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A study on the prescribing pattern of antibiotics in the Inpatient Department of Pediatric patients

R Harshitha[1] , K. Jagadeesh[2]

ABSTRACT

Aim: A study on the prescribing pattern of antibiotics in the in-patient department of pediatric patients**. Objective:** The main objective is to evaluate the prescribing pattern of Antibiotics in paediatrics and to assess the rational use of antibiotics. **Method**: Prospective observational study of Six month's duration was undertaken. A total number of 92 prescriptions were screened and enrolled for antibiotic study. Patient data relevant to the study was obtained from the prescriptions in direct interview with in- patients under antibiotic therapy and Children between the age group of 1-16 years. **Results**: A total of 92 paediatric patients fulfilled the inclusion criteria were enrolled. According to our study there were a total of 41boys (44.5%) and 51 girls (55.4%). Among 92 patients, the highest number of patients was in the age group of 6-12 years i.e.43.4% and lowest number was in the age group of 1-3 years i.e.10.8%. In our study, Cephalosporin antibiotics were found to be widely prescribed. Among all these Cephalosporin antibiotics- Ceftriaxone (49%) was the leading antibiotic prescribed followed by Cefixime (13%), Cefotaxime (13%) and least prescribed antibiotic was found to be Nitroimidazole antibiotics- Metronidazole (5.40%). **Conclusion:** Prescription of broad-spectrum antibiotics though has increased demonstrably which may result in development of bacterial resistance, however development of guidelines for antibiotic prescription and regular Prescription audits have to be done periodically to assess rationality and correct, whenever necessary, in order to make better practice to avoid untoward effects.

Introduction

Paediatrics is the branch of medicine dealing with the development, diseases and disorders of children. Drug therapy is considered to be major component of pediatric management in health care setting. Antibiotics are the key drugs for treatment of infections and are among the most commonly prescribed drugs in paediatrics department. Their indiscriminate use increases the risk of bacterial drug resistance and not only jeopardizes the effectiveness of infection prevention and treatment, but also leads to prolonged illness, increased risk of death, and longer periods of infectivity. The high cost of second-line drugs further hinders the treatment of these diseases for many individuals. Thus have prompted the need to use antibiotics judiciously in paediatrics practice. Many of the antibiotics are unnecessarily prescribed for viral infections such as common cold and using antibiotics to treat these viral infections is considered misuse/overuse of antibiotics.[1]

Antibiotic abuse happens due to common fallacies such as a belief that broad spectrum antibiotics are "safer" and failure to distinguish between bacterial infections and nonbacterial infections and non-infectious syndromes. In addition, antibiotics for durations longer than necessary, redundant cover (like double gram negative or double anaerobic over) or treatment of colonizers or contaminants also constitute inappropriate antibiotic use.[2]

Antibiotics are the second leading drug which is being prescribed or considered for treating infectious disease in children. Therefore, a proper selection of antibiotics along with prescribing of appropriate dose, formulation, pharmacokinetics profiles, response, and adverse drug reactions (ADRs**)** must be considered very seriously otherwise they may lead to fatal effects and promote the spread of antibiotics resistance.

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1. Pharm D Intern, Department of Pharmacy Practice, St. Johns college of Pharmaceutical Sciences, Yemmiganur, Kurnool, Andhra Pradesh, India, Mail harshitha.rayudu13@gmail.com; Mobile: 6303160955
2. Associate Professor, Department of Pharmacy Practice, St. Johns college of Pharmaceutical Sciences, Yemmiganur, Kurnool, Andhra Pradesh, India; Mail jagadeeshpharmd2011@gmail.com ; Mobile : 8555968094

Corresponding Author: Dr. K. Jagadeesh, Associate Professor, Department of Pharmacy Practice, St. Johns college of Pharmaceutical Sciences, Yemmiganur, Kurnool, AP; **Mail:** jagadeeshpharmd2011@gmail.com ; Mobile : 8555968094

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The irrational use of antibiotics is leading to destruction of micro-flora, emergence of multi drug resistance and the irrational use has lead to the development of "super bugs", use of more combination of antibiotics and fearing the experts about future availability of antibiotics. Therefore, an effective step should be taken for rational use, especially in the paediatric population

Bacterial infection: A bacterial infection is a proliferation of a harmful strain of bacteria on or inside the body. Bacteria can infect any area of the body. Pneumonia, meningitis, and food poisoning are just a few illnesses that may be caused by harmful bacteria. For example, runny nose, cough, headache, and fatigue can occur with the common cold (virus) and with a sinus infection (bacteria).

