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Acute Diarrhoea in Children Aged Up to 2 Years Age Group: Assessment of Therapeutic Strategies and Hospital Stay Variance, in Tertiary Care Rural Hospital – An Observational Study

Mousumi Das[1], Ranjana S. Kale[2] and Manish Jain[3]

[1]Department of Pharmacology, Agartala Govt. Medical College and GBP Hospital, Agartala, Tripura, India.
[2]Department of Pharmacology, Mahatma Gandhi Institute of Medical Sciences, Sewagram, Maharashtra, India.
[3]Department of Paediatrics, Mahatma Gandhi Institute of Medical Sciences, Sewagram, Maharashtra, India.
*Corresponding Author E-mail:dr.mousumidasbhattacharjee@gmail.com

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Acute Diarrhoea, it is one of the leading causes of under 5 childrens' morbidity and mortality in India. It is most common in children especially those between 6 months and 2 years. Antimicrobials are mostly used drug for acute diarrhoeal cases according to many studies but according to WHO antibiotics are not required for all the diarrhoeal cases except few bacterial diarrhoeas. Other way, WHO recommends Zinc with low osmolarity ORS for acute diarrhoea. So, this study was designed for assessing the treatment pattern and its outcome in our setup. Objectives: - To assess the use of antibiotics and Zinc among children under 2 years suffering from acute Diarrhoea by analysing average of use and hospital stay. Materials and Methods: - This observational study includes 76 patients, admitted under Paediatric Department of Mahatma Gandhi Institute of Medical Sciences, in the period of 6 months. All the patients admitted during the study period having acute Diarrhoea with moderate dehydration as per definition of WHO was included in the study. Patients with other existing diseases, bloody diarrhoea and seriously ill were excluded. Data was collected from Paediatric ward and was analysed by using GraphPad software. Results: - Over all among the 76 patients, 25(32.89%) patients received antimicrobials only and 31(40.79%) received Zinc only and11(14.47%) patients received both. Hospital stay difference was not statistically significant in culture negative acute diarrhoea cases with the use of zinc and antimicrobials (p = 0.08) but it was significant in culture positive cases (p = 0.03). Conclusion: - In culture negative acute diarrhoeal cases Zinc was mostly used and hospital stay was not found to be significant with and without antimicrobials. Implication: - Uncomplicated acute diarrhoeal cases may be treated with Zinc alone effectively.

Keywords: Antimicrobials; Children; Diarrhoea; Observational Study; Zinc.

According to World Health Organization "Diarrhoea is the passage of unusually loose or watery stools, usually at least three times in a 24-hour period".[1] Diarrhoeal diseases are one of the leading cause of children morbidity and mortality in developing countries, and an important cause of mal nutrition. Severely malnourished patients have higher mortality rates and more frequent hospital

admissions. Malnutrition adversely affects the immune system hence, considered to be the most common cause of immunodeficiency throughout the world.[2] It has been abstracted that the diarrhoea can be considered as low (1-5 stools/day), medium (6-9 stools/day), and high (e" 10 stools/day), according to the number of stool passed per day.[3] Diarrhoea may be due to an infection of the intestinal tract, which is caused by a variety of bacterial, viral and parasitic organisms. This infection can be spread through contaminated water and food& from person-to-person due to the result of poor hygiene. Other than this, it can be said that zinc deficiency may be a cause of diarrhoea or can say diarrhoea is consistently found in children with severe zinc deficiency.[4] Rotavirus is the most common cause of gastroenteritis in childhood, both in the developed and still developing countries. Viruses can cause almost 70% of infectious diarrhoeal diseases in children.[5] It is also the main important cause of diarrhoeal mortality.[6] So, antimicrobials have no role in such type of diarrhoeas. According to WHO, antimicrobials are helpful only for children suffering from bloody diarrhoea and suspected case of cholera with severe dehydration.[1] Now a days, antimicrobial resistance is a major problemworldwide.[7] Oral Zinc supplement can decrease the severity of the diarrhoea episode, amount of stool per day and the number of stools per day[8]. It has direct effect on intestinal villus, brush border disaccharidase activity and intestinal transport of water and electrolytes. Zinc also causes early normalization of stool consistency, early recovery and decreases total duration of hospital stay.[9] Still, a major number of clinicians prefer to prescribe antimicrobials for all of the acute diarrhoea cases and it is prescribed in a large number.[10,11]

There are some utilization studies of diarrhoea cases available but very few was done in under 2 years age group. So, we have decided to observe the utilization pattern of Zinc and antimicrobials in our setup in under 2 years age group in acute moderate diarrhoea cases and to observe the hospital stay difference between groups received Zinc and antimicrobials.

