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Research Article

**IN YOUNG CHILDREN THE IMPORTANCE OF ZINC  
SUPPLEMENTATION IN TREATMENT OF ACUTE WATERY  
DIARRHOEA**<sup>1</sup>Dr. Ayesha Zubair, <sup>1</sup>Dr. Ammara Mushtaq, <sup>2</sup>Dr. Mishal Nasir<sup>1</sup>Punjab Medical College, Faisalabad, <sup>2</sup>DG Khan Medical College, DG Khan**Abstract:**

**Objective:** The aim of this study was to know the role of zinc supplementation in young children with acute watery diarrhoea.

**Study design:** A semi-experimental study.

**Place and Duration:** In the Pediatric medicine Department Unit I of Allied Hospital, Faisalabad for one year duration from June 2017 to June 2018.

**Methods:** The sample was taken by any conformity technique and 300 children from both sexes were included in the aging of acute water diarrhoea from 6 months to 02 years. These cases were divided into two groups, first as a study group of 150 patients, 20 mg of zinc per day, then 150 patients treated without zinc supplementation control group. On the 7th and 14th days, the decrease in bowel movements was compared between the two groups.

**Results:** The total number of patients in our study was 300. The mean age of the study group was  $13.1 \pm 6.3$  months and the mean age of the study group was  $13.1 \pm 6.4$  months. In the first control examination in the study group, the mean bowel movements were  $3.2 \pm 1.5$  and  $4.2 \pm 1.6$  bowel movements in the control group. The mean frequency of bowel movement was  $2.5 \pm 2.0$  in the study group and  $3.6 \pm 2.3$  in the control group. In the distribution of the results, 122 (81.3%) patients in the study group recovered and 28 (18.7%) did not recover after two weeks of treatment. In the control group, 107 (71.3%) patients recovered and 43 (28.7%) patients did not recover.

**Conclusion:** Zinc supplementation is effective in reducing the frequency and severity of acute watery diarrhoea in children.

**Key words:** zinc supplementation, acute watery diarrhoea, ORS.

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**INTRODUCTION:**

Acute watery diarrhoea is the passage of liquid or aqueous feces or frequent feces. Acute watery diarrhoea is more common in young children with a higher incidence in infants aged 6-12 months. Acute diarrhoea is more common in summer and affects both sexes equally. It is estimated that there are more than one billion diarrhoea episodes in the world each year and cause more than 3.5 million deaths per year. Worldwide, 4% of all deaths and 5% of health loss occur due to diarrhoea. The world is responsible for 2.2 million deaths per year. In Pakistan, diarrhoea mortality is approximately 200000 deaths per year (almost 600 deaths per day) and occurs every year from 5 to 6 sections per child. Rotaviruses, enterotoxigenic *E. coli* and *Vibrio cholerae* are the most common pathogens causing acute diarrhoea in our country. The most important complications are acidosis, shock, septicemia and electrolyte disorders. Traditionally, diarrhoea is treated by rehydration of the patient according to the degree of dehydration by an oral rehydration solution or intravenous fluids. The use of zinc, antiemetics and the provision of adequate nutrition are other aspects of diarrhoea management. Antibiotics are not routinely recommended in acute diarrhoea, except for selective conditions such as cholera and shigellosis. These treatment methods may cause adverse effects such as increased fecal output and paralytic ileus. Rotavirus is the leading cause of acute diarrhoea worldwide and is one of the leading causes of morbidity and mortality in children in developing countries. Almost all children under the age of 5 are said to be infected. Acute diarrhoea is also caused by astroviruses, novoviruses, some parasites and bacteria. Acute diarrhoea is a major problem for Pakistani children and is associated with poor hygiene and sanitation. Poorly fed and immunocompromised children are at the greatest risk. Lack of breastfeeding, hygienic bottle feeding and untrained mothers put babies at risk. Zinc is an important trace element for growth and development, cellular immunity and metalloenzymes balances the cell membrane. Zinc deficiency is more common in undernourished and immunocompromised children, leading to severe and prolonged diarrhoea, dry and scaly skin and hair loss. Among the diseases of children in developing countries, especially the long-term ones are the major causes of growth retardation and death. It usually lasts longer in children with diarrhoea seizures, malnutrition, damaged cellular immunity<sup>17, 18, 19</sup> or recurrent diarrhoea<sup>20</sup>, which improves within a few days in a healthy child. The last two developments in diarrhoeal disease management include new formulated oral rehydration salts (ORS) containing low glucose and salt concentrations, and a significant

reduction in the duration and severity of lethal zinc supplements in acute diarrhoea. With the use of these two treatments, it is estimated that more than 1 million deaths per year may be prevented.

