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Assessment of Rationality and Prescription Pattern of Antibiotics in Tertiary Care Hospital

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ABSTRACT
Irrational prescribing is a widespread issue. Among inpatients, antibiotics are among the most routinely prescribed medications, and fears have been expressed regarding the recurring, excessive, and indiscriminate use of various antibiotics, thereby promoting the evolution of antibiotic-resistant pathogens. The objective of this study is to assess the most commonly prescribed, the rationality, and the prescription pattern of antibiotics as per the National guidelines in the tertiary care hospital, Chitradurga.A six-month prospective observational study was conducted in the inpatient department of a tertiary care hospital, Chitradurga. A total of randomly chosen 234 prescriptions were collected from General medicine, Surgery, Obstetrics & Gynaecology (OBG), and Orthopaedics, and analysed for their prescription pattern and rationality with the help of National Guidelines and ICMR treatment of antimicrobials.
A total of 559 antibiotics were found in 234 inpatient prescriptions of which monotherapy antibiotics 454 (81.2%) and 105 (18.8%) were antibiotic combination therapy. Ceftriaxone 152 (34%) was found to be the most frequently prescribed monotherapy antibiotic andPiperacillin + Tazobactam 60 (57.1%) among the antibiotic combination therapy. When rationality was checked for the overall appropriateness of antibiotics prescribed, it was found that 40 (17.1%) prescriptions were appropriate with respect to the choice of drug, dose, route frequency, and duration, and 194 (82.9%)prescriptions were irrational.The study concluded that cephalosporins and beta-lactams were the most frequently prescribed antibiotics. To tackle the irrationality, guidelines governing the use of antibiotics, proper training of physicians, implementation of an effective monitoring system, and provision of pharmaceutical services by retail pharmacies were necessary.Therefore, a uniform nationwide guideline should be implemented.

Keywords: Antibiotics, Microbial resistance, Rationality, Irrational use, Prospective observational study, Pharmaco-economics.

I. INTRODUCTION

Sir Alexander Fleming's ground-breaking discovery of penicillin in 1928 marked the start of the antibiotic revolution, which fundamentally altered the direction of modern medicine.[1] However, its misuse has resulted in microbial resistance. Since antimicrobials have been grossly mishandled in many instances it has contributed to this resistance.[2]Furthermore, the World Health Organization (WHO) states that more than half of all drugs are inappropriately prescribed, dispensed, or distributed and that the majority of patients do not consume them correctly.[3]

The World Health Organization's (WHO) concept of rational prescription is clear and concise, "Rational use of medicines requires that patients receive medication appropriate to their clinical needs, in doses that meet their requirements, for an adequate period and at the lowest cost to them and their

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community."[4]Irrational prescribing is a widespread issue. Multiple studies, both from developed and developing nations, outline a pattern that involves polypharmacy, the use of drugs not appropriate for the diagnosis or that are exorbitantly expensive, the inappropriate use of antibiotics, and irrational self-medication with drugs frequently used in underdose.[5]

Among inpatients, antibiotics are among the most routinely prescribed medications, and fears have been expressed regarding the recurring, excessive, and indiscriminate use of various antibiotics, thereby promoting the evolution of antibiotic-resistant pathogens.[6]To avoid infection after surgery, surgeons frequently use prophylactic antibiotics, and incorrect antimicrobial prophylaxis is prevalent. Guidelines and education can help to improve this.Antibiotic guidelines and related interventions are effective in reducing antibiotic usage.[6]Antibacterial resistance is an inevitable phenomenon; however anthropogenic activities have quite a detrimental effecton how swiftly it progresses.[8] Use of utterly irrational antimicrobial fixed-dose drug combinations (FDCs), suboptimal doses, limited duration of therapy, and superfluous antimicrobial drug use are some of the prominent elements that contribute to the emergence of antimicrobial resistance.[9]

As per William Osler, "One of the first duties of the physician is to educate the masses not to take medicine." In other words, though prescription drugs are useful for the malady, they should be considered through a valid prescription from a physician and this prescription should be made only when it is entirely necessary.[10]

II. MATERIALS AND METHODS

A six-month prospective observational study wasconducted among inpatientsof a Tertiary Care Hospital in Chitradurga, Karnataka. A total number of 234 inpatient prescriptions were collected from General Medicine, Orthopaedics, Surgery, and Obstetrics and Gynaecology (OBG) departments out of which 559 counted for antibiotics.

