RESEARCH ARTICLE

COMPARATIVE STUDY OF EFFICIENCY OF ZINC INTEGRATION IN ACUTE DIARRHEA.

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Manuscript Info

Abstract

Objectives:- To assess the efficiency of different forms of zinc supplementation in comparison to ORS without zinc in treatment of acute diarrhea in children.

Back ground:- Case control study of cases admitted at pediatric departmentat Benha Fever Hospital.

Patient and methods:- This study was done on 100 of infant/ children with acute diarrhea aged 4- 48 months it divided into two groups, Study group which subdivided into two subgroups:group (1): 40 infants/children received zinc syrup (sulfozinc),group (2):40 infants/children received ORS with zinc(Rehydro- zinc sachets),.Control group(group(3): 20 infants/children received ORS (Hydrosafe sachets).

Results:- Frequency of diarrhea significant low in study group vs control group(3± 0.47,3.4± 0.63vs5 ± 0.79) also duration of diarrhea significant low in study group in vs control group(3.3 ±0.52,3.6 ± 0.49 vs 5 ± 0.6).

Conclusion:- Supplementation of zinc useful for treatment acute diarrhea as it reduce duration , frequency of diarrhea in children /infant with acute diarrhea.

Introduction:-

Diarrhea is a leading cause of death in children younger than 5 y and accounts for 11% of total child mortality (0.8 million deaths/y) worldwide(1).

Furthermore, recurrent or prolonged infectious diarrhea in childhood is often associated with significant morbidity that impacts long-term growth and development(2) **.**

Acute diarrhea is defined as frequent passage of semisolid or watery stool (>3/24 h), lasting less than 14 days (3).

Intestinal infection is the most common cause of acute diarrhea. Acutediarrhea is caused by variety of viral, bacterial and parasitic agents. The common ones are; Rotavirus, E. coli, Shigella, Cholera, and Salmonella.Campylobacter jejuni, Giardia and E. histolytica are also common (4).

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WHO has estimated that rotavirus infection was responsible for 37% of diarrhea-related deaths in children < 5 years in 2008.(5).

The aim of management is to help the child to maintain or regain hydration and to recover from diarrhea with careful attention to adequate oral rehydration and judicious re-feeding .(6)

Preventive elements included Rota and measles vaccination, promotion of early and exclusive breast-feeding with vitamin A supplementation, promotion of hand washing with soap, improvement of water supply including treatment and safe storage of household water, and promotion of community-wide sanitation.**(7)**

Supplementations with zinc and probiotics have been shown to reduce severity and duration of diarrhea; however evidence does not support the use of antisecretary, antimotility and binding agents. Education of parents about hand hygiene, safe weaning and safe drinking water etc., can help in reducing incidence of this important health problem **.(8)**

Zinc supplementation is a critical new intervention for treating diarrheal episodes in children. Recent studies suggest that administration of zinc along with oral rehydration solutions (ORS) can reduce the duration and severity of diarrheal episodes for up to three months **.(9)**

Aim of the work:-
To show the efficiency of different forms of zinc supplementation in comparison to ORS without zinc in treatment of acute diarrhea in children.

Patient and method:-
This study was carried out on cases admitted at pediatric department at Benha Fever Hospital. The study was done on 100 0f infant/ children with acute diarrhea.These patients were with some dehydration according to World health organization criteria.It include two groups study group:Consists of 80 infant /children of both sexes with acute diarrhea They was subdivided into two subgroups:Group (1): 40 infants/children with acute diarrhea and received zinc syrup (sulfozinc).(The zinc supplement bottle containing zinc sulphate equivalent to 10mg/5ml of elemental zinc) given 10mg/ day for patient 6 months or less and 20mg/ day for patients above 6 month.Group (2):40 infants/children with Acute diarrhea will receive ORS with zinc (Rehydro-zinc sachets, which every sachet contains 11 mg zinc acetate anhydrous). Each sachet dissolved in 200 ml water child received 10ml/kg after every defection . and so each patient received 2 -8 mg zinc according to weight after each defecation.control group(Group(3): 20 infants/children presented with diarrhea will receive ORS (Hydrosafe sachet),. Each sachet dissolved in 200 ml water . child received 10 ml/kg after every defecation. All patient were subjected to detailed history taking ,full clinical examination and i nvestigation include serum zinc level ,ABG(arterial blood gas),CRP(C-reactive protein),Serum sodium ,potassium, both sexes are included. and excluded from this study Infant/Children with any gastrointestinal abnormalities.infant/Children taking zinc for therapeutic purposes

Data Analysis:-
The collected data were tabulated and analyzed using SPSS version 16 soft ware (Spss Inc, Chicago, ILL Company). Categorical data were presented as number and percentages while quantitative data were expressed as mean ± standard deviation, and range. Chi square test (X2), or Fisher's exact test (FET), were used to analyze categorical variables. Quantitative data were tesxxted for normality using Kolomogrov Smirnove test, using Paired "t" test and ANOVA if normally distributed, or Krauskal Wallis test (KWT) if not normally distributed. Significant ANOA was followed by posthoc multiple comparisons using Bonferroni test to detect the significant pairs. The accepted level of significance in this work was stated at 0.05 (P <0.05 was considered significant.

