



ORIGINAL ARTICLE

Effect of zinc supplement on duration of acute watery diarrhea from 6 months to 5 year aged children.

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ABSTRACT... Objective: To determine the effect of Zinc supplement on duration of acute watery diarrhea from 6 months to 5 year aged children. **Study Design:** Randomized Controlled Trial. **Setting:** Pediatric Unit, Mardan Medical Complex, Mardan, Pakistan. **Period:** 1st July 2022 to 31st December 2022. **Material & Methods:** A total of 100 children aged from 6 months to 5 years presenting with acute watery diarrhea were included in the study. Patients were divided into 2 equal groups. In Group-A patients were given oral Zinc supplement at a dose of 20mg daily while in Group-B children were not given oral zinc supplement. Follow up visit was set on day 3 after start of treatment. Primary outcome was set as frequency of diarrheal episodes during 24 hours while the secondary outcome was character of stool. **Results:** The Mean±SD of age in this study was 13.51±6.27 months with an age range of 6-30 months. The ratio of male gender was higher than female (59% Vs 41%). Clinical outcomes showed a significant decrease in frequency of diarrheal episodes (3.88±1.11 vs 4.58±1.03, p=0.001) and in number of children with watery stool (42% vs 70%, p=0.05) in Group-A compared to group-B. Number of children recovering from diarrhea was higher in group-A compared to group-B (14% vs 2%, p=0.026). **Conclusion:** Zinc supplement significantly reduces frequency of diarrheal episodes and improves character of stool in children with acute watery diarrhea aged from 6 months to 5 year.

Key words: Acute Watery Diarrhea, Children, Oral Zinc.

INTRODUCTION

Diarrheal illness, which can be defined as the passage of watery or loose stools as frequent as ≥ 3 times during 24 hours, accounts for 2nd leading cause of mortality among children. The reported global deaths in the years 2017 in children less than 5 years of age is more than 500,000.¹ The incidence and mortality related to diarrheal illnesses varies among the resource limited countries and therefore the need for focused interventions also varies in different geographic regions.^{2,3} The most common type of diarrhea among the age group of 6 months to 5 year is acute watery diarrhea while the other types of diarrhea are known as invasive diarrhea and chronic diarrhea.

As per found in the investigative studies in resource limited countries, the etiology of

acute diarrhea is mostly caused by infectious gastroenteritis. The microbiological causes of this acute diarrhea differ in geographical regions. In an important study published in lancet, stool samples were taken from 9439 children under 5 years of age belonging to 7 different geographical regions of Asia and Africa. In these patients with moderate to severe diarrhea Rotavirus was most common cause in children younger than 2 years while Shigella was the most common cause in children between 2 to 5 years. In Pakistan and other South Asian population Aeromonas, Campylobacter jejuni and Vibrio cholera were the most commonly found pathogens.⁴ Treatment guidelines by WHO (World Health Organization) includes the replenishment of fluid and correction of electrolyte loss. ORS is therefore basic treatment for the acute diarrhea patients which not only rehydrate the patient but also provide the

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proper nutritional cover for the children's loss due to high diarrheal frequency. Despite these benefits ORS has not shown any impact on reducing the frequency of diarrhea.⁵ Zinc is an element which serves as important micronutrient and plays a vital role in the treatment of acute diarrhea episodes. Zinc is crucial in cell functions and synthesis of protein.⁶ Studies have mentioned the role of Zinc in regulating intestinal fluid and mucosal integrity hence it has the synergistic effect along with the rehydration therapy.⁷ WHO and United Nations Children's Fund (UNICEF) also recommend the use of Zinc supplement in children of age 6 month to 5 years with oral rehydration therapy. The recommended dosage of Zinc by WHO for children under 6 months is 10 mg/day while for children aging between 6 months to 5 years this dose is 20 mg/day and must be continued for 10 -14 days. It will not only reduce the diarrheal frequency but also help in growing the body's damaged cells due to dehydration.⁸ WHO & UNICEF guidelines are based on the strong data collected from different trials that shows the significant role of Zinc in reducing the diarrheal frequency and duration. It was proven in the different trials that oral 2 week zinc supplement with the ORS has the significant role in reducing the diarrheal episodes. Based on such data, they issued guidelines to add zinc to the rehydration therapy in patient with acute diarrhea.^{9,10} Oral zinc supplement has an important role in the patient with acute watery diarrhea, it modify the host mechanism towards the infectious agents thus reduce the diarrhea episodes and mortality risk. Zinc also improves the patient's immunity by modulating the cellular function and cell membrane.¹¹