Aim

Assess the use of Zinc and Antimicrobials and hospital stay variance in the treatment of acute Diarrhoeal diseases in up to 2 years age group.

Objectives

1. Overall average use of Zinc and Antimicrobials alone and combined in treatment of acute Diarrhoea.
2. Assessment of hospital stay variance between patients getting Zinc and Antimicrobials alone in acute moderate diarrhoea cases

MATERIALS AND METHODS

This observational study was conducted in the dept. of Pharmacology in collaboration with department of Paediatrics of Mahatma Gandhi Institute of Medical Sciences, Sewagram starting from January 2016 to June 2016. All the patients admitted in indoor of dept. of Paediatrics under 2 years of age with acute moderate diarrhoea in the given period was included in the study.

Inclusion criteria

All the admitted and diagnosed cases of acute moderate diarrhoea within the study period Under the age up to 2 years

Passed watery stool less than 10 times on the day of admission Willing to give consent

Exclusion criteria

Chronic Diarrhoea cases (duration more than 14 days) Bloody Diarrhoea.

Patients having other diseases, acute or chronic Seriously ill patients.

Taking any medication other than prescribed for Diarrhoea.

Total 93 patients were admitted during the study period and among them 76 cases were included in the study and total 17 cases were excluded from the study according to the inclusion and exclusion criteria. Among the 17 patients Pneumonia 3 cases, URTI 6 cases, Hydronephrosis 1 case, LRTI 3 cases, Miliary TB 1 case, Meningitis 1 case, Febrile convulsion 1 case, Seizure disorder 1 case.

The diagnosis was made by the paediatrician and average stool output was 5 to 9 times on the day of admission which may be considered as medium or moderate diarrhoea[3].

Institutional Ethical Committee (IEC) approval was taken prior to the study.

Data collection

Prior written informed consent was taken from every patient's guardian. Single time enrolment of the patients was maintained

throughout the study. The data was recorded in the case record form (CRF).

Statistical analysis

The data was entered into GraphPad software and mean, standard deviation (SD) and p value was calculated. p value was calculated by using Unpaired t test and p value < 0.05 considered to be significant.

RESULTS AND DISCUSSION

Total 76 patients were enrolled in the study according to inclusion and exclusion criteria. Among 76 patients, it was found that 50 patients (65.79%) were from 6 - 11 months age group and 23 patients (30.26%) were from 1- 2 years and 3 patients (3.95%) were from 0- 6 months age group. Among the 76 patients, 56 patients (73.68%) were male and 20 patients (26.31%) were female. Among them, 64 patients (84.21%) were culture negative and 12 patients (15.79%) were culture positive. (Table 1a, 1b & 1c)

Among the 76 patients,31 patients (40.79%) were treated with Zinc alone, 25 patients (32.89%) were treated with antimicrobial alone and (Zinc+ antimicrobial) treated were11 patients (14.47%) and 9 patients (11.84%) were treated with others (prebiotics, H2 blockers, Proton pump inhibitors). (Table 2)

In culture positive (12) cases 3 patients (25%) were treated by Zinc alone, 5 patients (41.67%) were treated by antimicrobial alone and 4 patients (33.33%) were treated by (Zinc + antimicrobial). (Table 3a)

In culture negative (64) cases 28 patients (43.75%) were treated by Zinc alone, 20 patients (31.25%) were treated by antimicrobial alone and 7 patients (10.94%) were treated by (Zinc+antimicrobial) and 9 patients (14.06%) were treated by others. (Table 3b)

Table 1(a). Demographic Data (Age wise distribution)

Age	Total patients (n = 76)	Percentage
0 - 6 months	3	3.95%
6 -11 months	50	65.79%
1 – 2 years	23	30.26%

