Prescribing pattern for infectious diseases in tertiary care pediatric hospital

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ABSTRACT

The present study gives an overview of the prescribing pattern for infectious diseases in tertiary care pediatric hospital. The study is conducted on the basis of patient’s age, disease conditions, anti-microbial, antibiotic, and antifungal. Anti-viral, anti-diarrhoeal, anti-epileptic, anti-emetic, anti-asthmatic, anti-histamines, anti-ulcer, NSAIDS, Antipyretics, anti-infective, probiotics, anxiolytics, electrolytes, corticosteroids, spasmyotics, multivitamins, laxatives.

The study was based on the number of patients, the number of prescriptions, the single drug regimen, multiple drug regimen, combinational drug regimen for anti-microbials was noted. The drugs commonly seen in the prescriptions with anti-microbial combination therapy were identified. The study was also based on the analysis of route of administration of different categories of drugs like oral, parenteral, topical, rectal, nasal etc. The current study concludes that the frequently prescribed antibiotics are Ceftriaxone (107 prescriptions), Cefoperazone + Sulbactam with Amikacin (39 prescriptions), Amoxicillin + Clavulanate potassium was 47, Piperacillin + Tazobactum was 41.

The present study concludes that the highly prescribed anti-microbial agents for acute gastric enteritis are Ceftriaxone (40 prescriptions), Cefoperazone + Sulbactam (10 prescriptions). The highly prescribed anti-microbial agents for Acute Febrile illness are Ceftriaxone (37 prescriptions), Amikacin (24 prescriptions). The highly prescribed anti-microbial agents for urosepsis are Fluconazole with Gentamicin (5 prescriptions). The highly prescribed anti-microbial agents for miscellaneous infectious diseases are Ceftriaxone (4 prescriptions), Ampicillin with Gentamicin (4 prescriptions).

The current study also indicates the highly prescribed anti-microbial agents for respiratory tract infectious diseases are Amoxicillin + Clavulanic acid (29 prescriptions), Cefoperazone + Sulbactam (25 prescriptions), the highly prescribed anti-microbial agents for urinary tract infectious diseases are Piperacillin + Tazobactam (3 prescriptions), Cefoperazone + Sulbactam with Amikacin (4 prescriptions), the highly prescribed anti-microbial agents for cerebral complications are Ceftriaxone (16 prescriptions), Vancomyc in with amikacin combination (3 prescriptions).

The current study also indicates the number of prescriptions with different categories of drugs and indicating the routes of administration. The total routes of administrations were five including the oral, parenteral, topical, nasal, and rectal. According to the data obtained from my study indicates that the highest number of prescriptions containing the drugs with oral route of administration was 418.

1. INTRODUCTION

Prescribing pattern studies are powerful tools which explore widely in the society. It plays a key role due to its ideal properties which are judicious, appropriate, safe, effective and economical in health care sectors. The ultimate goal is to achieve rational and effective medical care, particularly in the economically developing countries. Considering these facts, this study is planned to analyze the prescribing pattern in paediatric patients at a tertiary care hospital. Paediatrics is the branch of medicine dealing with the development, diseases and disorders of children. Drug therapy is considered to be major component of paediatric management in healthcare setting like hospital. Effective medical treatment of a paediatric patient is based upon an accurate diagnosis and optimum course of therapy, which usually involves a medication regimen.

Choice of an antimicrobial agent:

Ceftriaxone: Ceftriaxone selectively and irreversibly inhibits bacterial cell wall synthesis by binding to transpeptidases, also called transamidases, which are penicillin-binding proteins (PBPs) that catalyze the cross-linking of the peptidoglycan polymers forming the bacterial cell wall.
They have broad spectrum of activity against enteric Gram – negative rods including Salmonella. Their activity against Gram – positive bacteria is variable. They have poor action against methicillin-resistant Staphylococcus as compared to first generation. They are ineffective against methicillin-resistant Staphylococcus and Enterococcus.

Cefaperazone + sulbactam: Cefoperazone, a bactericidal antibiotic, suppress bacterial cell wall synthesis of actively dividing cells by binding to one or more penicillin binding proteins (PBPs). Sulbactam is a β-lactamase inhibitor and acts primarily by permanent inactivation of β-lactamases.

Cefaperazone: Cefoperazone, a bactericidal antibiotic, inhibits bacterial cell wall synthesis of vigorously dividing cells by binding to one or more penicillin binding proteins (PBPs).

