RESEARCH ARTICLE

Assessment of role of zinc in the management of acute diarrhea in children at a teaching hospital

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ABSTRACT

Background: Pediatric diarrhea is one of the major causes of childhood mortality around the world. Oral rehydration therapy (ORT) along with zinc supplementation can reduce the irrational antimicrobial use and stay in hospital.

Aims and Objectives: This study aims to evaluate the role of zinc in reduction of stool frequency and duration of diarrheal episode.

Materials and Methods: A prospective observational study was performed for 12 months at pediatric in-patient unit of BRIMS teaching hospital, Bidar. We evaluated 400 prescriptions of acute diarrhea cases for the role of zinc based on reduction of stool frequency and decrease in the duration of diarrheal episode.

Results: A study revealed a very statistically significant reduction ($P < 0.001$) in both stool frequencies during the 3rd–5th day and there was reduction in mean duration of diarrheal episode in the group treated with ORT/parenteral rehydration + zinc.

Conclusion: We observed significant decrease in both stool frequency and mean duration of diarrheal episodes in the group treated with ORT/parenteral rehydration + zinc as compared to ORT/parenteral rehydration alone. Thus, we recommend practitioners to use ORS and zinc which reduces the stay in hospital and helps in faster recovery. And also, it would definitely reduce the practice of polypharmacy and inappropriate antibiotic prescribing practices.

KEY WORDS: Acute Diarrhea; Children; ORS; Zinc; World Health Organization; Indian Academic of Pediatrics

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 respiratory infection, acute diarrhea, and viral fever are common illnesses contributing in major proportion in the pediatric patients.[2] Among these, acute diarrheal disease has remained a grueling problem to the medical profession and to the community in the third world countries even today.[3] The overall incidence of diarrhea in children is estimated as 3.6 episodes per child-year. About 18% of childhood deaths are due to diarrheal disorders.[4] The World Health Organization (WHO) estimates that, worldwide 4 million children under the age of 5, die each year from diarrhea. This makes diarrhea the second leading cause of death in children.[3] In hospitals, up to a third of total admissions to pediatrics are due to diarrheal diseases and diarrhea contributes up to 17% of all pediatric deaths among inpatients.[5] This is greater than that caused by AIDS, malaria, and measles combined.[6] In India, diarrhea accounts for 8.2% of the total disease burden, contributing 22 million disability-adjusted life years, the highest among communicable diseases.[7] The most common cause of death in under-5 age group is acute diarrhea.[8] One out of every five children who die of diarrhea worldwide is an Indian.[9]
The WHO and Indian Academy of Pediatrics (IAP) have issued therapeutic guidelines for the treatment of diarrhea, which aimed to reduce the use of antimicrobials and unwanted anti-diarrheal drugs. These guidelines stated that the use of antibiotics is not necessary in majority of acute diarrheal cases in children. Zinc supplementation along with oral rehydration therapy (ORT) can be helpful to reduce the inappropriate antimicrobial use. The WHO has framed its guidelines categorizing patients into three distinct categories, depending on the signs and symptoms with which, the patient presents to the clinician. IAP, on the other hand, has given distinct directives on the use of oral rehydration salt and zinc supplementation for the treatment of acute diarrhea in patients of the pediatric age group. Even the IAP has concluded that rampant use of antibiotics for the treatment of acute diarrhea in pediatric patients as inappropriate. Despite publication of these guidelines around 10 years back, acute diarrhea is not widely treated with zinc and ORS in India. UNICEF surveyed in India and documented that zinc was prescribed in less than 1% of prescriptions.

The study was performed to evaluate the role of zinc in reducing the stool frequency and duration of diarrheal episode in pediatric patients in tertiary care hospital, BRIMS, Bidar.

MATERIALS AND METHODS

After getting approval from the Institutional Ethics Committee, this prospective observational study was carried out at pediatric inpatient unit of a tertiary care hospital. The study included 400 consecutive cases of acute diarrhea in children of either gender aged 1–12 years admitted to pediatric ward within the study period of 1 year starting from January 2016. We excluded children 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.

Patient’s prescription sheet was evaluated to collect the following data which was recorded in the case record form under headings demographic, disease related, medications used, zinc supplementation, data regarding stool frequency on day 1, day 3, and day 5 and duration, investigations if any. The patients were followed up throughout the stay, to assess the course and outcome of therapy, and analysis was done using descriptive statistics.

A study does not require any investigation or intervention to be conducted on patients or other humans or animals.

RESULTS

The total number of patients admitted for acute diarrhea in the pediatric ward of our study site was 400. Out of these, a total of 219 (54.75%) were male and 181 (45.25%) patients were females. Moreover, on an average, each patient prescription had more than 5 drugs prescribed for treatment of diarrhea at the hospital [Table 1].