Table 1(b). Demographic Data (Gender wise distribution)

Gender	Total patients n = 76	Percentage
Male	56	73.68%
Female	20	26.31%

Table 1(c). Culture report wise distribution of patients

Culture	Total patients n = 76	Percentage
Positive	12	15.79%
Negative	64	84.21%

Table 2. Distribution of Treatment

Treatment	Total patients (n = 76)	Percentage
Zinc only	31	40.79%
Antimicrobial only	25	32.89%
(Zinc +antimicrobial)	11	14.47%
Others	9	11.84%

Table 3(a). Treatment pattern in Culture positive cases

	Treated patient n = 12	Percentage
Zinc	3	25%
Antimicrobial	5	41.67%
Zinc+ Antimicrobial	4	33.33%

Table 3(b). Treatment pattern in Culture negative cases

	Treated patient n= 64	Percentage
Zinc	28	43.75%
Antimicrobial	20	31.25%
Zinc + Antimicrobial	7	10.94%
Others	9	14.06%

Hospital stays difference in between Zinc alone treated and antimicrobial alone treated group in culture positive diarrhoea cases is statistically significant (p – 0.03*) but it is not statistically significant (p – 0.08) in between Zinc alone treated and antimicrobial alone treated group in culture negative diarrhoea cases. The hospital stays difference in between Zinc alone treated and combined (Zinc+ antimicrobial) treated group is not statistically significant (p- 0.2) in culture negative cases but significant (p - 0.03*) in culture positive cases. While comparing between antimicrobial alone and combined (Zinc+ antimicrobial) treated group is found that hospital stay difference is highly significant (p – 0.0007**) in culture positive cases but it is not significant in culture negative cases. (Table 4a, 4b &4c)

The time period was selected from January to June, as diarrhoeal disease prevalence is more in summer in India,[12,13]because in hot and humid weather, the growth of pathogenic organisms in the food and other material is increased. Summer is also the breeding season for flies that act as mechanical vectors carrying pathogens to food and water. In tropical areas of India, rotavirus diarrhoea occurs throughout the year.[13] In this study, 6 – 11 months age group (65.79%) was mostly affected by diarrhoea which is like studies done by Sazawal et al[14], Fatima et al[15], Ahmed et al[13] and contrast to studies done by Sontakke et al[16]. Possible cause of this maybe it is the age when weaning is started in India. Male preponderance (73.68%) was found in this study which is like the studies done by Fatima

Table 4 (a). Hospital stay comparison between Zinc and Antimicrobial treated group

	Zinc treated group (Hospital stays) Mean ± SD	Antimicrobial treated group(Hospital stays) Mean ± SD	p value
Culture positive case	4.1±1.79	2.68±1.16	0.03*
Culture negative case	2.68±1.22	3.4±1.6	0.08(NS)

Unpaired t test was used. p value < 0.05 considered significant. NS – not significant * - statistically significant

Table 4 (b). Hospital stay comparison between Zinc and (Zinc +Antimicrobial) treated group

	Zinc treated group (Hospital stays) Mean ± SD	(Zinc + Antimicrobial) treated group (Hospital stays) Mean ± SD	p value
Culture positive case	4.1±1.79	7.75±1.5	0.03ð
Culture negative case	2.68±1.22	3.28±1.38	0.2(NS)

Unpaired t test was used. p value Â 0.05 considered significant. NS – not significantð - statistically significant

Table 4 (c). Hospital stay comparison between Zinc and (Zinc+ Antimicrobial) treated group

	Antimicrobial treated group (Hospital stays) Mean ± SD	(Zinc + Antimicrobial) treated group (Hospital stays)Mean ± SD	p value
Culture positive case	2.68±1.16	7.75±1.5	0.0007**
Culture negative case	3.4±1.6	3.28±1.38	0.8(NS)

Unpaired t test was used. p value Â 0.05 considered significant. NS – not significantð - statistically significant, ** - highly significant

et al[15], Rizwan et al[10], Desai et al[17], Gupta et al[18] but contrast to Sontakke et al[16] where they found female preponderance. Male preponderance may be described by the study done by Walker et al[6] and Siziya et al[19] which also described the possible mechanism behind this.