A physician may use the presence of other symptoms (such as fever or body aches), the length of the illness, and certain lab tests to determine if an illness is due to bacteria, or some other pathogen or disease process.

Pathogens: Pathogens (from Greek pathos, disease, and gen, to produce) are the micro-organisms or agents, which are capable of producing disease in the host. Its ability to cause disease is called pathogenicity. The following are the types of bacteria based on gram stain:

1. *Gram Positive Bacteria*:

- Cocci : Examples: Enterococcus, Streptococcus etc…
- Rods : Examples: Bacillus, Clostridium etc….

2. *Gram Negative Bacteria*:

- Cocci : Example : Neisseria, Moraxella etc…
- Nonenteric rods : Brucella, Pseudomonas etc…
- Enteric rods : Bacterioides, Enterobacter etc…

Importance of blood culture:

1. Blood culture is the most widely used diagnostic tool for the detection of bacteremia and fungemia.
2. A positive blood culture either establishes or confirms that there is an infectious etiology for the patient's illness.
3. Early identification of pathogens in the blood can be a crucial step in assuring appropriate therapy, and beginning effective antibiotic therapy as early as possible can have a significant impact on the outcome of the disease.

Treatment for bacterial infections:

- **Antibiotics** are medications that fight against bacterial infections. They work by disrupting the processes necessary for bacterial cell growth and proliferation.
- Antibiotics don't treat viruses, but they're sometimes prescribed in viral illnesses to help prevent a **"secondary bacterial infection."** Secondary infections occur when someone is in a weakened or compromised state due to an existing illness[5]

Antibiotics classification: Antibiotics are usually classified based on their structure, function and /or spectrum of activity.

1. ***Structure-Molecular structure*:** Beta Lactams-Beta lactam ring, Aminoglycosides-vary only side chains attached to basic structure.

2. ***Function-Mode of action*:** Inhibitors of cell wall synthesis, inhibitors of protein synthesis, inhibitors of membrane function, anti-metabolites, inhibitors of nucleic acid synthesis.
3. ***Spectrum of activity*:** Narrow and broad spectrum antibiotics.

ICMR guidelines for prescribing Antibiotics:

1. Skin and soft tissue infections should be treated with antibiotics for five days
2. Community- acquired pneumonia should be treated for five days, and hospital-acquired pneumonia should be treated for eight days.
3. Empiric antibiotic treatment is often only advised for a small subset of patients who have severe sepsis, septic shock, community-acquired pneumonia, ventilator-associated pneumonia.
4. The new recommendations ask that only severe conditions should receive empiric antibiotic therapy.

- A clinical diagnosis most often helps us predict causative pathogens fitting into a clinical syndrome which would tailor the correct antibiotic rather than blindly relying on fever, WBC counts, cultures or radiology to make a diagnosis of infection.
- A sizable percentage of Indian patients may no longer benefit from the administration of carbapenem, a strong antibiotic frequently used in ICU settings to treat conditions like pneumonia and septicemia, among others, because they have developed antimicrobial resistance to it (according to a previous ICMR study)
- Resistance to Imipenem, which is used to treat infections caused by E coli bacteria, increased from 14.0% in 2016 and 36.0% in 2021.
- Bacterium klebsiella pneumoniae showed a decline in susceptibility to certain antibiotics, going from 65% in 2016 to 45% in 2020, and then to 43% in 2021, further demonstrating the trend of decreasing bacterial susceptibility to medicines. Imipenem resistance grew from 14% in 2016 to 36% in 2021, and it is used to treat illnesses brought on by the E coli bacterium.

The analysis of the data indicated a consistent rise in pathogens that are drug-resistant, making it challenging to treat some infections with the drugs currently on the market.

Indian Council of Medical Research (ICMR) has issued a warning against while prescribing antibiotics for viral bronchitis and low-grade fever etc.[4]

Some General Principles: Antibiotic use will need to be classified with respect to type (high- and low-risk) and the patient's place in the treatment pathway (untreated, treated, and post treatment).