Inclusion Criteria:

- Prescription of patients undergoing antibiotic therapy with a duration of at least 4-5 days.
- Patients of both genders are included in the study.
- Patients belonging to the age group of 19-60 years of age.

Exclusion Criteria:

- Prescription without antibiotic therapy.
- Patients treated as outpatients.
- Paediatric and Geriatric patients.

Ethical Approval: The study was approved by the Institutional Ethical Committee of SJM College of Pharmacy, Chitradurga.
Ref. No: SJMCP/625/2022-2023.

Statistical Analysis: Descriptive statistical analysis was carried out in the study.Data was collected using Predesigned, validated proforma from the medical case sheets, drug charts, and laboratory investigations of in-patients and entered in Microsoft Excel-2019 version and the results were by using IBM SPSS Data Analysis Version 26.0 for Windows (Armonk, NY: IBM Corp) and Graph Pad Prism 9.4 (LA Jolla, CA, USA) has been used to generate graphs. Microsoft Excel-2019 version was used to obtain tables.

III. RESULTS

A total of 234 patients were included in the study as per the inclusion criteria. The following are study results in the view of age, gender, department, monotherapy prescriptions, combination prescriptions, and rationality following the objectives of the study.

EPIDEMIOLOGIC PROFILE

Age Distribution:

The patients who enrolled in the study belonged to the adult age group of 19-60 years. They were further subclassified into 3 different groups: 19-29, 30-40, 41-51, and 52-60. The greatest number of subjects enrolled in the study belonged to the age group of 30-40 years. **Figure 1**shows a graphical representation of the age distribution of the participants enrolled in the study.

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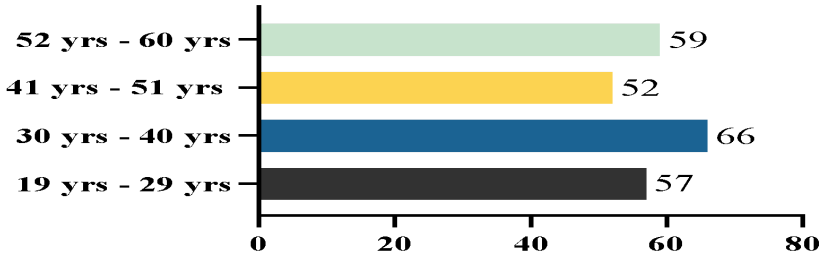

Figure 1: Age Distribution of patients

- **Gender-wise Distribution**

Among the 234 patients, more than half of the patients in the study were males 127 (54.3%) and females accounted for 107 (45.7%). **Figure2** shows its graphical representation.

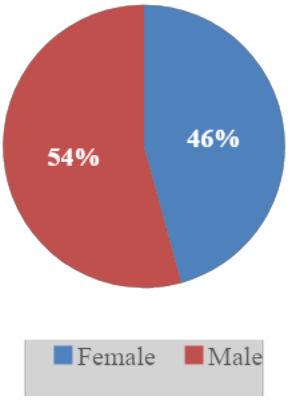

Figure2: Gender-wise Distribution

- **Department-wise distribution:**

Out of the 234 inpatient prescriptions collected for the study, 168 (71.8%) were from General Medicine, Surgery 29 (12.4%), Obstetrics & Gynecology 25 (10.7%), and Orthopedics 12 (5.1%). The details of the aforementioned are graphically represented in **Figure 3.**

