RESEARCH ARTICLE

Drug utilization pattern in the treatment of acute diarrhea in children aged 1–12 years

Shailandar Singh1, Swetha K2, Jyothi DB3

1Department of Pharmacology, Bidar Institute of Medical Sciences, Bidar, Karnataka, India, 2Department of Pharmacology, Karwar Institute of Medical Sciences, Karwar, Karnataka, India, 3Department of Pharmacology, Vijayanagar Institute of Medical Sciences, Ballari, Karnataka, India

Correspondence to: Swetha K, E-mail: drswethak27@gmail.com

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ABSTRACT

Background: Pediatric diarrhea is the second most common cause of childhood mortality globally. Despite being self-limiting, polypharmacy is rampant in their treatment. The adherence of practitioners to the recommended guidelines can be assessed by drug utilization studies. Aim and Objectives: The aim of the study was to assess the drug utilization pattern of acute diarrhea management in children. Materials and Methods: A prospective observational study was undertaken for 12 months at pediatric inpatient unit of BRIMS, Bidar. Prescriptions of 400 cases of acute diarrhea in children of either gender aged 1–12 years were evaluated for the pattern of drugs prescribing using the WHO core indicators. Results: The study showed male preponderance with 54.75% being males. Every prescription, on an average had five drugs for diarrheal management. About 43.5% prescriptions had at least two antibiotics. Out of a total of 2237 drugs prescribed, 1392 (62.2%) drugs were prescribed as injections. About 78.5% medicines were selected from the National List of Essential Medicines (NLEM), 2015 and 87.12% drugs were from the hospital formulary. Drugs were categorized as per ATC/DDD system using the WHO reference DDDs and ATC codes website. PDD to DDD ratio of majority of drugs was 0.99. Conclusion: We observed polypharmacy in practice for diarrheal illness in our study. Accentuation on evidence-based management and adherence to the treatment guidelines may help in improved and rational drug use in children.

KEY WORDS: Acute Diarrhoea; Adherence; ATC/DDD System; NLEM

INTRODUCTION

Children contribute in major proportion to India’s population (i.e., more than 1/3rd of total).[1] Childhood is a time of tremendous growth across all areas of development. Therefore, the medications should be prescribed with utmost care and vigilance. Acute diarrhea, viral fever, and acute respiratory infection are responsible for majority of pediatric ailments.[2] Among them, acute diarrheal disease is still a grueling health problem in developing countries.[3] The incidence of diarrhea globally in children is found to be 3.6 episodes per child-year.[4] Diarrheal diseases account for one-third of pediatric inpatient admissions and up to 17% of mortality.[5] Diarrheal disease burden in India is 8.2%, accounting for 22 million Disability Adjusted Life Years (DALYs), which is the largest for any communicable disease.[6] The most common cause of death in the under-five age group is acute diarrhea.[7]

Despite being self-limiting, polypharmacy is rampant in diarrhea treatment.[8] It is well known that viruses are the...
common pathogens causing diarrhea in children below the age of 5 years.\textsuperscript{9} The WHO and the Indian Academy of Paediatrics (IAP) guidelines for the treatment of acute diarrhea aim to reduce the inappropriate use of antimicrobials and anti-diarrheal drugs. These guidelines state that the use of antibiotics is unnecessary in most of the acute pediatric diarrhea patients.\textsuperscript{3} The compliance of practitioners to these guidelines can be assessed by drug utilization studies.\textsuperscript{1}

Till today, plenty of studies on drug utilization are conducted in adults but there is scarcity of such studies in the pediatric age group.\textsuperscript{10} Thus, considering the paucity of data, the present study was planned to assess the prescribing pattern of drugs for diarrhea in pediatric inpatients at BRIMS Teaching Hospital, Bidar.

MATERIALS AND METHODS

A prospective and observational study was conducted at pediatric inpatient unit of BRIMS tertiary care hospital after approval from the Institutional Ethics Committee. The study included 400 consecutive inpatients of acute diarrhea in children of either gender aged 1–12 years within the study period of 1 year starting from January 2016 excluding those who had congenital gastrointestinal abnormalities or diseases related to chronic diarrhea or seriously ill (ICU) or discharged or die within 24 h of ward admission or HIV or HbsAg positive or those who have Left Against Medical Advice (LAMA).