- The choice of medication may vary depending on differences in the case mix of patients, various drugs (of same or different class) listed in the hospital formulary or clinical practice guidelines already in place at different institutions in similar patient care locations.
- Timely use of diagnostic tests or documentation of symptoms supporting the presence of infection would be best. Cultures (two sets of blood cultures and other appropriate samples as clinically indicated e.g. normally sterile body fluids, deep pus etc.) should be taken before starting empiric antibiotic treatment.
- Empiric antibiotic treatment for common infections should be limited to conditions where early initiation of antibiotics has been shown to be beneficial, e.g. severe sepsis and septic shock, acute bacterial meningitis, community acquired pneumonia, necrotizing facilities, etc.
- Re-assessment of the situation within 48 hours based on the test results and examination of the patient is required. If needed, the drug's dosage and duration can be adjusted or the antibiotic regimen should be de-

escalated (to the narrowest spectrum, least toxic and least expensive antibiotic) based upon patient response and culture and susceptibility reports.[2]

Methodology

Ethical approval: The study is initiated after the clearance of Institutional Ethics Committee.

Study design: Prospective observational study

Study duration: 6 months

Study site: Govt. Area Hospital, Yemmiganur

Study criteria:

***Inclusion criteria*:** Patients of either sex within the age group of 1 to 14 years receiving Antibiotic therapy from Pediatric department were recruited in the study.

Exclusion criteria:

- ✓ Case records without Antibiotic prescription.
- ✓ Case records of Out Patient (OP) department were excluded.

Sample size: 92 patients

Statistical Analysis: The data is analysed by using Microsoft EXCEL.

Study procedure:

Participation in ward rounds at Govt. Area Hospital

⇓

Data Collection

⇓

To study the prescribing pattern of antibiotics in the in-patient department of pediatric patients

⇓

Results verified by Physician

Results

A total of 92 paediatric patients were involved in the study who were eligible with the study criteria and the age of studied patients was between 1-14 years.

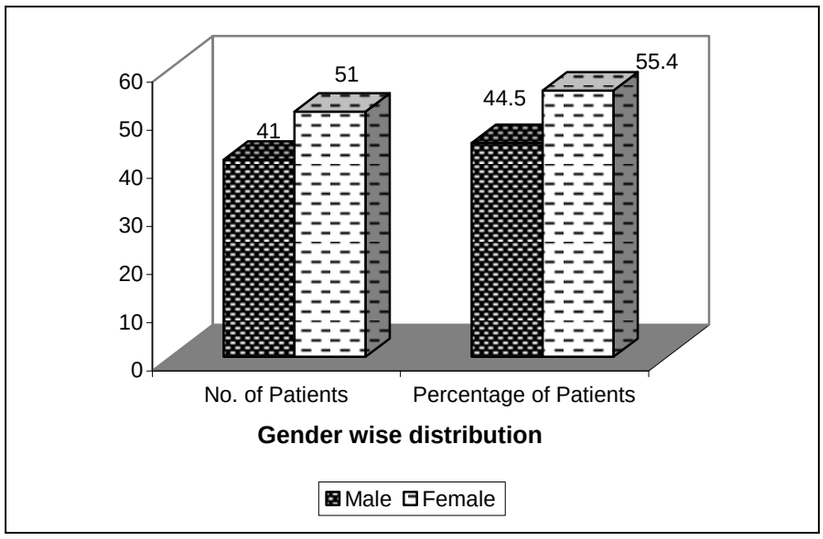
Gender Wise Distribution:

The study involved a total 92 paediatric patients of either gender. According to our study, there were a total of 41 boys (44.5%) and 51 girls (55.4%) and gender distribution is shown in the Table -1 and Figure- 1.

Table-1: Gender wise distribution

Gender	No.	%
Boys (Male)	41	44.5
Girls (Female)	51	55.4
Total	92	100

Figure-1: Gender wise distribution



Age Distribution

Among 92 patients, the highest number of patients was in the age group between 6-12 years (43.4%) and lowest number was in the age group 1-3 years (10.8%). It was shown in table 2 and graph 2.

