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Effect Of Zinc Supplementation On Children With Diarrheal Diseases In Regard To Hospital Stay Duration And Cost-Effect Patient Residency

تأثير تزويد مادة الزنك للأطفال المصابين بالإسهال على فترة دخولهم للمستشفى وتكاليف رقودهم فيها

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الخلاصة:

الخلفية: التهاب الأمعاء الحاد يعتبر احد أهم أسباب الالتهابات المعدية الشائعة لدى الإنسان ،والثانية بعد التهابات التنفسية الحادة ،وهي احد أسباب المراضة وسبب رئيسي للوفاة عند الأطفال دون سن الخامسة في الدول النامية

الهدف: لتقييم تأثير تزويد مادة الزنك غلى دخول الأطفال المصابين بالإسهال للمستشفى وعلى فترة رقودهم ومن ثم تقليل تكاليفهم.

المنهجية: في هذه الدراسة تم تضمين(50) طفلا تتراوح أعمارهم بين (6)اشهر –(5)سنوات مصابون بالإسهال وادخلوا إلى مستشفى الزهراء في محافظة النجف ،وهؤلاء قسموا إلى مجموعتين متساويتان ،حيث أن المجموعة الأولى لم تعطى الزنك ،أما الثانية فزودت بحبوب الزنك بجرعة (20)ملغم ولمدة (14) يوما . مستوى الزنك بالدم سجل وحدد لكل مريض في المجموعتين .

النتائج: الدراسة أظهرت أن استعمال حبوب الزنك في علاج الإسهال له تأثير ايجابي على مدة الرقود في المستشفى ،حيث أن (52%)من الأطفال في المجموعة الثانية التي أعطيت الزنك قد اخرجوا من المستشفى بعد ثلاثة أيام من دخولها بالمقارنة مع تحسن (12%)من أطفال المجموعة الأولى والتي لم تزود بمادة الزنك .

الاستنتاجات: استعمال حبوب الزنك لكل طفل مصاب بالإسهال يقلل من احتمالية دخوله المستشفى أو فترة رقوده فيها

التوصيات: نوصي (1)إضافة مادة الزنك لكل طفل مصاب بالإسهال سواء ادخل المستشفى أو يعالج خارجها .(2) مطلوب عمل دراسات لاحقة لمعرفة مدى فائدة إضافة مواد نادرة أخرى للعلاج كفيتامين ـأـ و النحاس .

Abstract

Background: Acute infectious gastroenteritis is one of the most common infectious diseases of human, ranking second to acute respiratory tract infections, and it is a worldwide cause of morbidity with a significance cause of death in children below five years, in developing countries.

Objectives: to evaluate effect of zinc supplementation on children admission duration to hospital and their residency for those who had diarrheal diseases.

Methods: In this study, 50 children were enrolled, having the age between 6mth-5yr, they have been admitted for diarrhea in Al-zahraa teaching hospital in Al-najaf governorate for the period of(March-June)2011 . those patients are subdivided into two group in regard to zinc supplementation as group one who constitute 25 patients managed without zinc given , while other 25 patients designed as group two who received 20 mg elemental zinc for 14 days from starting day, serum zinc level was recorded for each group , and the duration of their hospital stay was recorded .spss and chi square .

Result: the study showed that using zinc tablets has a good effect on the duration of hospital stay , as 52% of those children (group-2)who received zinc were discharged after 3 days of admission in comparison to 3(12%) of those children(group-1) who have not received zinc tablet .

Conclusion: using zinc tablet for every child admitted to hospital because of diarrhea will shortens patient residency and time of hospital stay.

Recommendation: We recommend;

(1)Adding zinc for every child presented with diarrhea whether admitted to hospital or treated as out-patient.

(2)Further studies are required to assess the benefit of adding other trace element to the management such as vitamin-A and copper.

Keywords: Zinc supplementation, zinc, diarrhea.

INTRODUCTION:

Over two million children die because of diarrhea and dehydration every year. In the majority of cases diarrhea is preventable through exclusive breastfeeding,

improved hygiene, sanitation, and access of clean water. Yet it is still one of the leading causes of death among children less than five years in developing countries. A new oral rehydration solution (ORS) formula and the introduction of zinc supplementation offer much-improved outcomes for the treatment of childhood diarrhea. Use of (ORS) in the treatment of diarrhea reduces the risk of mortality through prevention and treatment of dehydration but does not decrease diarrheal duration or stool output .[1]

Zinc function as a co-factor for more than 200 enzymes and is essential to numerous metabolic function .It is found in a wide variety of foods but good sources are: red meat, beans, nuts, whole grains, fortified breakfast cereals and dairy products. bioavailability is a greater from animals sources than plants sources[2] . The required daily allowance of zinc FDA :

For infants until 6 months of age 2 mg/day.

For children (7mth-3years), the FDA of zinc is 3mg/day.

Between (4-8) years of age, the FDA of zinc is 5 mg/day.

Normal serum zinc level in children are (66-115) mg/dl[3].