**MATERIALS AND METHODS:**

This semi-experimental study was held in the Pediatric medicine Department Unit I of Allied Hospital, Faisalabad for one year duration from June 2017 to June 2018. Three hundred patients who presented with acute diarrhoea and met the inclusion criteria were selected from the Department of Pediatrics. Diagnosis was confirmed by diarrhoea history, duration and frequency. The age, sex and residence of the patient were obtained. History of diarrhoea (duration and frequency) and related history (fluid intake and nutritional status) were also gathered. Clinical examinations were performed and these cases were divided into two groups: the first 150 patients included the study group and the next 150 patients were the control group. In the study group, patients received 20 mg of zinc per day, while in the control group patients were treated without zinc supplementation. When they were discharged at the hospital, the patients were given the drug for home use and were followed up twice and 7 days after the treatment and diarrhoea, ie, decreased bowel movements. All data were collected in a specific format. The collected information was entered into SPSS version 10 and analyzed accordingly. Quantitative variables such as age, weight, duration of diarrhoea, frequency of bowel movements, fluid intake, hospital stay, frequency of bowel movements and frequency of bowel movements during the first follow-up visit the second follow-up visit was presented as mean and standard deviation. Qualitative variables such as gender, nutritional status, drugs, dehydration, treatment and outcome were presented as frequency and percentage. Student t-test was used for the duration of hospital stay, the frequency of bowel movements at the first control examination (7 days) and the frequency of bowel movements at the second control examination (14 days). Chi-square test was applied in the results to see the difference between the two groups.  $P < 0.05$  was considered significant.

**RESULTS:**

The mean age of the study group was  $13.1 \pm 6.3$  months and the mean age in the control group was  $13.3 \pm 6.4$  months. In the study group, there were 99 (66%) patients in the range of 6-12 months, 22 patients (14.7%) in 13-18 months and 29 (19.3%) patients in the group. It varies between 19-24 months. There were 101 (67.3%) patients in the control group and 19 (12.7%) patients in the 13-18 age group and

30 (20%) patients in the control group. 19-24 age group (Table 1).

Table 1: Distribution of patients by age

Age	Study Group (n=150)		Control Group (n=150)	
	=n	%age	=n	%age
6-12	99	66.0	101	67.3
13-18	22	14.7	19	12.7
19-24	29	19.3	30	20.0
Mean±SD	13.1±6.3		13.1±6.4	

In the study, 78 patients (52%) were male and 72 (48%) were female. There were 84 (56%) male patients and 66 (44%) female patients in the control group. The mean weight in the study group was  $7.9 \pm 1.9$  kg and  $7.9 \pm 1.9$  kg in the control group. The study group consisted of 34 (22.7%) patients with a weight of 4.0-6.0 kg, 48 (32%) patients with a weight of 6.1-8.0 kg, and 54 (36%) patients with a median value of 6.1-8.0 kg. 8.1 - 10.0 kg and 14 (9.3%) weight of the patient weighing 10.1 - 12.0 kg. In the control group, 32 (21.3%) patients in the 4.0 to 6.0 kg weight range, 42 (28%) patients in the 8.1 to 10.0 kg weight range, and 18 (12%) patients in 18 (12%)

patients. 10.1 - 12.0 kg. In the study group, the mean duration of diarrhoea was  $4.4 \pm 3.2$  days and  $4.7 \pm 3.6$  days in the control group. In the study group, 80 (53.3%) patients with diarrhoea lasting 1 to 3 days, 31 (20.7%) of 4 to 6 days, and 11 (7.3%) of 7 to 9 patients had diarrhoea. 24 patients (16%) between 10-12 days and 4 patients between 13 and 15 days (2.7%). The control group included 84 (56%) patients with 1-3 days of diarrhoea, 30 (20%) patients with 4-6 days, 17 (11.3%) patients with 7-9 days and 19 patients (12.7%). Patients between 10 and 12 days (table 2).