Result:-
Regarding the demographic criteria of our study population there were 21 male,19 female for group (1) , 21 male,19 female for were(2)8 male,12 female for group (3) ,mean gestational age(19.7 ± 13.1) for group(1),(15.6 ±11.1) for group (2) (16.6± 10.1) for group(3),mean weight (11.1 ± 2.7) for group(1),(10 ± 2.6) for group (2),(11 ± 2.4) for group(3)

Comparison between group(1) zinc syrup ,group (2) zinc-ORS ,group (3) ORS, as regards mean serum zinc level at admission in Table(1). shows significant low mean serum zinc level in 3 studied groups at admission.
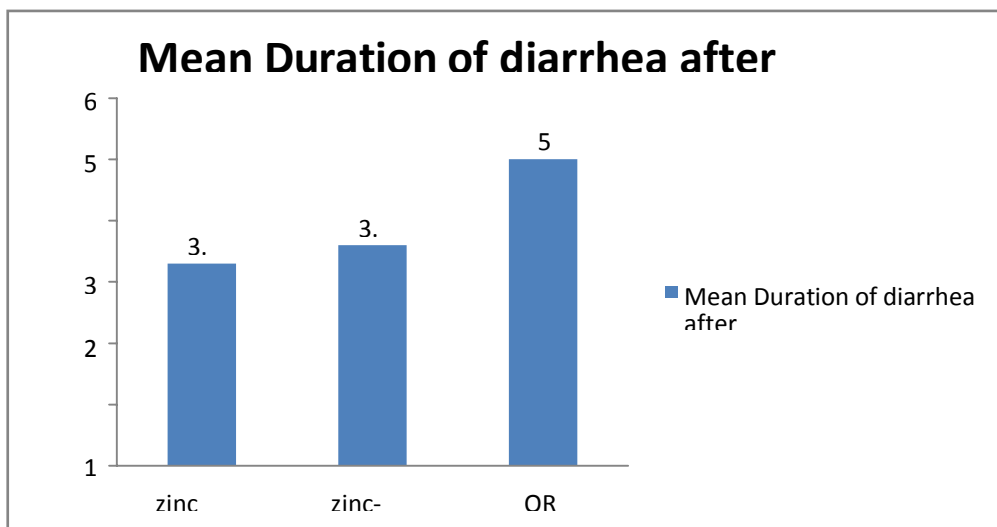
Table 1:-

Group	n.	Serum zinc			ANOVA	P	Sig. pairs
		Mean	± SD	Range			
Zinc syrup group	40	56.2	4.54	40-65	6.29	0.003 (S)	I≠II II≠III
Zinc-ORS group	40	53.6	3.06	45-68			
ORS group	20	52	3.03	45-55			
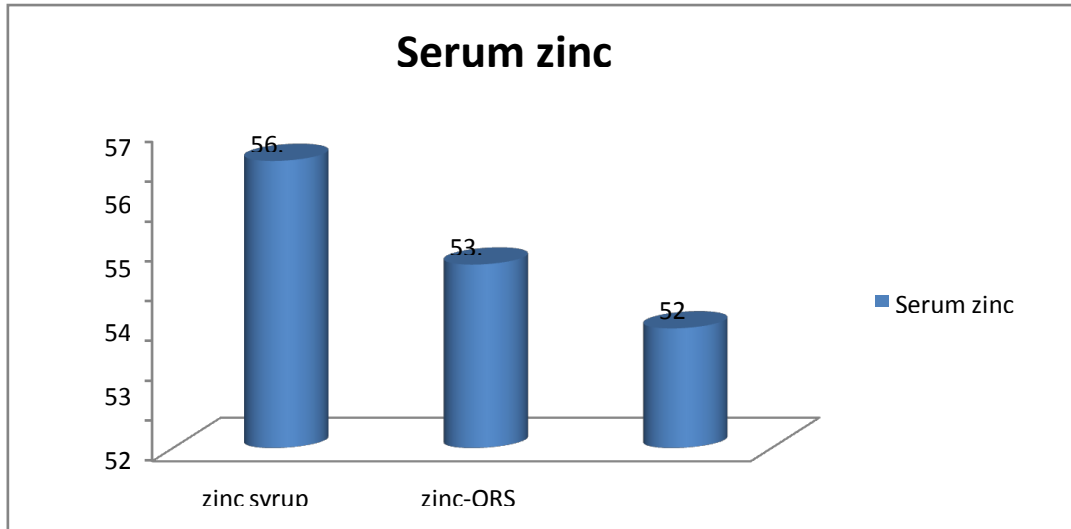
As regard **Table (2) ::** which show there were statistically highly significant difference between group(1) zinc syrup ,group (2) zinc- ORS , vs group (3) ORS, as regards duration of diarrhea post treatment (days)**.**