Clinical features of zinc deficiency include : growth retardation, hair loss, diarrhea, delayed sexual maturation and hypogonadism, eye and skin lesion, and loss of appetite, while continued deficiency can lead to delayed wound healing, immune dysfunction, thyamic atrophy, acrodermatites enerpathica, and lymphopenia[4]. Children who received (10-14) days of zinc supplementation in a dose of (10-20) mg showed greater resistance to episodes of diarrhea and other infectious diseases for the next (2-3) months periods following treatment and also show zinc tablets supplementation have a good effect on the duration of hospital stay[5].

Objectives: to evaluate effect of zinc supplementation on children admission duration to hospital and their residency for those who had diarrheal diseases.

PATIENTS AND METHODS:

In this cross-sectional study, 50 children have been admitted for diarrhea in Al-zahraa teaching hospital from (March- June) 2011.

A venous blood sample 2 ml., was obtained from peripheral vein and centrifuge and stored in plain tubes at 2-8 c°, and colorimetric determination of zinc in serum by spectrophotometer UV/VIS with thermo station.

All the studied patients are subdivided into two group in regard to zinc supplementation as group one constitute 25 patients ,managed without zinc given, while another 25 patients constitutes group two who received 20mg elemental zinc and the duration of their hospital stay was recorded.

We prepared questionnaire form included the following information: age, sex, body weight, residency "rural or urban", feeding "breast or bottle", diarrhea "acute or chronic"

RESULTS:

In this clinical trial study, 50 children with diarrhea were included .the result of our study showed that hospital stay duration differ significantly in both groups as its shown in table (1).

Table-1 comparison of two patients groups in regard to hospital stay duration

Hospital stay duration	Zinc supplementation		total	P-value
	Group-1/ without zinc	*Group-2/ with zinc*		
≤ 3 days	3 (12%)	13 (52%)	16	0.002
≥ 4 days	22 (88%)	12 (48%)	34	

This table showed better response to zinc supplementation in 13(52%) patients of group-2 who discharged in ≤3 days in comparison to group-1 who have not received zinc for the same duration but, with low response 3(12%), in addition the p-value 0.002 which is highly significance between two groups.

Table-2 comparison of patients' response to zinc according to age and number of discharged patients from hospital.

age	**group**	**Hospital stay duration**		
		≤ 3 days	**≥ 4 days**	**total**
<1 year	**Group-1(no zinc)**	**3 (12%)**	**15 (60%)**	**18(72%)**
	Group-2(zinc)	**7 (28,%)**	**4 (16%)**	**11(44%)**
>1year	**Group-1(no zinc)**	**0**	**7 (28%)**	**7(28%)**
	Group-2(zinc)	**6 (24%)**	**8 (32%)**	**14(56%)**

The same thing is applied in table-2 which show comparison of two groups of patients in regard to age, and duration but the response to zinc given and hospital stay duration more rapid and pronounce in both age group of <1year who constitute 29 patients, and also for those >1 year for the same duration ≤3 days .

Table 3. The time required for diarrheal recovery in days and hospital stay duration for both groups in regard to zinc supplementation.

Hospital stay duration	**Zinc supplementation**	
	Group-1/no zinc	**Group-2/with zinc**
2nd day	**1 (4%)**	**2(8%)**
3rd day	**2(8%)**	**11(44%)**
4th day	**2(8%)**	**10(40%)**
5th day	**4(16%)**	**2(8%)**
6th day	**5(20%)**	**0**
7th day	**5(20%)**	**0**
8th day	**4(16%)**	**0**
9th day	**1(4%)**	**0**
10thday	**1(4%)**	**0**

Table-3 showed, the times needed for the studied patients with diarrhea to recover from their illnesses in regard to zinc supplementation, and number of days that represents patients residency

Table-4 Demographic characteristic of all studied patients and their initial zinc level

Parameters		Initial normal serum zinc	Initial Deficit serum zinc	total
Gender	Female	17(34%)	7(14%)	24(48%)
	male	18(36%)	8(16%)	26(52%)
Feeding	Breast	6(12%)	19(38%)	25(50%)
	bottle	17(34%)	8(16)	25(50%)
Diarrhea	Acute	13(26%)	20(40%)	33(66%)
	chronic	7(14%)	10(20%)	17(34%)
Residency	Rural	4(8%)	13(26%)	17(34%)
	Urban	21(42%)	12(24%)	33(66%)

In regard to table-4, both gender are mostly have normal initial zinc level 35(70%)and its 17(34%) for female, and 18(36%) for male, while breast feeding 6(12%) patients showed significantly low initial serum zinc in comparison to high percentage 17(34%) in bottle feeding. In regard to acute diarrhea serum zinc level is relatively high 13(26%) in comparison to 7(14%) with chronic diarrhea. lastly the serum zinc level show significant difference in regard to residency in which rural patients 4(8%) had much low initial serum level than urban area21(42%) patients.