The patient’s case file was collected to obtain the following data, which was noted in the proforma under the headings demographics, disease-related, medications used, and investigations. Data entered in MS Excel sheet and analyzed with descriptive statistics application.

RESULTS

Out of 400 acute diarrhea cases admitted in pediatric unit at the study site, 219 (54.75\%) were males and 181 (45.25\%) were females. Demographic details are depicted in Figure 1. A total of 2237 drugs were prescribed among 400 prescriptions. Hence, on an average, each prescription had more than five drugs. Brand names were used to prescribe 53.2\% of drugs and generic names were used exclusively in 28.8\% prescriptions [Figure 2]. Antibiotics were prescribed in 55.5\% of patients. Parenteral route (94.8\%) was the most common route for administering antibiotics while oral route was opted in only 5.2\% [Table 1]. On an average, 1.73 antibiotics were encountered per prescription. The most common antibiotic encountered was Cefotaxime and the least common was Azithromycin [Figure 3]. Among 2237 drugs prescribed, 1392 (62.2\%) were prescribed as injections. About 97.5\% prescriptions had at least one injectable prescribed in them. About 1756 (78.5\%) medicines were selected from the National List of Essential Medicines (NLEM), 2015 and 1949 (87.12\%) drugs were from the hospital formulary.
About 337 (15.06%) ORS sachets were prescribed in our study. Drugs were categorized as per ATC/DDD system using the WHO reference DDDs and ATC codes website [Table 2]. PDD to DDD ratio of majority of drugs was 0.99.

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### DISCUSSION

The majority of patients (42.8%) in the present study were in the age group of ≤ 4 years. This finding was similar to studies done by Panchal et al., Shankar et al., and Sharma et al., This might be because the majority of children are weaned at 6 months. Improper and unhygienic feeding practices lead to the risk of faeco-oral infection.

Out of 400 acute diarrhea cases, majority were male patients in all the age groups. Similar finding was reported by Pandey et al. This may be due to the fact that male patients get medical help more readily than female patients.

An important index of prescribing practices is the average number of drugs prescribed per encounter. On an average, more than five drugs were prescribed per patient in our study. A higher number of drugs per patient were prescribed in the studies by Panchal et al. and Shankar et al., while in the study by Alam et al., number of drugs prescribed were much lower. According to the WHO recommendation, maximum drugs per encounter should be two. The international average number of drugs per prescription is 2.2. Therefore, our study showed that poly-pharmacy is rampant which implies irrational prescribing practices. Lack of adherence to standard treatment guidelines and lack of diagnostic accuracy may be few reasons for this finding. Demand for intravenous fluids by patient’s bystanders may be a reason for this increase in the average number of drugs per prescription.

Brand names were used in majority of prescriptions (53.2%). Similar results were observed by Palikhe N (59%). In studies done by Vishwanath et al. and Shankar et al., generic names were used more frequently. Cost of therapy can be minimized using generic names.

Injectable drugs were prescribed in 97.5% of encounters. This is in contrast to the findings of studies by Vishwanath et al. (49.06%) and Shankar et al. (48.9%) where the number of injectable drugs was less. The probable reason for this may be the inclusion of intravenous fluids in the injectable drugs.

Drug administration was by parenteral route in 62.2% and by oral route in remaining. This was similar to studies by Mezgebe et al. and Bordoloi et al. Parenteral route, while essential for some children, is costlier.

Antibiotics were prescribed in 55.5% patients. Comparable outcome was observed in a study by Bordoloi et al. while Panchal et al. reported contrasting results. On an average, 1.72 antibiotics were encountered per prescription. Ashraf et al. and Panchal et al. reported a higher number of antibiotics per prescription. A lower number of antibiotics were prescribed per prescription in a study by Bordoloi et al Virus are responsible for majority of pediatric diarrhea. Hence, it is inappropriate to prescribe antibiotics for acute diarrhea unless bacterial etiology is confirmed. Irrational antibiotic use contributes to increased treatment cost, adverse reactions, and antibiotic resistance.