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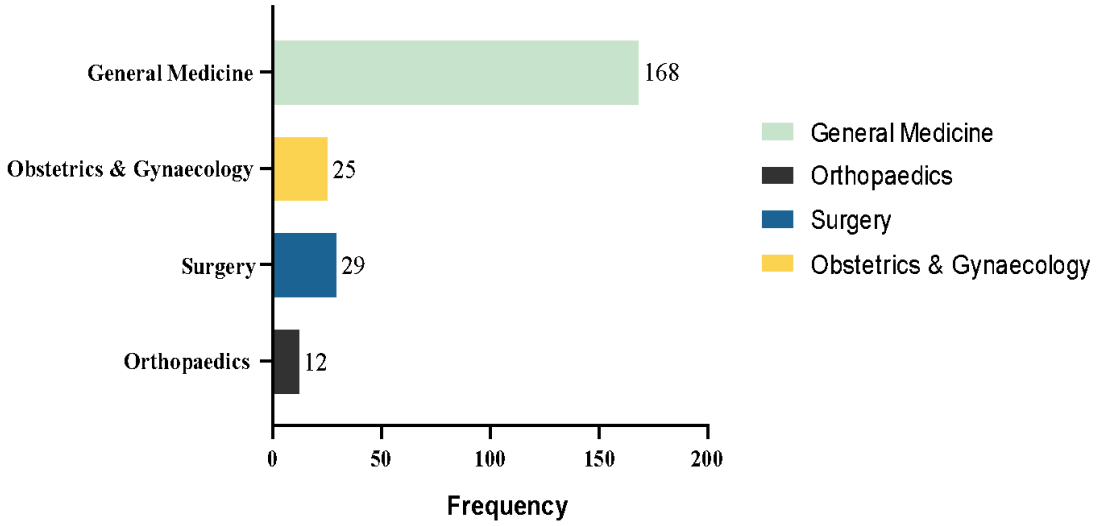

Figure3: Department-wise distribution

- **Distribution of Diagnosis:**

Out of 234 prescriptions included in the study, 39 (16.7%) were diagnosed with RTI, 22 (9.4%) with Viral Fever, 19 (8.1%) with Viral Fever with Thrombocytopenia, 17 (7.3%) Gastroenteritis, 16 (6.8%) AFI, 15 (6.4%) Pancreatitis, 9 (3.8%) UTI, 8 (3.4%) cellulitis, 7 (2.99) Fracture, 5 (2.1%) Appendicitis, AKI with Sepsis,Meningitis, Diabetic Foot, 3 (1.3) Cholecystitis, 2 (0.85%) Cholelithiasis and 57 (24.4) others. Thegraphical representation of the above is shown in **Figure 4.**

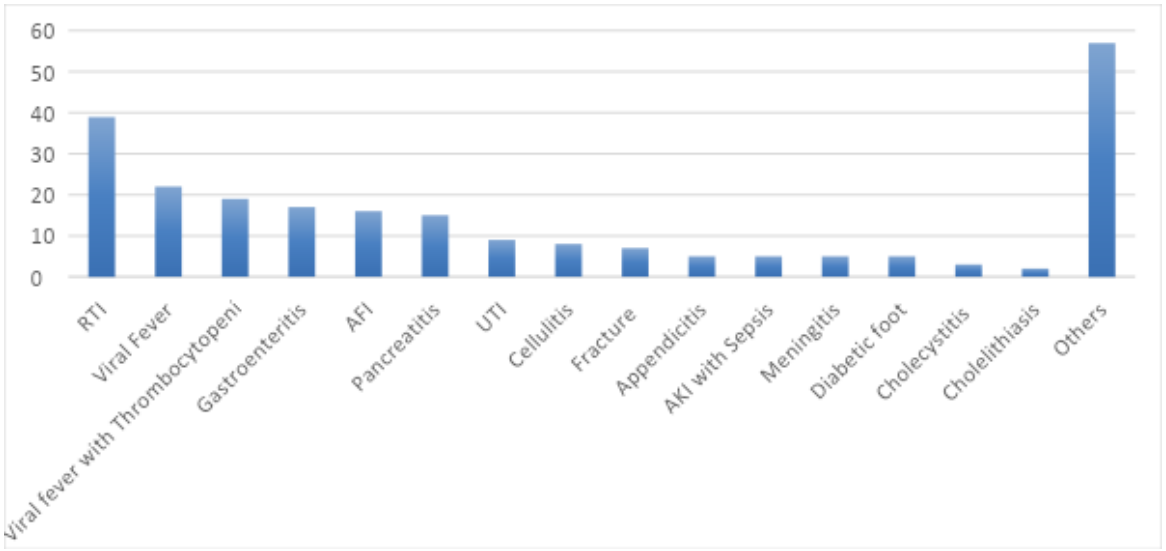

Figure4: Distribution of Diagnosis

- **No. of drugs prescribed:**

It was found that 153 (65.4%) of prescriptions had 2 drugs per prescription. 71 (30.3%) had more than two drugs and only 10 (4.3%) had one drug per prescription. The details ofthese are shown in **Table 1.**

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Table 1: No. of Drugs Prescribed

No. of drugs	No. of drugs per prescription	Frequency (%)
1	10	4.3
2	153	65.4
More than 2	71	30.3
Total	**234**	**100**