Table 2: Distribution of patients by duration of diarrhoea

Duration (days)	Study Group (n=150)		Control Group (n=150)	
	=n	%age	=n	%age
1-3	80	53.3	84	56.0
4-6	31	20.7	30	20.0
7-9	11	7.3	17	11.3
10-12	24	16.0	19	12.7
13-15	4	2.7	0	0
Mean±SD	4.7±3.6		4.4±3.2	

The mean stool frequency in the study group was  $11.0 \pm 3.4$  stools and  $10.8 \pm 3.1$  stools in the control group. In the study group, fecal frequency was up to 5 stools, 2 (2%) patients, 6-10 stools and 74 (49.7%), 11-15 stools and 63 (42%) and 10 (6) . , 7%). Patients with 16-20 stools in the control group, 1 (0.7%) with diarrhoea frequency up to 5 bowel movements, 74 (49.3%) with 6-10 bowel movements, 68 (15.3%) patients with 11-15 bowel movements and 7 (4%) , 7) 16-20 patients on the stool. The mean fluid intake in the study group was  $68.7 \pm 22.7$  ml and  $54.5 \pm 25.6$  ml in the control group. There were 15 (10%) patients with no oral fluid intake (ORS) in the study group, 59 (39.3%), 50-100 ml and 73

(48.7%) patients up to 50 ml. (2%), Patients over 100 ml there were 4 (2.7%) patients with no fluid intake in the control group, 73 (48.7%) patients with 50 ml, 50 patients with 100 ml and 72 patients (48%), and 1 (0.7%) patients. More than 100 sick patients. In the distribution of nutritional status, the study group included 10 (6.7%) patients with breastfeeding and fresh milk, 2 (2%) breastfeeding patients and 1 (0.7) cereal (1%) bottle-fed patients, 2 (1.3%) bottles and cereal patients, 8 (5.3%) mild and fresh cereal patients, 15 (10%) patients with fresh milk, 14 (9.3%) patients and mixed 87 patients (58%). In the control group, 3 (2%) patients were breastfeeding, 9 (6%) patients in breast milk and 4 (2.7%) breastfeeding patients and 4 (2.7%) patients mild and fresh cerebral

disease, 16 (10.7%) fresh milk patients, 21 (14%) mixed patients, 2 (1.3%) fresh and mixed milk patients and 87 patients in mixed and cereals (58%). The study group consisted of 40 (26.7%) patients, 83 (55.3%) patients receiving antibiotics, 20 (13.3%) patients receiving kaolin and pectin, and 7 (4.7%) patients receiving antibiotics. kaolin and pectin. In the control group, 39 (26%) patients without drug, 78 (52%) patients with antibiotics, 32 (21.3%) patients with kaolin and pectin, and 1 (0.7%) patients with antibiotics and kaolin; pectin. In the study group, 21 patients (14%) had no dehydration, 88 patients (58.7%) had dehydration, and 41 patients (27.3%) had severe dehydration. In the control group, 30 patients (20%) had no dehydration, 72 patients (48%)

had dehydration and 48 patients (32%) had severe dehydration. In the study group, 2 patients (1.3%) received antibiotics, 40 patients (26.7%) received antibiotics and intravenous fluid, 86 patients (57.3%) received intravenous fluid and ORS, and 22 patients (14, 7%) received ORS. In the control group, 50 patients (33.3%) received antibiotics and intravenous fluid, 77 patients (51.3%) received intravenous fluid with ORS and 23 patients (15.3%) received ORS. The mean hospital stay was  $1.9 \pm 0.9$  days in the study group and  $1.8 \pm 1.0$  days in the control group (P 0.3). In the first control examination in the study group, the mean bowel movement was  $3.2 \pm 1.5$  bowel movements and in the control group  $4.2 \pm 1.6$  bowel movements (P 0.8) (table 3).