Table 2:-

Group	n.	Duration of diarrhea post treatment (days)			ANOVA	P	Sig. pairs
		Mean	± SD	Range			
Zinc syrup group	**40**	3.3	0.52	2-4	497.5	<0.001 (HS)	I≠III
Zinc-ORS group	**40**	3.6	0.49	3-4			II≠III
ORS group	**20**	5	0.60	5-6			I≠II

Comparison between group(1) zinc syrup ,group (2) zinc-ORS ,group (3) ORS, in **Table (3)** shows there were statistically highly significant difference between group (1)and group (2), vs group (3) as regards Frequency of diarrhea post treatment.

Table 3:-

Group	n.	Frequency ofdiarrhea post treatment			ANOVA	P	Sig. pairs
		Meannnn	**± SD**	**Range**			
Zinc syrup group	**40**	3.0	0.47	2-4	71.5	<0.001 (HS)	I≠III
Zinc-ORS group	**40**	3.4	0.63	2-4			II≠III
ORS group	**20**	5.0	0.79	4-6			I≠II
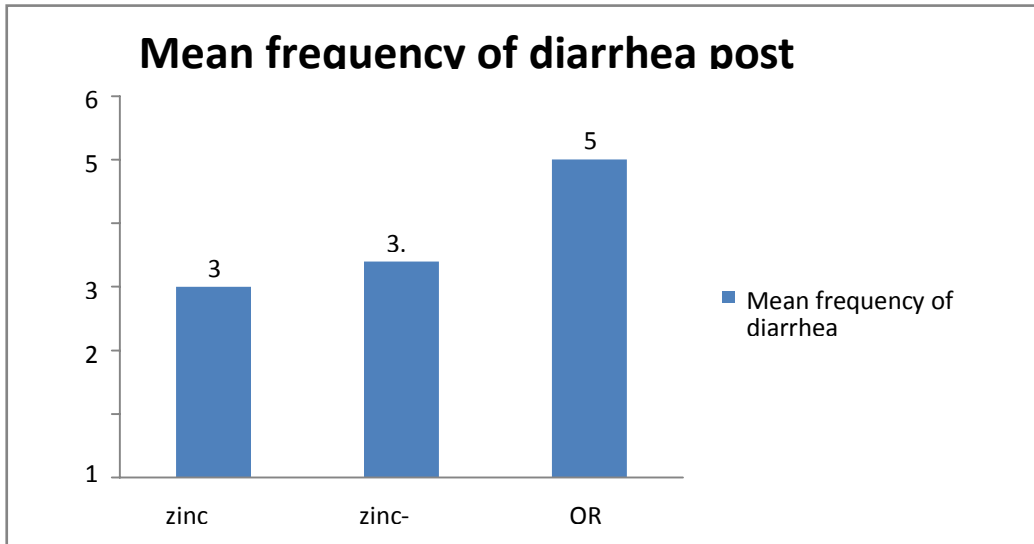
As regard Table(4) shows there were statistically highly significant difference between group (1)and group (2), vs group (3) as regards duration of hospital stay.

Table 4:-

Group	n.	Duration of hospital stay (days)			ANOVA	P	Sig. pairs
		Mean	**± SD**	**Range**			
Zinc syrup group	**40**	3.3	0.46	3-4	528.7	<0.001 (HS)	I≠III
Zinc-ORS group	**40**	3.6	0.47	3-4			II≠III
ORS group	**20**	5.1	0.6 1	5-6			I≠II
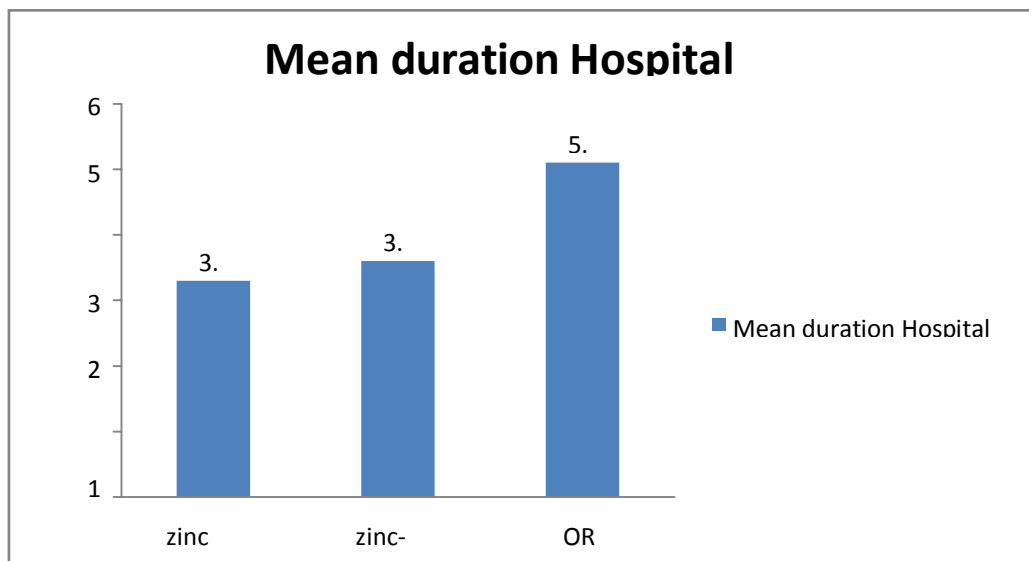
Discussion:-