Cefotaxime: Cefotaxime antimicrobial activity, pharmacology, adverse effects, and clinical efficacy of cefotaxime. Cefotaxime sodium, a parenteral cephalosporin antibiotic, exerts its bactericidal action via inhibition of bacterial cell wall synthesis.

β-lactamase inhibitors: Beta-Lactamases are now accountable for resistance to penicillins, extended-spectrum cephalosporins, monobactams, and carbapenems. In order to defeat beta-lactamase-mediated resistance, beta-lactamase inhibitors (clavulanate, sulbactam, and tazobactam) were introduced into clinical practice. Amoxicillin + clavulanic acid: Amoxicillin is prone to degradation by β-lactamase-producing bacteria, which are resistance to a narrow spectrum of β-lactam antibiotics, such as penicillin. For this reason, it may be pooled with clavulanic acid, a β-lactamase inhibitor.


Ampicillin: Ampicillin acts as an irreversible inhibitor of the enzyme transpeptidase, which is required by bacteria to make their cell walls. It inhibits the third and final stage of bacterial cell wall synthesis in binary fission, which eventually leads to cell lysis; therefore Ampicillin is usually bacteriolytic agent.

Piperacillin: Broad-spectrum penicillin (PCN): exerts bactericidal activity by inhibiting septum formation and cell-wall synthesis of susceptible bacteria.

Tazobactam: β-lactamase enzyme inhibitor.

Amino glycosides: The aminoglycoside group comprises gentamicin, tobramycin, amikacin, netilmicin (not available in the U.S.), kanamycin, streptomycin, paromomycin, and neomycin. These drugs are used primarily to treat infections caused by aerobic gram-negative bacteria; streptomycin is an essential agent for the treatment of tuberculosis, and paromomycin is used orally for intestinal amebiasis and in the treatment of hepatic coma. On the contrary to most inhibitors of microbial protein synthesis, which are bacteriostatic, the aminoglycosides are bactericidal inhibitors of protein synthesis. Mutations affecting proteins in the bacterial ribosome, the target for these drugs, can grant marked resistance to their action. However, most commonly resistance is due to attainment of plasmids or transposon-encoding genes for aminoglycoside-metabolizing enzymes or from impaired transport of drug into the cell. Thus, there can be cross-resistance between members of the class.

Amikacin: Amikacin is a semi-synthetic aminoglycoside antibiotic derived from kanamycin A. Similar to other aminoglycosides, amikacin disrupts bacterial protein synthesis by binding to the 30S ribosome of susceptible organisms.

Gentamicin: Gentamicin is a bactericidal antibiotic that works by permanently binding the 30S subunit of the bacterial ribosome, interrupting protein synthesis.

Meropenem: The bactericidal activity of meropenem results from the inhibition of cell wall synthesis. Meropenem readily penetrates the cell wall of most Gram-positive and Gram-negative bacteria to reach penicillin-binding-protein (PBP) targets.

Macrolides: Macrolide antibiotics are an old and well-established class of antimicrobial agents that have long played an important role in the chemotherapy of infectious diseases. Among the most prominent characteristics of the macrolide class are more or less broad spectrum of antimicrobial activity, an orally effective route of administration, and a fairly high margin of safety (high therapeutic index). Although macrolides have been the primary antibiotic of choice for a few indications, they have also played a very vital role as an alternative drug of choice, particularly as an alternative to the penicillins. Over the past two decades, the macrolide class has undergone a remarkable resurgence that has been characterized by 1) the discovery and commercial development of several important new semi-synthetic derivatives demonstrating a variety of improved features and 2) clinical efficacy in the treatment of several infectious diseases not originally related with macrolide therapy. The subsequent chapters of this book will 1) document the clinical progress that has been made thus far in utilizing the more recent semi-synthetic macrolides, 2) update our knowledge and understanding about the biosynthetic origins of the macrolides and the mechanisms involved in their antibacterial activity and in microbial resistance to them, and 3) look toward the future emergence of additional new macrolides potentially arising from the discovery and development pipelines of several pharmaceutical research organizations.

Azithromycin: Azithromycin avoids bacteria from growing by interfering with their protein synthesis. It binds to the 50S subunit of the bacterial ribosome, thus
inhibiting translation of mRNA. Nucleic acid synthesis is not affected.

**Clarithromycin:** Clarithromycin prevents bacteria by acting as a protein synthesis inhibitor. It binds to 23S rRNA, a component of the 50S subunit of the bacterial ribosome, thus inhibiting the translation of peptides.

