Comparison of the effectiveness of zinc supplementation in tablets form with that of the suspension form in the treatment of acute diarrhoea

Sarwat Urooj,1 Hafeez Ullah Memon,2 Yasmeen Memon,3 Bibi Shazia Ali 4

Abstract
Objective: To compare the effectiveness of zinc supplementation in tablet form with that of the suspension form in the treatment of acute diarrhoea.
Methods: A comparative study was carried out at the Liaquat University Hospital, Hyderabad, Pakistan from October 2008 to April 2009, and comprised children aged 6-24 months suffering from acute diarrhoea. The patients were divided into two groups on the basis of even and odd numbers. Group A (even numbers) received dispersible zinc tablets, and group B (odd numbers) received zinc suspension. The patients were admitted for 3 days and improvement was checked at the end of 3rd day in terms of decrease in the frequency of stools/day. SPSS 15 was used for data analysis.
Results: The 88 patients were divided into two groups of 44(50%) each. Overall, 49(55.7%) patients were male and 39(44.3%) were female. At the end of the 3rd day 51(58%) patients improved, while 37(42%) did not. In the zinc tablet group, improvement was in 32(72%) patients compared to 19(43%) in the zinc suspension group (p<0.05).
Conclusion: The results of tablets preparation were clinically significant in reducing the duration and severity of diarrhoea.
Keywords: Diarrhoea, Zinc tablets, Zinc suspension, ORS. (JPMA 67: 156; 2017)

Introduction
Acute diarrhoea remains a leading cause of childhood deaths despite the undeniable success of oral rehydration therapy (ORT). Worldwide, diarrhoeal diseases are the leading cause of paediatric morbidity and mortality, with 1.5 billion episodes and 1.5-2.5 million deaths estimated annually among children below five years of age.1

Much of the success achieved in the control of diarrhoeal morbidity and mortality has been conventionally attributed to two therapeutic interventions: the oral rehydration solution (ORS) and zinc supplementation.2 In 1992, the Centre for Disease Control (CDC) reported the first national guideline, emphasising the emergency of the treatment of childhood diarrhoea and the importance of zinc supplementation. Since then, a variety of trials have been done, especially in developing countries, to assess the effect of zinc supplementation on the duration and severity of diarrhoea.3

Despite these improvements, mortality due to diarrhoea in developing countries remains too high. Zinc is used in tablet or suspension forms, both preparations have the same zinc sulphate monohydrate formulation, but different efficacy, which was first observed in 2005 after an earthquake in northern areas of Pakistan. After the earthquake a massive number of children developed diarrhoea due to poor hygiene in camps, and zinc was available there in both forms for diarrhoea management. There was the improvement with the treatment of zinc, but there was difference in the efficacy level between zinc tablet and suspension.4

The current study was planned to evaluate the difference in children below 5 years of age.

Patients and Methods
The comparative study was carried out at the Liaquat University Hospital, Hyderabad, Pakistan from October 2008 to April 2009, and comprised children aged 6-24 months suffering from acute diarrhoea. The sample size was calculated by taking level of significance 5%, power of study 80%, P1 39%, P2 13%.5 The sample was picked using non probability purposive sampling.

Acute diarrhoea was defined as passage of three or more semi-liquid stools in the preceding 24 hours, and not containing blood and mucus. Those excluded were cases of parental diarrhoea, diarrhoea with sepsis, severely malnourished child, acute dysentery, failure to produce consent.

All the paediatric patients who were admitted with
history of acute diarrhoea were enrolled in the study after
taking informed consent from the parents/caregivers. A
questionnaire was developed for data collection. The
questionnaire was first pre-tested and then implemented.
Detailed history and examination were recorded on a
proforma.

The patients were divided into two groups on the basis of
even and odd numbers. Group A (even numbers) received
dispersible zinc tablets, and group B (odd numbers)
received zinc suspension with a dose of 20mg/day as per
the World Health Organisation (WHO) protocol for
diarrhoea. The patients were admitted for 3 days and
improvement was checked at the end of the 3rd day in
terms of decrease in frequency of stools (<3 stools/day).

Data analysis was done using SPSS 15. Qualitative and
quantitative variables were presented as mean ± standard
deivation (SD), while qualitative variables like gender and
effectiveness were presented as frequencies and
percentages. Chi square test was used to compare the
effectiveness of the two zinc formulations between the
groups. P<0.05 was considered significant.

**Results**

The 88 patients were divided into two groups of 44(50%)
each. Overall, 49(55.7%) patients were male and
39(44.3%) were female. Of the total, 39(44.3%) patients
were 6-12 months of age, and of them 18(46%) were
on tablets and 21(54%) were on suspension form. Besides,
49(55.7%) patients were aged 13-24 months, and of them
26(53%) were on tablets and 23(47%) were on suspension
form.

At the end of the 3rd day 51(58%) patients improved,
while 37(42%) did not (Table-1).

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3 Stools Per Day</td>
<td>51</td>
</tr>
<tr>
<td>3 Or More Stools Per Day</td>
<td>37</td>
</tr>
</tbody>
</table>

Table-1: Decreased frequency of diarrhoea within 24 hour.

<table>
<thead>
<tr>
<th>Comparison of Effectiveness of zinc at the end of 3rd day between the treatment groups.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment group</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>Tablets</td>
</tr>
<tr>
<td>Suspension</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

In the zinc tablet group, improvement was in 32(72%)
patients compared to 19(43%) in the zinc suspension
group (p<0.05) (Table-2).

**Discussion**

Zinc is one of the most important micronutrients in the
human diet, and it is crucial for many cell functions, such
as protein synthesis and cell growth and differentiation.
Zinc’s mechanism of action for the treatment of diarrhoea
caused by different pathogens is not fully understood, but
studies conducted in this field reveal that zinc plays
different roles in the intestine, such as regulation of
intestinal fluid transport and mucosal integrity and
modulation of expression of genes encoding important
zinc-dependent enzymes like cytokines, which play
important roles in the immune system and in modulation
of oxidative stress (OS). These different roles might
explain the positive effect of zinc intake during acute
diarrhoea in children.

The current study was conducted to document the better
effectiveness of zinc supplementation in tablets or
suspension form as an adjunct to ORT and early
continued feeding among pre-school children with acute
diarrhoea. It shows clinically important and statistically
significant overall reduction of 72% in the risk of
continued diarrhoea with zinc tablets compared to 43%
with zinc suspension with 95% confidence interval (CI) for
tables group (0.326-1.762) and for suspension group
(0.757-1.736). Another longitudinal cohort study was
conducted among children to measure the impact of
daily zinc administration in different formulations. About
90% of the patients recovered from diarrhoea within 3
days of presentation; 82% from tablet group and 96%
from the suspension (p= 0.001).

Therefore, a considerable effect of zinc on the duration
and frequency of diarrhoea was found in both groups, but
more favourably in the suspension group.

Zinc tablets, however, are cheaper and dose
measurement is more accurate than in suspension form,
and there is no need for teaching the mother about
having to shake the suspension before use or proper
measurement by spoon. Only 10-day course of zinc
tablets are sufficient for decreasing the frequency of
diarrhoea and diarrhoea-related morbidity and mortality.

Our results suggest tablet form of zinc is more effective
in the treatment of acute diarrhoea. But more controlled
studies are needed to establish better evidence in favour
of zinc tablets.

**Conclusion**

Zinc tablets resulted in clinically significant reduction in
the duration and severity of diarrhoea than the zinc suspension form.

**Disclaimer:** None.

**Conflict of Interest:** None.

**Source of Funding:** None.

**References**