Diarrhea is defined as acute when lasting for 14 days or less, but when diarrhea lasts for 30 days or more, it is considered chronic diarrhea*. (10)*

Infectious diarrhea resulted in about 0.7 million deaths in children under five years old in 2011 and 250 million lost school days(11)**.**

Rotavirus, norovirus, adenovirus, and a*stroviru*s are known to cause viral gastroenteritis (12)

Introduction of zinc to community programs resulted in increased use of oral rehydration solution (ORS), decreased use of unnecessary antibiotics, and a reduced need for medical visits for acute diarrhea **(**13).

In our study, the serum zinc level at admission and before treatment in children with acute diarrhea in group 1 (zinc syrup) and group 2 (zinc+ ORS) group 3(ors only) was significant low, suggesting zinc depletion during diarrhea.. .in our study mean serum zinc level at admission (56.2ug/dl) in group (1) ,(53.6 ug/dl) in group (2) ,(52 ug/dl) in group(3) $p<0.05$.

This come in agreement with **Abdullah et al., (2006)** , who found significant low mean serum zinc level at admission (61.44 ug/dl ,. $p<0.05$.) in children with diarrhea at admission.

Also in our study their significant low frequency of diarrhea after treatment in group (1) group (2)vs group (3) as we found mean diarrhea frequency group (1) zinc syrup(3.0 ± 0.47) ,group (2)zinc plus ORS (3.4 ± 0.63) group(3) ORS (5.0 ± 0.79) $p<0.05$.,This agreed with **Karamyyar etal.,(2013)** who found The mean diarrhea frequency (4.5 ± 2.3 vs.5.3 ± 2.1 ;$p <0.05$). Was significant lower in the group received zinc.

However this disagreed with **Boran et al .,(2006)** as their study found no significant difference in mean diarrhea frequency between first group received zinc and second received ORS as in their study mean diarrhea frequency (1.8 ± 1.1 vs 1.6 ± 0.9;$p>0.05$) as their study done on 280 of children with acute diarrhea aged 6-60 month

In our study there is significant low mean duration of hospitalization in group (1) ,group (2) vs group(3) as we found The mean duration of hospitalization was significantly lower in group (1) zinc syrup(3.3 ± 0.46),group (2)zinc plus ORS(3.6 ± 0.47) ,group(3) ORS($5.1 \pm .0.61$) $p<0.05$.

This agreed with **Karamyyar etal.,(2013)** who found The mean duration of hospitalization was significantly lower in the patients receiving zinc (2.5 ± 0.7)vs (3.3 ± 0.8days), $p<0.05$.

In our study significant low duration of diarrhea after treatment in   group
group (2) vs group (3)) as we found the mean duration of diarrhea group (1) zinc syrup(3.3 ± 0.52),group (2)zinc plus ORS(3.6 ± 0.49) group(3) ORS($5 \pm .0.60$) $p<0.05$.

This agreed with **Dutta et al .,(2011**) who found mean diarrhea duration(2.6 ± 0.9 vs 3.6 ± 0.9; $p<0.05$) was significant lower in the group rece ivied zinc.

Also agreed with **Dalgic et al .,(2011**) who found mean diarrhea duration(3.4 ± 1.3 vs 5.3 ± 1.8; $p<0.05$) was significant lower in the group receivied zinc.

However **Patel et al.,(2009**) disagreed with our study as their study found no significant difference in mean diarrhea duration between first group received zinc and second received ORS as in their study mean diarrhea duration (1.5 ± 0.9 vs 1.4 ± 0.7; $p>0.05$) as their study done on 808 of childrent aged 6-59 month

Conclusion:-

From our study ,it could be recommended that:
Supplementation of zinc useful for treating acute diarrhea as it reduce duration , frequency of diarrhea in children /infant with acute diarrhea.

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