In our study culture positivity rate was higher than the studies done by Koplan et (2.4%) al[20] and Rohner et al (12.6%)[21]. Comparatively high stool cultures positivity rate in our study may be due to the seriousness of diarrhoea[21] as it is the only tertiary health care centre and the main referral unit of this area. Various positivity rates in different studies could be due to many factors like different screening panels and evaluation methods, nature of diarrhoeal cases (community vs. hospital), several dietary factors[22] and of course hygiene.

In our study, highest number of patients were treated with Zinc only (40.79%) which is greater than the studies done by Desai et al (12.6%)[17], Sontakke et al (5%)[16] which indicates towards the adherence to the WHO guideline in our setup. 32.89% patients were treated with antimicrobials which is lower than the studies done by Devi et al (71%)[11], Rizwan et al (87.5%)[10] but higher than the studies done by Desai et al (25.5%)[17], and Sontakke et al (23.74%)[16]. Only one antimicrobial agent was given to each patient which indicates toward the rationality of prescription and to avoid antimicrobial resistance. But the percentage of patients treated with antimicrobials in this study is a bit high though culture positivity rate is low, may be because of a single negative stool culture report may not be enough to completely rule out the presence of bacterial infection.[21] Sometimes, if the patient's symptom is indicating towards any infectious cause the clinicians started early antimicrobial therapy to reduce the morbidity and mortality, which may lead to the existence of antimicrobial agents in specimen which may cause false-negative stool culture report as it may inhibit the growth of susceptible bacteria.[21]

In this study, among the culture positive diarrhoea cases 41.67% patients were treated with antimicrobials and 33.33% patients were treated with antimicrobials and Zinc supplement combinedly justifies the treatment for infectious diarrhoea. Only 3 patients were treated with Zinc supplement only, possible cause may be as this is a referral hospital, so patient may have got any antimicrobial in previous hospital and he/she was symptomatically better when reaches here.

In culture negative cases, maximum cases (43.75%) were treated with Zinc supplement only and 14.06% patients were treated with other measures which justifies the treatment protocol for non-infectious/viral diarrhoea. Here also 31.25% and 10.94% patients received antimicrobial alone and antimicrobial with Zinc consecutively. This may be due to these patients were false negative cases or symptomatically worse.

In our study, when we compared the hospital stay between the groups, we have found that hospital stay difference is statistically significant ($p = 0.03$) in between Zinc and antimicrobial treated group in culture positive cases. But in culture negative cases when we compared the hospital stay between Zinc treated and Antimicrobial treated & also between Zinc treated and combinedly Zinc and antimicrobial treated, we observed that it is statistically not significant in both the cases. So, it may be taken into consideration that use of antimicrobials does not have any beneficiary effect in reducing hospital stay in culture negative diarrhoea cases. Hospital stay difference is also statistically significant (p - 0.03) in between culture positive cases treated with zinc alone and (zinc+ antimicrobial) combinedly, which is obvious. While comparing hospital stay between antimicrobial alone and zinc and antimicrobial combinedly treated group it is found to be statistically highly significant(p-0.0007) may be due to the reason that zinc directly affect intestinal villus and brush border disaccharides activity and affect intestinal water and electrolytes transportation. So, when zinc is used in treatment, it can bring down the severity and duration of diarrhoeal disease and thus cut down the hospital stay effectively [8,9].

The epidemiology of childhood diarrhoea and pneumonia, both of them are important causes of childhood morbidity and mortality, share same risk factors like undernutrition, measles , inadequate water and sanitation, poor handwashing, indoor air pollution and crowding, and can be prevented by scheduled infant vaccination, breastfeeding and good childhood nutrition, proper care at home and appropriate case management.[6] So, diarrhoeal

diseases and also morbidity and mortality can be minimised significantly by providing safe drinking water and proper sanitation and hygiene.

CONCLUSION

Zinc alone was prescribed over antimicrobials in acute moderate diarrhoea cases. Use of antimicrobials in culture negative acute diarrhoea cases cannot reduce hospital stay. Zinc can reduce hospital stay in culture positive and negative moderate diarrhoea cases.

Limitations

Further studies are required with large sample size and longer duration of study for better interpretation of result.

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Conflict of Interest

There is no conflict of interest.

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