Figure-2: Age wise distribution

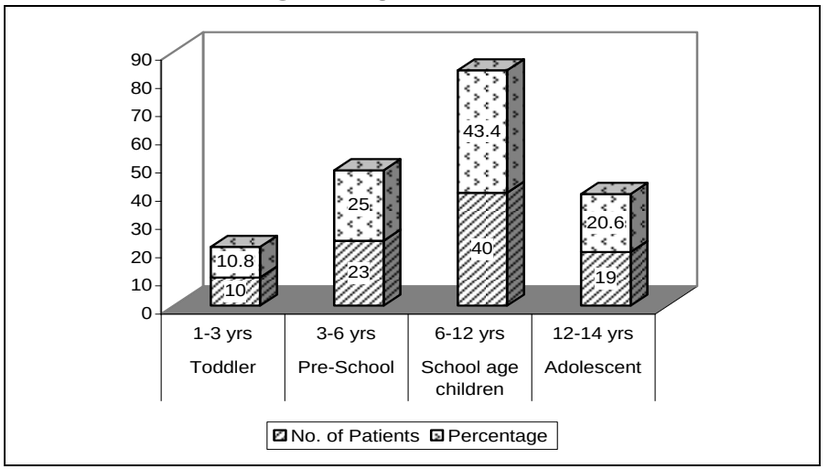


Table- 2: Age wise distribution

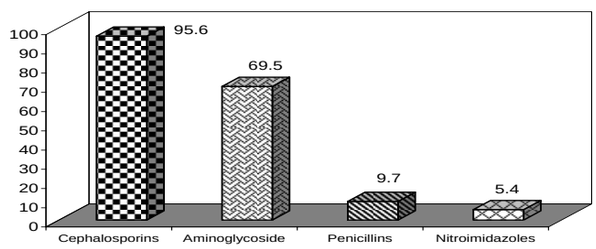
Life Age Descriptor	Age (yrs)	No.	%
Toddler	1 - 3	10	10.8
Preschool	3 - 6	23	25.0
School Age Child	6-12	40	43.4
Adolescent	12-14	19	20.6

Category wise prescription of Antibiotics (according to Class): In our study, Cephalosporins were found to be widely prescribed antibiotic followed by Aminoglycoside antibiotic, Penicillins, Nitroimidazole Antibiotics. It was shown in Table -2 and Figure- 2.

Table- 3: Class of antibiotic prescribed

Antibiotics Category	No.	%
Cephalosporins	88	95.60
Aminoglycoside	64	69.50
Penicillins	9	9.70
Nitroimidazoles	5	5.40

Figure- 3: Class of antibiotic prescribed



Antibiotics Prescribed: In our study, Amikacin (39%) antibiotics were found to be widely prescribed antibiotic followed by Ceftriaxone, Cefixime, Cefotaxime, Amoxyclavulanate, Metronidazole respectively.

Table-4: Distribution of Antibiotics prescribed

Antibiotics	**No.**	**%**
Metronidazole	5	3.0
Ceftriaxone	45	27.0
Amikacin	64	39.0
Cefixime	21	13.0
Cefotaxime	22	13.0
Amoxyclavulanate	9	5.0

Figure-4: Distribution of Antibiotics prescribed

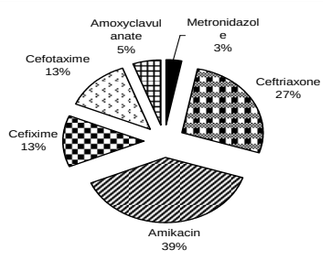
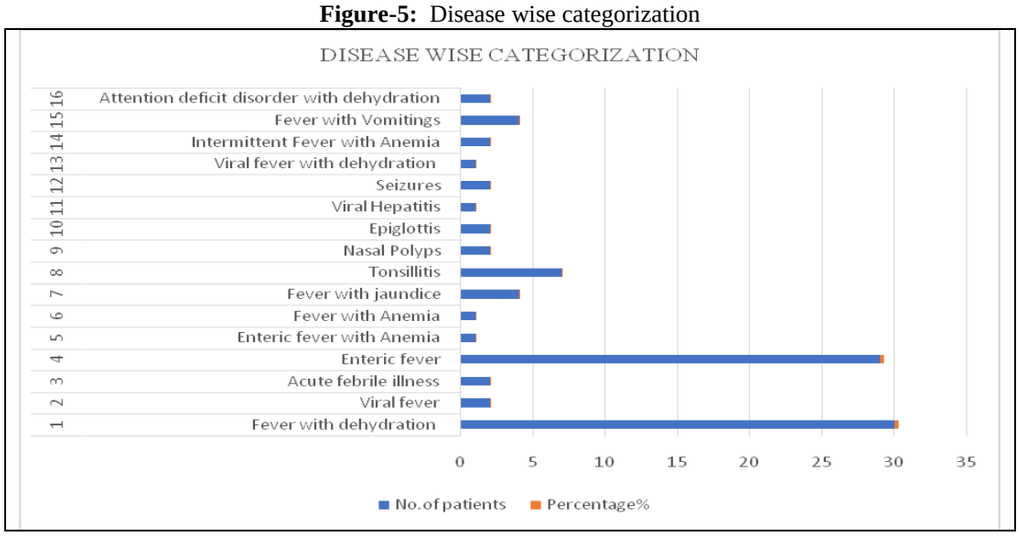


