res., 2009; 3: 590–4.
20. Kumar S, Joseph NM, Easow JM. “Prevalence and current antibiogram of staphylococci isolated from various clinical specimens in a tertiary care hospital in Pondicherry”. Internet J Microbiol, 2012; 10: 1937–8289.
21. Shankar RP, Partha P, Shenoy NK, Easow JM, 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 MicrobiolAntimicrob, 2003; 2: 7.

22. Ali M, Naureen H, Tariq MH, Farrukh MJ, Usman A, Khattak S, Ahsan H. "Rational use of antibiotics in an intensive care unit: a retrospective study of the impact on clinical outcomes and mortality rate". Infection and Drug Resistance. 2019; 6(12): 493-99.
23. Kaushal V Sheth, Tejas K Patel, Saklainhaider S Malek and CB Tripathi. "Antibiotic Sensitivity Pattern of Bacterial Isolates from the Intensive Care Unit of a Tertiary Care Hospital in India".Tropical Journal of Pharmaceutical Research. 2012; 11 (6): 991-999.
24. Ambili Remesh, Samna Salim, AM Gayathri, Uma Nair, KG Retnavally. "Antibiotics prescribing pattern in the in-patient departments of a tertiary care hospital". Arch Pharma Pract. 2013; 2(4): 71-6.
25. Farhan Ahmad Khan, Vinod Kumar Singh, Sanjeev Sharma, and Preeti Singh. "A Prospective Study on the Antimicrobial Usage in the Medicine Department of a Tertiary Care Teaching Hospital". J Clin Diagn Res. 2013; 7(7): 1343–1346.
26. Shipra Jain, PrernaUpadhyaya, JaswantGoyal, Abhijit Kumar, Pushpawati Jain, Vikas Seth, and Vijay V Moghe. "A systematic review of prescription pattern monitoring studies and their effectiveness in promoting rational use of medicines". Perspect Clin Res. 2015; 6(2): 86–90.
27. K. V. Ramanath, Priyanka Biswas, Rosemary Sunny, Stephy John. "Study the antibiotic resistance pattern in a tertiary care teaching hospital". International journal of pharmaceutical sciences and research. 2019; 10(2): 819-29.