### Table 2: Drug categorization as per ATC/DDD

<table>
<thead>
<tr>
<th>Name of drug</th>
<th>Route of administration</th>
<th>ATC code</th>
<th>DDD (g)</th>
<th>PDD (g)</th>
<th>PDD/DDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albendazole</td>
<td>Oral</td>
<td>P02CA03</td>
<td>0.4</td>
<td>0.39</td>
<td>0.97</td>
</tr>
<tr>
<td>Amikacin</td>
<td>Parenteral</td>
<td>J01GB06</td>
<td>1</td>
<td>0.99</td>
<td>0.99</td>
</tr>
<tr>
<td>Cefotaxime</td>
<td>Parenteral</td>
<td>J01DD01</td>
<td>4</td>
<td>3.97</td>
<td>0.99</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>Parenteral</td>
<td>J01DD04</td>
<td>2</td>
<td>1.98</td>
<td>0.99</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>Parenteral, Parenteral</td>
<td>J01X01</td>
<td>1.5</td>
<td>1.48</td>
<td>0.98</td>
</tr>
<tr>
<td>Ondansetron</td>
<td>Oral, Parenteral</td>
<td>A04AA01</td>
<td>16</td>
<td>15.88</td>
<td>0.99</td>
</tr>
<tr>
<td>Paracetamol</td>
<td>Oral, Parenteral</td>
<td>N02BE01</td>
<td>3</td>
<td>2.97</td>
<td>0.99</td>
</tr>
<tr>
<td>Piperacillin and</td>
<td>Parenteral</td>
<td>J01CR05</td>
<td>14</td>
<td>13.5</td>
<td>0.96</td>
</tr>
<tr>
<td>Tazobactum</td>
<td>Parenteral</td>
<td>A02BA02</td>
<td>0.3</td>
<td>0.29</td>
<td>0.96</td>
</tr>
<tr>
<td>Ranitidine</td>
<td>Parenteral</td>
<td>A07FA51</td>
<td>1</td>
<td>0.99</td>
<td>0.99</td>
</tr>
<tr>
<td>Zinc</td>
<td>Oral</td>
<td>A12CB01</td>
<td>0.6</td>
<td>0.55</td>
<td>0.92</td>
</tr>
</tbody>
</table>
Cefotaxime was the most common antibiotic prescribed. It was also the most common antibiotic in studies by Panchal et al. and Maniar et al. Norfloxacin was the most common antibiotic either alone or combined with metronidazole or tinidazole in a study by Sharma et al. Antibiotic use in acute diarrhea highlights the ignorance regarding standard treatment guidelines.

The majority of the drugs (78.5%) were chosen from National List of Essential Medicines (NLEM), 2015. About 65% and 86.42% of the drugs, respectively, were from NLEM in studies by Panchal et al. and Vishwanath et al. Selection of drugs from the NLEM is a cost-effective way to manage most of the health issues. Rational drug use can be promoted by adhering to prescribing drugs from NLEM. About 87.12% drugs were prescribed from the hospital formulary drug list. Only 66% of drugs were prescribed from the hospital formulary list in a study by Panchal et al. This highlights the effective communication between the prescribers and the hospital pharmacists in our institution.

ORS accounted for 15.01% of the total drugs prescribed in the study. A lower number was observed in a study by Panchal et al. while Pathak et al. and Singh et al. reported a higher number.

Pattern of Drug Utilization According to ATC and DDD Systems

In this study, drugs (except intravenous fluids) were categorized as per anatomical therapeutic chemical (ATC) and daily defined dose (DDD) system using the WHO reference DDDS and ATC codes website [Table 2]. PDD to DDD ratio of majority of drugs was 0.99, similar results were reported by Vishwanath et al.

PDD/DDD ratio of 1 implies appropriate drug utilization. Anything less than this implies underutilization of drugs and vice versa. PDD depends on national therapeutic practices and the disease treated and varies among different countries. This provides the possible explanation for the PDD/DDD ratios observed in the present study. All countries are encouraged by the WHO to maintain individual DDD list based on locally available data. Since our study was conducted in a single setup the findings observed in this study are not generalizable.

CONCLUSION

Our study showed that there was polypharmacy and inappropriate antibiotic usage in treating acute diarrhea cases in the pediatric population. Based on the findings of our study, it can be suggested that adherence to standard treatment guidelines is essential to minimize polypharmacy and irrational drug use, thereby encouraging prescription of generic drugs and rational selection of drugs.

REFERENCES


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