Table-5: Disease wise categorization

Types of Disease	**No.**	**%**
Fever with dehydration	30	32.60
Viral fever	2	2.17
Acute febrile illness	2	2.17
Enteric fever	29	31.52
Enteric fever with Anemia	1	1.08
Fever with Anemia	1	1.08
Fever with jaundice	4	4.34
Tonsillitis	7	7.60
Nasal Polyps	2	2.17
Epiglottis	2	2.17
Viral Hepatitis	1	1.08
Seizures	2	2.17
Viral fever with dehydration	1	1.08
Intermittent Fever with Anemia	2	2.17
Fever with Vomiting	4	4.34
Attention deficit disorder with dehydration	2	2.17
Total	92	100

Figure-5: Disease wise categorization



Discussion

Antibiotics represent one of the most commonly used drugs. The prescribing prevalence of antibiotics was also high. The majority of common childhood illnesses are caused by viruses which do not require antibiotics. So, excessive and inappropriate use leads to a number of consequences in term of cost, drug interactions, hospital stay and bacterial resistance.

Deny K. Joy conducted a study on prescribing pattern of antibiotics in paediatrics inpatient population in a tertiary care teaching hospital. According to this study third-generation Cephalosporins were the antibiotics most commonly prescribed, of which ceftriaxone was more common. Cephalosporins followed by aminoglycosides.

In the present study, the total antibiotic prescribed contains cephalosporins, aminoglycosides, penicillins, nitroimidazoles antibiotic.

The most commonly prescribed antibiotics in all age group were cephalosporins which include 27% of ceftriaxone and 13% of cefixime, 13% of cefotaxime. The mostly used aminoglycoside antibiotic was amikacin, and the widely used penicillins antibiotics were amoxicillin and clavulanate in combination. Whereas, the study of Sriram et al[23] have shown 68.2% of Cephalosporins and 31.3% of Penicillins prescriptions.

However, Sandra R Arnold in 1999 revealed that antibiotics from the penicillin class were the most frequently prescribed antibiotics and other categories of antibiotics prescribed include Aminoglycosides (8.9%), Macrolides (6.1%) Fluoroquinolones (4.7%).[23] Higher numbers of antibiotics were prescribed for children whose age was between six and twelve years (43.4%). The number of female patients exceeded the male patients.

The difference in the trend of prescribing practice may be due to the difference in the prevalence of disease and availability of the drugs. Due to allergic reactions of Penicillins in some patients, they were replaced by aminoglycosides antibiotics like Amikacin and cephalosporins like Ceftriaxone, Cefixime and Cefotaxime.

Prescription of broad-spectrum antibiotics though has increased demonstrably which may result in development of bacterial resistance[3] and not only jeopardizes the effectiveness of infection prevention and treatment, but also leads to prolonged illness, increased risk of death, and longer periods of infectivity. The high cost of second-line drugs further hinders the treatment of these diseases for many individuals.

Conclusion

This study gives an overview of prescribing pattern of antibiotics in Pediatric patients. The difference in the trend of prescribing practice may be due to the difference in the prevalence of disease and availability of the drugs. Antibiotic prescription in the pediatric patients who acutely needed was prescribed appropriately, where it proved to be beneficial.

This study may be considered as an effort to improve the quality of health care and carry out intervention along with regular Prescription audits have to be done periodically to assess rationality and correct, whenever necessary, in order to make better practice to avoid untoward effects.