**Linezolid:** Linezolid inhibits bacterial protein synthesis through a mechanism of action different from that of other antibacterial agents; therefore, cross-resistance between linezolid and other classes of antibiotics is improbable. Linezolid is a synthetic antibacterial agent of the oxazolidinone class of antibiotics.

**Vancomycin:** It also has a unique mode of action inhibiting the second stage of cell wall synthesis of susceptible bacteria. There is also evidence that Vancomycin alters the permeability of the cell membrane and selectively inhibits ribonucleic acid synthesis.

**Fluoroquinolones:** The fluoroquinolones have become an increasingly accepted class of antibiotics for use in a variety of infections. Newer drugs in this class have been developed with a broader spectrum of activity including better coverage of gram-positive organisms and, in one case, even anaerobes. However, toxicities have been associated with some of these newer agents.

Fluoroquinolones available for systemic use include ciprofloxacin, gatifloxacin, gemifloxacin, levofloxacin, moxifloxacin, and ofloxacin.

**Levofloxacin:** The mechanism of action of levofloxacin and other fluoroquinolone antimicrobials involves inhibition of bacterial topoisomerase IV and DNA gyrase (both of which are type II topoisomerases), enzymes necessary for DNA replication, transcription, repair and recombination.

**Ofloxacin:** Ofloxacin is a quinolone/fluoroquinolone antibiotic. Ofloxacin is bactericidal and its mode of action depends on blocking of bacterial DNA replication by binding itself to an enzyme called DNA gyrase, which allows the unwinding required replicating one DNA double helix into two.

**Tetracyclines:** Tetracycline is an antibiotic used to treat a number of bacterial infections. It is usually used to treat acne and rosacea. Historically it was important in dropping the number of deaths from cholera.

A broad-spectrum antibiotic of the polykite class, it is produced by the antinobacterial genus Streptomyces. It acts by inhibiting protein synthesis.

Tetracycline is on the World Health Organization's List of Essential Medicines, a list of the most significant medication essential in a basic health system. It is marketed under the brand names Sumycin, Tetracyn, Lymecycline, and Panmycin, among others. Actisite is a thread-like fiber formulation used in dental applications. It is also used to produce several semisynthetic derivatives, which together are known as the tetracycline antibiotics. The term "tetracycline" is also used to denote the four-ring system of this compound; "Tetracyclines" are related substances that contain the same four-ring system.

**Doxycycline:** Doxycycline inhibits bacterial protein synthesis by binding to the 30S ribosomal subunit. Doxycycline has bacteriostatic activity against a broad range of Gram-positive and Gram-negative bacteria. Cross resistance with other tetracyclines is common.

**Antifungals:** An antifungal medication is a pharmaceutical fungicide or fungistatic used to treat and avoid mycoses such as athlete's foot, ringworm, candidiasis (thrush), serious systemic infections such as cryptococcal meningitis, and others.

**Metronidazole:** It inhibits nucleic acid synthesis by distracting the DNA of microbial cells. This function only occurs when Metronidazole is partially reduced, and because this reduction usually happens only in anaerobic cells, it has relatively little effect upon human cells or aerobic bacteria.

**Fluconazole:** Fluconazole is a highly selective inhibitor of fungal cytochrome P450 dependent enzyme lanosterol 14- α-demethylase. This enzyme functions to convert lanosterol to ergosterol.

**Anti-viral agents:**

**Acyclovir:** Acyclovir is a new anti-viral drug that acts as a definite inhibitor of Herpes virus DNA polymerase. It shows good invtro activity against herpes simplex and varicella-Zoster viruses.

**Oseltamivir:** It is an ethyl ester prodrug requiring ester hydrolysis for conversion to the active form, Oseltamivir carboxylate is an inhibitor of influenza virus neuraminidase, effecting release of viral particles.

### 2. MATERIALS AND METHODS

This is a prospective coherent observational study carried out in the tertiary care pediatric hospital, Hyderabad, Telangana, India. Patients of either sex, aged between below 1 year to 12 years suffering with clinical symptoms were selected from various departments of hospital. Patients who are admitted in IPD with clinical symptoms were included in this study. Above 12 years children, adults & OPD were excluded from the study. Either Patients or Patients guardian declared their willingness to participate in the study and written informed consent was obtained from them. Complete information of all the drugs prescribed were recorded including drug dose route, dosage form, frequency of administration indicators for which prescribed and duration of therapy were recorded in the patient profile form. A well-designed patient data collection form was developed with the help of the consulting pediatrician, trained pharmacist & the faculty members of the Pharmacology Department of the College & Hospital was used. Depending on the sternness of infection, patients were prescribed antimicrobials agents either as single or multiple or combination therapy. The data obtained & the patient related parameters were computed using Ms-Excel 2007. The results were expressed as percentage or...
proportion either as pictorial representation in the form of bar diagram & pie chart or in the tabular form.