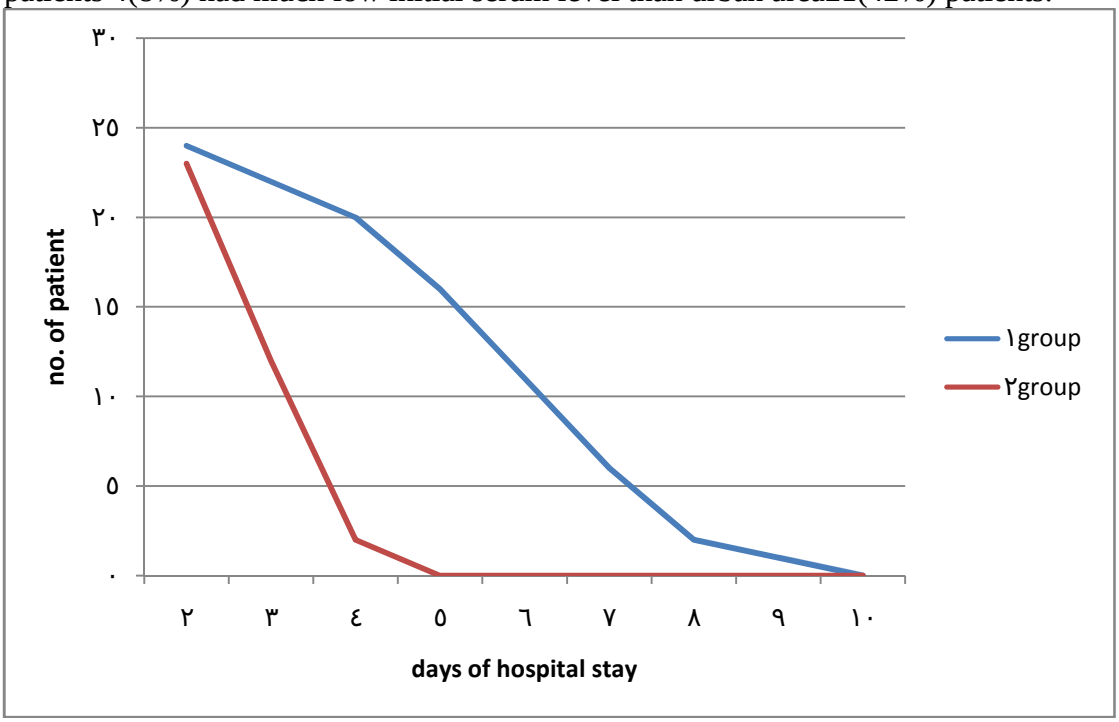

Figure (1): Effect of zinc supplementation on patients in both groups with diarrhea and their hospital stay duration.

It is clearly noted in fig. (1) that all patients in group-2 with diarrhea who received zinc are responding to management more rapidly i.e within five days of treatment, While group-1 who have not supplemented with zinc are delayed responders and need ten days for complete healing.

DISCUSSION:

Our study showed that children who have been admitted to Al-zahraa teaching hospital because of diarrhea have a shorter duration of residency in hospital 13(52%) when zinc is added to their management ,while its only 3(12%)in those without zinc supplementation. This finding is similar to the result seen by Anwer [6] study in Baghdad**,** when he showed that the percentage of improvement after 3 days in those received zinc was 79%, and its only 40% in those without zinc supplementation. This relatively variable value in two study may be attributed to different parameters used like age, residency, type of feeding , dose…..

In regard to age, children <1 year have less hospital stay duration ,and good response to zinc supplementation in comparison to those of >1year, and this finding is consistent with Anwer [6]study in Baghdad, and also in study performed in North India[7] by S.K.Roy, this fact may be explained by the higher risk of having zinc deficiency in infants compared to toddlers, because milk contains small amount of zinc, and infants whose diet is mainly compose of milk are expected to have zinc deficiency more readily than toddlers whose diet may include meats, nuts, and other rich sources of zinc ,and for this reason ,they show rapid response to zinc supplementation.

In relation to gender, both male and female, show no significance difference in their response to zinc therapy .this finding is appeared also in many studies like[6,7].

Regarding to the type of diarrhea whether acute or chronic ,our study showed good response in acute diarrhea than chronic one, a finding which is in agreement of DHIA J AL-TIMIMI , in Dhuk, Iraq[8] .

In regard to patients residency ,the results in our study showed significant difference of initial serum zinc of children in rural patients 4(8%) than urban area 21(42%), this may be explained on bases of diet given which is composed mainly of milk in rural area, and as the milk is known to be a poor source of zinc. this result is even approved by Iranian study[9].

CONCLUSION:

Adding zinc supplementation to the management of diarrhea will help these children to maintain more adequate zinc status during the convalescent period which improve healing and hence shortened their hospital stay duration and cost-effect patient residency.

RECOMMENDATION:

(1) Adding zinc for every child presented with diarrhea whether admitted to hospital or treated as outpatient.
(2) Further studies are required to assess the benefit of adding other trace elements to the management such as vitamin-A, and copper.

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