References

1. https://economictimes.indiatimes.com/industry/healthcare/biotech/healthcare/govt-asks-doctors-pharmacists-to-mention-reasons-for-prescribing-antibiotics/articleshow/106986244.cms
2. https://main.icmr.nic.in/sites/default/files/guidelines/Treatment_Guidelines_2019_Final.pdf
3. Essentials of medical pharmacology 8th edition by KD TRIPATI https://www.slideshare.net/SnehaPandey624445/kdt-8th-edition-pharmacologypdf
4. ICMR GUIDELINES - https://www.livemint.com/news/india/warning-issued-doctors-advisedto-use-caution-while-prescribing-antibiotics-11669532064345.html
5. https://www.slideshare.net/grkmedico/antibiotic-usage-in-paediatrics-empirical-or-rational-dr-grk
6. https://pharmdguru.com/general-prescribing-guidelines-for-paediatric-patients
7. https://www.researchgate.net/figure/Algorithm-of-antibiotic-choice-recommended-by-the-Frenchhealth-authorities-in-2005_fig1_306087356
8. PUB MED CENTRAL https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7839261/(Evaluation of antibiotic prescribing pattern in pediatrics in a tertiary care hospital)
9. https://www.ijopp.org/sites/default/files/10.5530.ijopp_.9.4.7_0.pdf (Study on Prescribing Pattern of Antibiotics in a Pediatric Out-Patient Department in a Tertiary Care Teaching and Non-Teaching Hospital)
10. https://ijopp.org/sites/default/files/IJOPP_v1_i1_2008_7.pdf (Assessment of Antibiotic Use in Pediatric Patients at a Tertiary care Teaching Hospital)
11. WHO. *How to Investigate Antimicrobial Use in Hospitals: Selected Indicators*. World Health Organization; 2012.
12. Choudhury DK, Bezbaruah BK. Antibiotic prescription pattern in pediatric in-patient department Gauhati medical college and hospital Gauhati. 2013;3(8):144-8.
13. Gopal VD, Krishna RT, Kumar SA, Meda VS, Reddy RK. Prescribing pattern of Antibiotics in the general medicine and pediatrics department of a tertiary care teaching hospital. 2014;6(2):221-4.
14. Kanish R, Gupta K, Juneja S. Prescribing pattern of antibiotics in the department of pediatrics in a tertiary care medical college hospital in Northern India. Asian Journal of Medical Sciences. 2014;5(4):69-72.
15. Priyadharsini R, Surendiran A, Adithan C, Sreenivasan S, Firoj KS. A study of adverse drug reactions in paediatric patients. Journal of Pharmacology and 2011;2(4):277-80.
16. Venkateswaramurthy N, Murali R, kumar SR. The study of drug utilization pattern in paediatricspatients. International Journal of Pharmacy and Pharmaceutical Sciences, 2013; 5(3).
17. Sharma M, Eriksson B, Marrone G, Dhaneria S, Lund borg CS. Antibiotics prescribing in two private sector hospitals; one teaching and one non teaching: Across sectional study in Ujjain, India. BMC infectious Disease. 2012;12(1): 155. http://dx.doi.org/10.1186/1471-2334-12-155; P Mid: 22788873 PMCid:PMC3447672.
18. Gupta N, Sharma D, Garg SK, Bhargava VK. Auditing of prescriptions to study utilization of antimicrobials in tertiary hospital. Ind J Pharmacol. 1997; 29 (6):411 5.

19. Deshmukh N, Mahajan MM. A Study of Prescription Pattern of Antibiotics in Paediatric InPatients at a tertiary care hospital in central India. International Journal of Pharmacological Research. 2016; 6 (8):286-290.
20. Prabahar K, Sikharam D, Barla S, Padmasani L.N. Antibiotics Utilization Pattern in Pediatrics in a Tertiary Care Teaching Hospital.Asian Journal of Pharmaceutics.2017; 11(1): 230-234.
21. Vahdati RL, Alekhya M. prescribing pattern of antibiotics in pediatric inpatient department of a tertiary care teaching hospital in Bangalore. IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS).2015; 10 (4):26-32.
22. Shamshy K, Mufida Begum I, Perumal P. Drug Utilization of Antimicrobial drug in Paediatrics Population in a tertiary care hospital in Erode, Tamilnadu, India.Int.J. PharmTech Res.2011; 3 (3):1530-6.
23. Sriram S, Leo M, Manjula Devi AS, Rajalingam B, Ramkumar K, Rajeswari R. Assessment of Antibiotic Use in Pediatric Patients at a Tertiary care Teaching Hospital. Indian J. Pharm. Pract 2008; 1 (1):30-6.
24. Akhtar MS, Vohora D, Pillai KK, Dubey K, Roy M, Najmi A, et al . Drug prescribing practices in pediatric department of a North Indian University teaching hospital. 2012;5 (1):146-9.
25. Joseph D, Robert T, Gary Y, Gary M. Pharmacotherapy, A Pathophysiologic Approach. 2011; 15-16.

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