PRESCRIPTION PROFILE

- **Monotherapy antibiotics prescribed**

454 were found to be monotherapy antibiotics in 234 prescriptions. Among the study population, Ceftriaxone 152 (34%) was the most frequently prescribed monotherapy antibiotic followed by Metronidazole 95 (21.3%), Doxycycline 68 (15.2%), and Azithromycin 50 (11.2%) respectively. The least prescribed drugs found were Ceftazidime, Feropenem, Gentamycin, Imipenem, and Ofloxacin 1 (0.22%) as expressed in **Table2.**

Table2: Monotherapy Antibiotics Prescribed

Name of the antibiotics	No. of drugs per prescription	Frequency(%)
Ceftriaxone	152	34.0
Metronidazole	95	21.3
Doxycycline	68	15.2
Azithromycin	50	11.2
Amikacin	19	4.3
Nitrofurantoin	17	3.8
Clindamycin	14	3.1
Meropenem	8	1.8
Cefotaxime	8	1.8
Cefixime	7	1.57
Linezolid	6	1.3
Ciprofloxacin	3	0.7
Levofloxacin	2	0.4
Ofloxacin	1	0.22
Imipenem	1	0.22
Gentamycin	1	0.22

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Feropenem	1	0.22
Ceftazidime	1	0.22
Total	**454**	**100**

- **Antibiotic Combination Therapy**

Among 234 inpatient prescriptions, 105 were found to be combination antibiotic therapy. Among the study population, it is seen that Piperacillin + Tazobactam 60 (57.1%) was the most commonly prescribed antibiotic. This is followed by Amoxicillin + Clavulanate 15 (14.3%) and Cefotaxime + Sulbactam 13 (12.3%). The least prescribed combination antibiotics therapy was Cefuroxime + Clavulanate 1 (0.95%) as shown in **Table 3.**

Table 3: Antibiotic Combination Therapy

Name of the antibiotics	No. of drugs per prescription	Frequency (%)
Piperacillin + Tazobactam	60	57.1
Amoxicillin + Clavulanate	15	14.3
Cefotaxime + Sulbactam	13	12.3
Cefoperazone + Sulbactam	5	4.8
Ceftriaxone + Sulbactam	5	4.8
Cefpodoxime Proxetil + Clavulanate	4	3.8
Ceftazidime + Tazobactam	2	1.9
Cefuroxime + Clavulanate	1	0.95
Total	**105**	**100**

- **Class-wise Distribution**

Out of 559 antibiotics, 283 (50.6%) of antibiotics were Beta-lactam antibiotics, 158 (28.3%) antibiotics were Protein synthesis inhibitors, 95 (16.99%) antibiotics were DNA gyrase inhibitors, 17 (0.30%) antibiotics were Urinary antiseptics and 6 (0.11%) of antibiotics were DNA topoisomerases as shown in **Table 4.**

Table 4: Class-Wise Distribution

Class of Ab.	Antibiotics	Number of drugs	Percentage (%)
Beta-Lactams	Penicillin	75	13.4
	Cephalosporins	198	35.4

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	Carbapenems	10	0.18
DNA Gyrase Inhibitors	Nitroimidazoles	95	16.99
Protein synthesis Inhibitors	Aminoglycosides	20	0.36
	Macrolides	64	11.4
	Tetracyclines	68	12.2
	Others	6	0.11
DNA Topoisomerases	Fluoroquinolones	6	0.11
Urinary Antiseptics	Nitrofurans	17	0.30
Total		**559**	**100**

RATIONALITY PROFILE

Rationality of Antibiotics

The rationality of antibiotics was analysed with the help of National guidelines for antibiotics and ICMR treatment guidelines for antimicrobials. The dose, indication, route, frequency, and duration of antibiotics were verified from these guidelines. The assessment of rationality was performed by collecting evidence from published literature about individual antibiotics. When rationality was checked for the overall appropriateness of antibiotics prescribed, it was found that 40 (17.1%) prescriptions were appropriate with respect to the choice of drug, dose, route frequency, and duration. 194 (82.9%) prescriptions were inappropriate/irrational with respect to the choice of drug, dose, route frequency, and duration**.** Its graphical representation is depicted in **Figure 5**.

