



Original Article

Effect of Zinc Supplementation on Duration of Hospital Stay in Childhood Pneumonia

Ahmed ATMF¹, Hyder RT², Sufian A³, Hossain A⁴, Majumder RC⁵

Abstract

Background: Pneumonia is one of the major causes of death in children younger than age five, especially in developing countries. Supplementation with zinc is effective in the treatment and prevention of childhood pneumonia. **Objective:** To assess the duration of hospitalization after zinc supplementation in childhood pneumonia. **Materials and Methods:** This randomized double blind controlled trial was conducted in the Department of Pediatrics, Sylhet MAG Osmani Medical College Hospital, Sylhet during the period from 1st July 2013 to 30th June 2015. A total of 120 patients with severe pneumonia in hospitalized children fulfilling inclusion and exclusion criteria were enrolled by systematic random sampling. Group allocation of Group-A and Group-B was done by lottery method each consisting of 60 and 60 patients. Identically small packets that contained 10mg zinc sulphate powder or 10 mg placebo powder were coded as A and B by guide. **Results:** Time for normalization of all parameters (clinical recovery) in placebo group and zinc group was 127.12 ± 24.58 hours and 111.23 ± 35.47 hours respectively which were statistically significant ($p < 0.05$). All patients of both groups were discharged. The mean duration of hospital stay was found to be 6.78 ± 0.42 days in placebo group and 5.42 ± 0.81 days in zinc group. Mean duration of hospital stay was significantly less in zinc group in comparison to placebo ($p < 0.05$). **Conclusion:** Supplementation of zinc therapy in childhood pneumonia causes early clinical recovery and less duration of hospital stay in comparison to the non-zinc therapy group.

Key words: Zinc supplementation, childhood pneumonia, duration of hospitalization.

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Introduction

Pneumonia is one of the major causes of death in children younger than age five, especially in low and middle income countries¹. Pneumonia is the largest cause of childhood mortality, accounting for 15% of all childhood deaths under five years² and 19% of all childhood deaths in low-income countries^{3,4}. Pneumonia is diagnosed by the presence of either fast breathing or lower chest wall indrawing in children aged under five years. Presenting features in viral or bacterial pneumonia are similar, however wheezing is more common in children with viral pneumonia². Rudan I, et al identified five risk factors for pneumonia: malnutrition, low birth weight, nonexclusive breast feeding, solid fuel use and overcrowding⁵. Among young children suffering from pneumonia, zinc deficiency has been documented in many countries and supplementation with zinc is effective in the treatment and prevention of childhood pneumonia⁶.

Zinc is important for protein and lipid processing and metabolism, cell integrity and maturation⁷. Moreover, besides its regulatory roles, zinc has an essential function in metabolism of different

nutrients, for example it helps in catalysis, synthesis and breaking down of nutrients⁷. The role of zinc in protection and response of the body to infections is well documented especially in children. It is known that every cell in the immune system, either humoral or cell mediated, is influenced by zinc. Immune cells development and functioning require the presence of zinc. Moreover, zinc is an integral part of a thymic hormone, thymulin, which is required for maturation of T cell^{8,9}.

Studies of zinc supplementation for the treatment or improved management of acute lower respiratory tract infections, including pneumonia have had mixed results^{10,11}. The clinical trial assessed the efficacy of zinc as adjuvant therapy to standard antibiotic treatment in reducing the duration of hospital stay of childhood pneumonia episode.

Materials and Methods

A total of 120 patients with severe pneumonia in hospitalized children fulfilling inclusion and exclusion criteria were enrolled by systematic random sampling and divided into two groups.

¹Dr ATM Faruque Ahmed, Associate Professor, Department of Pediatrics, Eastern Medical College & Hospital, Cumilla, Bangladesh.

²Dr Romy Tabrez Hyder, Assoc. Prof. (Paediatrics), Jahurul Islam Medical College & Hospital, Bajitpur, Kishoregonj, Bangladesh.

³Dr Abu Sufian, Assistant Professor, Department of Pediatrics, Eastern Medical College & Hospital, Cumilla, Bangladesh.

⁴Dr Abir Hossain, Assistant Professor, Department of Pediatrics, Eastern Medical College & Hospital, Cumilla, Bangladesh.