Situation of diarrheal infection in the developing countries like Pakistan are worsening. Pakistan Demographic and Health Survey conducted in 2013, found the pediatric diarrhea in 23% children \leq 5 year age group prior to the survey. Six and eleven months children, which are time when solid food is added to the children diet, had high prevalence of acute diarrhea by 35%. Pakistan has added Zinc to the diarrhea treatment protocol, but the percentage of children receiving Zinc in their treatment was only 2% as per 2013 health

survey report, which further improves to 8% in 2018 health Survey report.^{12,13} The study was therefore planned to determine the effect of Zinc supplement on duration of acute watery diarrhea in 6 months to 5 year aged children in our local population. The results of this study will add up to the data of benefits of Zinc supplements in our children and will help to boost the confidence of pediatricians for the use of Zinc in all these children suffering from acute watery diarrhea.

MATERIAL & METHODS

This randomized controlled study was conducted over a period of 6 months at the pediatric unit, Mardan Medical Complex, Mardan, Pakistan, from 1st July 2022 to 31st December 2022.

A total of 100 children aged from 6 months to 5 years presenting at outpatient department with acute watery diarrhea (the passage of watery stools as frequent as \geq 3 times during 24 hours) were included in the study through consecutive sampling.

Exclusion criteria was set as dysentery, severe dehydration (requiring hospitalization) and diarrhea $>$ 14 days duration.

Patients were divided in to 2 equal groups of 50 patients each through computer generated sheet. In Group-A patients were given oral zinc supplement at a dose of 20mg daily while in Group-B children were not given oral zinc supplement.

Children were rehydrated as per the guidelines of WHO by prescribing low osmolarity ORS and probiotics.

Complete history including episodes of acute diarrhea during last month, duration of current episode of diarrhea and frequency of daily loose stools was taken from both the groups. Follow up visit was set on day 3 after start of treatment. Primary outcome was set as frequency of diarrheal episodes during 24 hours while improvement in character of stool was set as secondary outcome.

Written consent was obtained from all the parents

of children included in the study.

Permission for conducting study was taken from ethical committee of Mardan Medical Complex Mardan (256/BKMC).

Data was analyzed using SPSS 25. Mean \pm Standard deviation was calculated for quantitative parameters while qualitative parameters were expressed by frequency and percentage. Study outcomes were compared between the 2 groups by applying independent t test to the means of variables and Chi-square tests to the difference of proportion of the two groups. $P < 0.05$ was considered statistically significant.

RESULTS

The Mean \pm SD of age in this study was 13.51 ± 6.27 months with an age range of 6-30 months. The male gender was 59% while the female gender was 41% of overall population. Group wise details of demographics and clinical findings are shown in Table-I.

Outcomes of the study shows a significant decrease in frequency of diarrheal episodes in Group-A compared to group-B. There was also a significant decrease in children with

watery stool and number of children recovering from diarrhea in group-A treated with Zinc supplement compared to Group-B. A statistically non-significant improvement was also seen in body weight in children taking Zinc supplement compared to the other group as shown in Table-II.

DISCUSSION

Since the recommendations for the use of Zinc as an essential part of antidiarrheal therapy by international guidelines, researchers have conducted studies to find the role of Zinc in different needs relating to the treatment of diarrhea in children.

A review article on zinc supplementation in pediatric diarrhea published in 2010, shared that the use of oral zinc therapy provides the reduction in the mean diarrhea duration and persistent diarrhea by 20% and 30% respectively. It clearly shows that the Zinc supplement along with the rehydration therapy not only shorten the diarrheal episodes but also improve the immunity.¹⁴

Yosra S et al conducted a randomized controlled trial to determine the effect of Zinc supplement taken daily for 4 months on frequency and severity of diarrhea.

Demographics & Clinical Characteristics		Group-A n=50	Group-B n=50
Age (months)		13.02 \pm 5.83	14 \pm 6.70
Gender	Male n (%)	28 (56)	22 (44)
	Female n (%)	31 (62)	19 (38)
History of diarrhea during last month n (%)		15 (30)	18 (36)
Duration of diarrhea (Mean \pm SD) hours		17.88 \pm 10.32	16.08 \pm 9.65