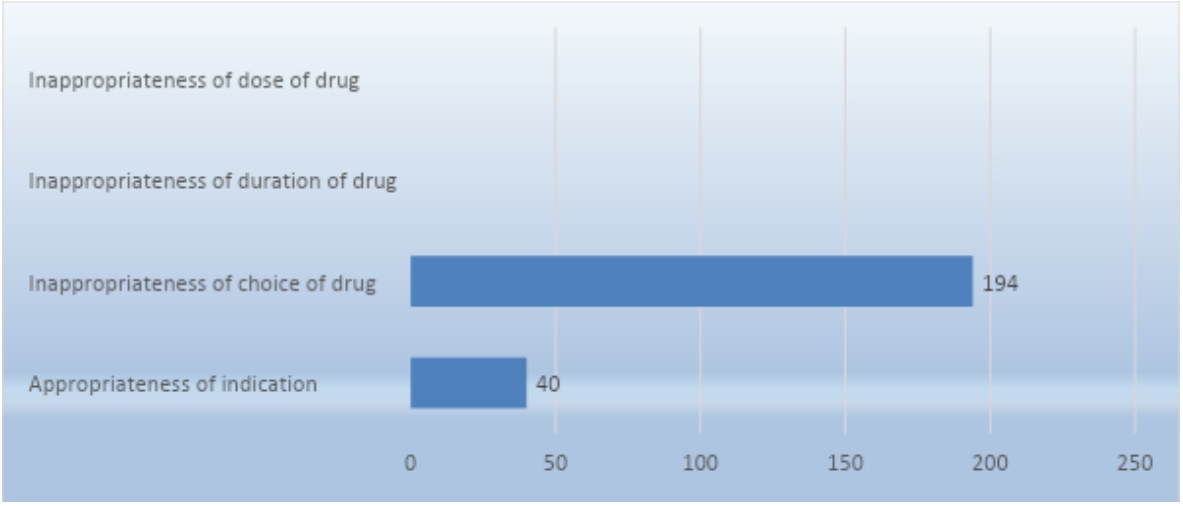

Figure 5: Rationality of Antibiotics

IV. DISCUSSION

A total of 559 antibiotics were found in 234 inpatient prescriptions and wereanalysed for the study of which 127 (54.3%) were maleand female accounted for 107 (45.7%). The greatest number of prescriptions collected for the study

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were from general medicine 168 (71.8%). This contrasts with the study conducted by Sidrah Nausheen et al., which reported 1564 (91.54%) from the OBG department.[11]

The patients who enrolled in the study belonged to the adult age group of 19-60 years with the most common being the 30-40 years age group. Out of 234 prescriptions included in the study, the most common diagnosis was found to be with RTI 39 (16.7%) followed by viral fever 22 (9.4%). This result is in contrast with the study conducted by Kumaraswamy M et al., in which it was found that 29 (12.3%) patients were diagnosed with hernia followed by appendicitis 27 (11.5%).[26]The age group in our study is in contrast to the study done by D.K. Upadhyay et al., in 2008, the highest number of patients was of the age group 21-30 years.[12]

Our study is in line with D.K. Upadhyay et al., in 2008 which found that the department of general medicine 28.74% accounted for the greatest number of prescriptions in the hospital.[12]The same was of which was seen in our study in which the greatest number of prescriptions 71.8% was obtained from the department of general medicine.

In this study, a total of 559 antibiotics were prescribed in 234 prescriptions. Our study is in line with the study conducted by D.K. Upadhyay et al., in 2008 which reported that the most no. of drugs per prescription was 2 (37.65%).[12]and the study by Kumaraswamy M et al., reported that the most no. of drugs per prescription was2 (35.5%).[13]The same was concluded by our study in which it was found that 65.4% had 2 drugs per prescription. Out of 559 antibiotics, 283 (50.6%) of antibiotics were Beta-lactam antibiotics, 158 (28.3%) antibiotics were Protein synthesis inhibitors, 95 (16.99%) antibiotics were DNA gyrase inhibitors, 17 (0.30%) antibiotics were Urinary antiseptics and 6 (0.11%) of antibiotics were DNA topoisomerases. A study conducted by T.M. Akande et al., 2009 2021recorded that 35.9% penicillin class of antibiotic was widely and most frequently prescribed drug[6],and Kumaraswamy M et al., found that metronidazole 17.8% was the most frequently used antibiotics.[13] This is in contrast with our study which concluded that the most common class of antibiotics prescribed was ceftriaxone 34%.