Table 3: Distribution of patients by stool frequency on 1<sup>st</sup> follow up visit

Stool frequency	Study Group (n=150)		Control Group (n=150)	
	=n	%age	=n	%age
1-3	55	36.7	57	38.0
4-6	89	59.3	89	59.3
7-9	6	4.0	4	2.7
Mean±SD	4.2±1.7		4.2±1.6	

P 0.9

The mean frequency of bowel movement in the second control visit was  $3.5 \pm 2.9$  stools and  $3.6 \pm 2.8$  stools in the control group (Table 4).

Table 4: Distribution of patients by stool frequency on 2<sup>nd</sup> follow up visit

Stool frequency	Study Group (n=150)		Control Group (n=150)	
	=n	%age	=n	%age
1-3	122	81.3	117	78.0
4-6	4	2.7	6	4.0
7-9	12	8.0	13	8.7
>9	12	8.0	14	9.3
Mean±SD	3.5±2.9		3.6±2.8	

P 0.8

In the distribution of the results, 122 (81.3%) patients in the study group recovered and 28 (18.7%) patients did not recover. In the control group, 107 (71.3%) patients recovered and 43 (28.7%) patients did not recover (P 0.001) (Table 5).

Table 5: Distribution of patients by results

Results	Study Group (n=150)		Control Group (n=150)	
	=n	%age	=n	%age
Improved	122	81.3	107	71.3
Not improved	28	18.7	43	28.7
Total	150	100.0	150	100.0

P 0.001

**DISCUSSION:**

Acute diarrhoea is one of the leading causes of death and disease in developing countries and is estimated to kill 8 to 10 million children per year in the world. It represents about 25% of total income in children's neighborhoods and requires 5-10% mortality in the community. Incidence and mortality are particularly high in childhood and are much higher in the presence of malnutrition and breastfeeding. Each child has approximately 3 to 6 diarrhoea each year and a maximum of one year. Acute diarrhoea is a major problem of Pakistani children and is associated with poor hygiene and sanitation. Lack of breastfeeding, hygienic bottle feeding and untrained mothers put babies at risk. Zinc is the trace element required for growth and development. Zinc deficiency causes serious and prolonged diarrhoea, dry and scaly skin and hair loss. In our study, the mean age of the patients in the study group was  $13.1 \pm 6.3$  months and in the control group  $13.1 \pm 6.4$  months. The average age of the patients was 10 months compared to the 25 studies of Reither et al. And this was comparable to our study. In our study, the mean duration of diarrhoea in the study group was  $4.7 \pm 3.6$  days and  $4.4 \pm 3.2$  days in the control group. The mean duration of diarrhoea was 4.3 days in group 1 and 3.9 days in group II, which was comparable to our study compared with the study by Bhandari et al. In our study, the mean bowel movement in the study group was  $11.0 \pm 3.4$  bowel movements and  $10.8 \pm 3.1$  bowel movements in the control group. The mean stool frequency was 10 stools in group I and 13 stools in group II compared to the study of Bhandari et al. And this was comparable to our study. The mean frequency of bowel movements was  $3.2 \pm 1.5$  in the first 7 visits (7 days) in the study group and  $4.2 \pm 1.6$  in the control group. Compared to the study of Sazawal et al<sup>26</sup> in the first follow-up visit on the frequency of bowel movements in the zinc supplementation group, the mean number of stools ( $\pm$  SD) per day was  $3.1 \pm 9.9$  days in the control group, which was almost equal and comparable with our study,  $5.1 \pm 14.9$ . Treatment with zinc reduced total fecal production and daily diarrhoea production. The risk of diarrhoea was

lower in the zinc group and diarrhoea attacks lasting more than 7 days were lower. The study showed that the rate of zinc applied during acute diarrhoea in the production of feces, the duration of diarrhoea and the rate of episodes lasting more than 7 days have a beneficial effect. The effects are large enough to guarantee the use of routine zinc in acute diarrhoea in developing countries.

**CONCLUSION:**

Zinc supplementation reduces the duration and frequency of acute watery diarrhoea compared to children without zinc supplementation. The study shows that zinc supplementation is effective in reducing the frequency and severity of diarrhoea in children.

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