Table-I. Demographics and clinical characteristics n=100

Study Outcomes		Group-A n=50	Group-B n=50	P-Value
At the time of inclusion				
Frequency of diarrheal episodes during 24 hours (Mean \pm SD)		6.36 \pm 1.36	5.98 \pm 1.05	0.121
Watery Stool during last 24 hours n (%)		50 (50)	50 (50)	1
Body Weight (Mean \pm SD) Kg		8.88 \pm 2.11	9.04 \pm 2.14	0.707
At 3 days follow up				
Frequency of diarrheal episodes during last 24 hours (Mean \pm SD)		3.88 \pm 1.11	4.58 \pm 1.03	0.001
Character of stool	Watery	21 (42)	35 (70)	0.05
	Loose	18 (36)	13 (26)	
	Firm	11 (22)	2 (4)	
Body weight (Mean \pm SD) Kg		9.36 \pm 2.15	8.98 \pm 2.01	0.363
Complete recovery n (%)		7 (14)	1 (2)	0.026

Table-II. Comparison of outcomes between the two groups n=100

The results of the study showed that the incidence of diarrhea, number of diarrhea episodes and the frequency of daily stools was significantly reduced in patients taking Zinc supplements ($P < .05$).¹⁵

Jabeen S et al planned a study with children < 5 years of age to determine the effect of Zinc supplement on severity of acute diarrhea. The results showed a significant improvement in consistency of stool at the follow up visits on 3rd and 5th day of treatment ($P < 0.005$) while frequency of stool was reduced significantly as reported on 7th day of treatment ($P < 0.005$).¹⁶ Shah BB studied the role of Zinc supplement in reducing the duration of acute diarrhea in children between the ages of 6 months to 5 years. The results showed a significant reduction in duration of diarrhea in Zinc group (68.3 ± 9.4 hours) compared to placebo group (99.8 ± 15.2 hours) ($p = 0.001$). There was also recovery in 100% of the children after 5 day of treatment in Zinc supplement group compared to 86.6% of the patients in the placebo group ($p = 0.04$). It was concluded in this study that as add on to ORS, Zinc supplement provides a better efficacy on course of the disease.¹⁷

Laghari G conducted a study to evaluate the efficacy of Zinc supplement in reducing the frequency and improving the consistency of stool in children suffering from acute diarrhea. The follow up at 3rd day showed a statistically significant reduction in the frequency of diarrheal episodes in Zinc group compared to the control group (2.40 ± 0.81 Vs 4.28 ± 1.07 , $p < .00001$). Moreover the consistency of stool (soft to firm) was also significantly improved in the Zinc group ($p = .01$).¹⁸

The Mean \pm SD of age in our study was 13.51 ± 6.27 months with an age range of 6-30 months. The male gender was 59% while the female gender was 41% of overall population. History of diarrhea within last one month was reported in 30% children in Group-A and 36% children in Group-B. Duration of diarrhea was 17.88 ± 10.32 hours in Group-A while 16.08 ± 9.65 hours in Group-B.

The primary outcomes shows a significant

decrease in frequency of diarrheal episodes in Group-A compared to group-B (3.88 ± 1.11 vs 4.58 ± 1.03 , $p = 0.001$). Similar results were also reported in studies previously conducted with Zinc supplementation.^{14,15,16,17,18,19}

As reported in studies conducted previously using Zinc supplementations in children with diarrhea, there was significant decrease in children with watery stool in Group-A compared to Group-B (42% vs 70%, $p = 0.05$).^{16,18}

Moreover, as proven in the studies discussed above, the number of children recovering from diarrhea in our study was also significantly high in group-A treated with Zinc supplement compared to Group-B who were not treated with Zinc (14% vs 2%, $p = 0.026$).¹⁷

The results also showed a statistically non-significant improvement in body weight in children receiving Zinc supplementation.

Diarrhea being a commonly prevalent illness in children under 5 years of age, this role of Zinc supplementation will help the pediatricians and general physicians to treat these patients more effectively thereby preventing morbidity and mortality.

The major limitation of our study includes the small sample size. Future studies with higher number of patients and double blind design may be planned to get more useful data in this treatment regimen.

CONCLUSION

Zinc supplement significantly reduces frequency of diarrheal episodes and improves character of stool thereby reducing the severity of disease after 3 days of treatment in children aged from 6 months to 5 years with acute watery diarrhea. Oral Zinc supplements are therefore needed to be an essential part of anti-diarrheal treatment regimen in our population.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Faizan Sadiq	Study concept, Planning, Manuscript writing, Drafting the work.	
2	Muhammad Shahan Jan	Collection of data and interpretatin, Manuscript writing.	
3	Muhammad Tariq	Collectin of data and references.	
4	Ibrahim Ullah	Collectin of data and references.	
5	Abbas Ali Khan	Critical review, Final checking of manuscript.	
6	Muhammad Suleman	Revision of manuscript.	