The rationality of antibiotics was analysed with the help of National guidelines for antibiotics and ICMR treatment guidelines for antimicrobials. The dose, indication, route, frequency, and duration of antibiotics were verified from these guidelines. The assessment of rationality was performed by collecting evidence from published literature about individual antibiotics. When rationality was checked for the overall appropriateness of antibiotics prescribed, it was found that 40 (17.1%) prescriptions were appropriate with respect to the choice of drug, dose, route frequency, and duration. 194 (82.9%) prescriptions were inappropriate/irrational with respect to the choice of drug, dose, route frequency, and duration. However, a study conducted by Erick Alexander Mboya et al., in 2018 in Northern Tanzania found 135 (88.8%) irrational prescriptions.[8]

V. CONCLUSION

The study discovered that prescribing antibiotics in developing countries and rural areas often disregards established guidelines. Cephalosporins and Beta-lactams are commonly used as single and combination therapy, respectively. Out of 243 prescriptions, only 17.1% were deemed rational. The problem is further exacerbated by multiple antibiotic prescription guidelines, inadequate patient education on medication compliance, and traditional prescribing methods. To resolve this issue, guidelines for antibiotic use should be established, physicians should receive appropriate training, and effective monitoring and pharmaceutical services should be available in retail pharmacies.

VI. ACKNOWLEDGEMENT

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REFERENCES

[1]. Remesh A, Salim S, Gayathri AM, Nair U, Retnavally KG. Antibiotics prescribing pattern in the in-patient departments of a tertiary care hospital. Archives of Pharmacy Practice. 2013; 4(2): 71-76.

[2]. Thomas M, Govil S, Moses BV, Joseph A. Monitoring of antibiotic use in a primary and a tertiary care hospital. Journal of Clinical Epidemiology. 1996; 49(2): 251-4.

[3]. Lalan BK, Hiray RS, Ghongane BB. Drug prescription pattern of outpatients in a tertiary care teaching hospital in Maharashtra. Int J Pharm Bio Sci. 2012; 3(3): 225-29.

[4]. Mathai D, Salim S, Hinge R, UP N, Joel JJ, Shenoy V. Assessment of Drug use Pattern in Paediatric Department of a Tertiary Care Hospital. J Young Pharm. 2020; 12(3): 242-245.

[5]. Babalola CP, Awoleye SA, Akinyemi JO, Kotila OA. Evaluation of prescription pattern in Osun state (Southwest) Nigeria. Journal of Public Health and Epidemiology. 2011; 3(3): 94-8.

[6]. Akande TM, Ologe M, Mebubi GF. Antibiotic Prescription Pattern and Cost at University of Ilorin Teaching Hospital, Ilorin, Nigeria. International Journal of Tropical Medicine. 2009; 4(2): 50-54.

[7]. Harvey K, Zhang Y. Rational antibiotic use in China: lessons learnt through introducing surgeons to Australian guidelines. Australia and New Zealand Health Policy. 2006; 3(1).

[8]. Mboya EA., Sanga LA., Ngocho JS. Irrational use of antibiotics in the Moshi Municipality Northern Tanzania: a cross-sectional study. Pan African Medical Journal. 2018; 31:165.

[9]. Amane H, KOP P. Prescription analysis to evaluate the rational use of antimicrobials. International Journal of Pharma and Bio Sciences. 2011; 2(2): 314-19.

[10]. Chioma O. Rational Use of Antibiotics -A Point Prevalence Study Carried out at a Tertiary Hospital in South-South Nigeria. International Journal of Tropical Disease & Health. 2020; 41(14): 39-47.

[11]. Nausheen S, Hammad R, Khan A. Rational use of antibiotics--a quality improvement initiative in a hospital setting. Journal Pakistan Medical Association. 2013; 63(1): 60-64.

[12]. Upadhyay DK, Shankar SP, Mishra P. Rational drug prescribing and dispensing in a tertiary care teaching hospital of Western Nepal. Journal of the institute of medicine. 2009; 30(2): 33-38.

[13]. M Kumaraswamy, S Apoorva, VS Sowmya, Shaji J S, Dr. Hanumanthaiah C S. Study of Antibiotic Utilization and Resistance Pattern in Surgery Department in Rural Tertiary Care Teaching Hospital. Int. J. Pharm. Sci. Rev. Res. 2021; 14(2): 80-84.