**Study Population:** In our study 263 infectious subjects were included between the age group of below 1 year to 12 years both male and female patients. Patients who are admitted with clinical symptoms were included in this study. Above 12 years children, adults and who were not interested to participation in the study were expelled from the study.

**Study Design:**

- Number of infectious patients identified (263)
- Group based on age
- Group based on disease
- All the drugs prescribed were recorded including drug dose route, dosage form, frequency of administration indicators for which prescribed and duration of therapy of IPD
- The average number of drugs per prescription, encounters with antimicrobials, antimicrobials prescribed by the parenteral route, frequency of prescribing different anti-microbial classes was calculated
- Data interpreted and analyzed
- Conclusion

**Study Criteria:**

**Inclusion Criteria:**
- Age: Below 1 year to 12 years
- Sex: Male and Female

Absolute information of all the drugs prescribed were recorded including drug dose route, dosage form, frequency of administration indicators for which prescribed and duration of therapy of IPD were recorded.

**Exclusion Criteria:** Subjects who are the age group of above 12 years children and adults were excluded. OPD prescriptions were excluded from this study.

**IEC Approved:** Our project work was supported by the institutional ethical committee. And also provide IEC approval note with number: IEC-ASNPC/2015-16/Proposal:7.

### RESULTS AND DISCUSSION

Below 1 year patients are observed in my study is 78 (29.66%), 1-5 years patients are observed in my study is 148 (56.27%) and 6-12 years patients are observed in my study is 37 (14.07%). In this the age group of 5-12 years patients highly persisted in my study.

Acute febrile illness (AFI) cases are presented in my study was 86 (32.7%), Acute gastroenteritis (AGE) cases are presented in my study was 58 (22.1%), Respiratory tract infections (RTI) are presented in my study was 74 (28.1%), Sepsis cases are presented in my study was 9 (3.4%), Central nervous system infections (CNSI) cases are presented in my study was 18 (6.8%), Urinary tract infection (UTI) cases are presented in my study was 6 (2.3%), and Other cases are presented in my study was 12 (4.6%). Acute febrile illness cases were highly observed in my study.

**Figure.1.Infections Percentage observed in our study**
4. CONCLUSION

The present study gives an overview of the prescribing pattern for infectious diseases in tertiary care pediatric hospital. The study is conducted on the basis of patient’s age; disease conditions, 1 – 5 years comprised the highest proportion of the patients, comparatively reaming age groups. Respiratory tract infections, Gastroenteritis and acute febrile illness were prevalent diagnosis among the below 1 year. Among the 1 – 5 years and 6 – 12 years acute febrile illness, Respiratory tract infections, and Gastroenteritis were the most prevalent diagnosis. Acute febrile illness, Respiratory tract infections, and Gastroenteritis were mostly prevailing among the children. Majority (about 93.7%) of the antimicrobials were administered parentally.

The present study concludes that the highly prescribed antibiotics are Ceftriaxone, Cefoperazone + Sulbactam, Amoxicillin + Clavulanate potassium, and Piperacillin + Tazobactam.

The present study concludes that the highly prescribed anti-microbial agents for Acute Febrile illness are Ceftriaxone and Amikacin. The highly prescribed anti-microbial agents for acute gastric enteritis are Ceftriaxone and Cefoperazone + Sulbactam. The highly prescribed anti-microbial agents for uro-sepsis were Gentamicin. The highly prescribed anti-microbial agents for miscellaneous infectious diseases are Ceftriaxone.

The current study also indicates the highly prescribed anti-microbial agents for respiratory tract infectious diseases are Amoxicillin + Clavulanic acid and Cefoperazone + Sulbactam, the highly prescribed anti-microbial agents for urinary tract infectious diseases are Piperacillin + Tazobactam, the highly prescribed anti-microbial agents for cerebral complications are Ceftriaxone.

The current study also indicates the number of prescriptions with different categories of drugs and indicating the routes of administration. My study indicates that the highest number of prescriptions containing the drugs with oral route and parenteral route of administration.

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