Out of 400, the total number of prescriptions that prescribed ORS sachets in our study was 337. Among these, 66 prescriptions had zinc preparations also. From Table 2 and Figure 1, mean ± SD of stool frequency on day 3 and day 5 was 3.81 ± 1.46 and 2.37 ± 0.48, respectively, in ORT/parenteral rehydration with zinc syrup supplemented group while it was 5.49 ± 2.66 and 3.93 ± 1.68, respectively, in ORT/parenteral rehydration without zinc supplemented group.

The study reveals that there was very high statistically significant difference in stool frequency between treatment of ORT/parenteral rehydration with zinc and ORT/parenteral rehydration without zinc on the 3rd and 5th day of treatment ($P < 0.001$). Mean duration of diarrheal episode was lower in ORT/parenteral rehydration with zinc supplemented group when compared to ORT/parenteral rehydration without zinc.

<table>
<thead>
<tr>
<th>Variables</th>
<th>ORT/parenteral rehydration with zinc ($n=66$)</th>
<th>ORT/parenteral rehydration without zinc ($n=334$)</th>
<th>t-test value</th>
<th>P-value and significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stool frequency on day 3</td>
<td>3.81 ± 1.46</td>
<td>5.49 ± 2.66</td>
<td>4.945</td>
<td>$P=0.000$ Very highly significant</td>
</tr>
<tr>
<td>Stool frequency on day 5</td>
<td>2.37 ± 0.48</td>
<td>3.93 ± 1.68</td>
<td>7.419</td>
<td>$P=0.000$ Very highly significant</td>
</tr>
<tr>
<td>Duration of diarrheal episode (in days)</td>
<td>3.81 ± 1.07</td>
<td>5.31 ± 1.85</td>
<td>6.312</td>
<td>$P=0.000$ Very highly significant</td>
</tr>
</tbody>
</table>

ORT: Oral rehydration therapy
The role of zinc in the reduction of stool frequency and ORS and zinc. reported a very lower rate of reduction. Another study. National Journal of Physiology, Pharmacy and Pharmacology ed. Geneva: Department of Child and Adolescent Health. A slightly higher usage. On the other hand, in a study conducted by Pathak. 66 drugs out of the total 2237 drugs prescribed in our study were reported in a study conducted by Pathak et al. On the other hand, in a study conducted by Pathak et al., a much higher, 58% contribution of ORS to the total drugs prescribed, was noted. A slightly higher usage than our study was reported by Singh et al. They recorded 22% of the total drugs prescribed for acute diarrhea to be ORS in their study.

Around 3% of the drugs prescribed in our study were contributed by zinc preparations. This accounted for a mere 66 drugs out of the total 2237 drugs prescribed in our study. A much higher number were prescribed in a study conducted by Pathak et al. who reported zinc preparations to be 22% of the total drugs prescribed in their study. ORS and zinc preparations are recommended in the treatment of diarrhea because it reduces the severity and frequency of diarrhea and thus helps in a quicker recovery. However, treating clinicians still seem to be slightly indifferent toward the standard treatment guidelines of both WHO and IAP, which are reflected by the lower prescribing trends.

Our study showed that there was obvious difference of 31% in stool frequency on day 3 and 40% on day 5 between the two groups (ORT/parenteral rehydration + zinc supplemented and ORT/parenteral rehydration alone group). This was similar to a study conducted by Trivedi et al. which reported a difference of 36% between the zinc supplemented group and placebo supplemented group from day 1 to day 3 and day 5. In our study, there was 29% reduction in the mean duration of diarrheal episode between the two groups (ORT/parenteral rehydration + zinc supplemented and ORT/parenteral rehydration alone group) which was highly statistically significant (P < 0.001). A meta-analysis of 12 studies on the impact of zinc supplements on the management of acute diarrhea reported that 11 of the studies showed reduction in the duration of the diarrheal episode. The reduction was statistically significant in eight studies. Another study by Boran et al. reported a very lower rate of reduction (18%) in mean duration of diarrhea, which was statistically insignificant. This was attributed to the small sample size of the subgroup with low zinc levels which was too small to detect a statistically significant difference.

The mechanisms of zinc in reducing duration of diarrhea are as follows: 1. Improved absorption of water and electrolytes by the intestine 2. Faster regeneration of gut epithelium 3. Increased levels of enterocyte brush border enzymes, and/or 4. An enhanced immune response leading to increased clearance of the pathogen(s) responsible for diarrhea from the intestine.

In our study, we observed significant reduction in both stool frequency and mean duration of diarrheal episode in the group treated with ORT/parenteral rehydration+zinc as compared to ORT/parenteral rehydration alone. Thus, we recommend practitioners to use ORS and zinc which would definitely reduce the practice of polypharmacy and inappropriate antibiotic prescribing practices. ORS and zinc have proved to be beneficial in the treatment of diarrhea in all the age groups. Their use has to be encouraged and more awareness needs to be created among practitioners about using this modality of the treatment of diarrhea.

REFERENCES

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