⁵Dr Ripon Chundra Majumder, Associate Professor, Dept. of Nephrology, Eastern Medical College & Hospital, Cumilla, Bangladesh.

Address of Correspondence: Dr ATM Faruque Ahmed, Associate Professor, Department of Pediatrics, Eastern Medical College and Hospital, Cumilla, Bangladesh. Mobile: +8801812831049, Email: ahmedfaruque8@gmail.com

Group-A includes 60 patients and Group-B also includes 60 patients. Identical small packets that contained 10 mg zinc sulphate powder or 10 mg placebo powder were coded as A and B by guide. The patients of group-A were treated with coded A packet and those of group-B were treated with coded B packet for total of 7 days. Antibiotic and supportive treatment was administered according to WHO guidelines. The primary outcome was recovery from severe pneumonia. Group A and Group B completed the schedule treatment protocol. Decoding was done by the guide after the completion of the study, coded A blister was placebo and coded B blister was zinc. The patients of group-A were treated with code-A packet and those of group-B were treated with code-B packet. Children aged less than 12 months receive one packet of code-A or one packet of code-B, while those aged 12 months or more received two packet of code-A or two packet of code-B daily for 7 days. Children received code-A or code-B powder that was mixed with breast milk or water and were taken by mouth at the time of enrollment. From day 2, they received one or two packets of their assigned treatment by mouth twice a day for a total of 7 days. The standard treatments of severe pneumonia (antibiotic, oxygen therapy, fluid, and nutrition) were given to both groups accordingly.

Results

In this study most of the patients belonged to the age group 6 months to 2 years in both groups (Figure-1). Mean age was found 11.62±11.13 months in placebo group and 11.49±9.73 months in zinc group. Most of the patients were male in placebo group (78.3%) and in zinc group (73.3%) (Figure-2). The difference was not significant between the two groups.

Table-I demonstrated the clinical findings of both groups. The respiratory rate of placebo and zinc group were 117.35±16.14 and 113.27±23.41 breaths per minute and was not statistically significant. Time for normalization of chest indrawing was 111.86±14.17 hours in placebo group and 93.62±25.33 hours in zinc group and was statistically significant. Time for normalization of temperature was 36.12±14.13 hours in placebo group and 25.78±5.72 hours in zinc group, time for normalization of SPO₂ was 30.95±17.52 hours in placebo group and 24.53±9.17 hours in zinc group and time for normalization of crepitation was 98.78±51.37 hours in placebo group and 78.82±44.91 hours in zinc group, which were statistically significant (p<0.05) between two groups.

In Table-II, time for normalization of all parameters (clinical recovery) in placebo group and zinc group was 127.12±24.58 hours and 111.23±35.47 hours respectively which were statistically significant

(p<0.05). All patients of both groups were discharged. Mean length of hospital stay was found 6.78±0.42 days in placebo group and 5.42±0.81 days in zinc group. Mean length of hospital stay was significantly longer in placebo group than zinc group (p<0.05).

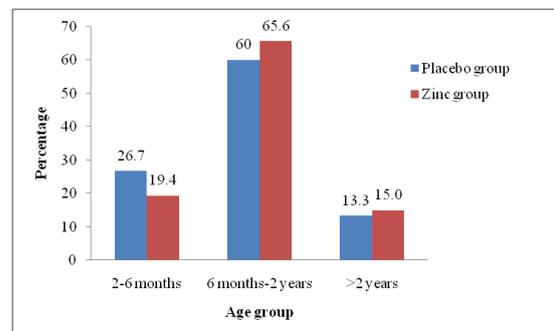


Figure-1: Age distribution of the study patients (n=120)

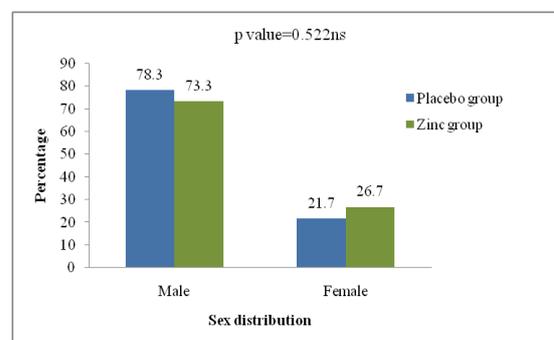


Figure-2: Gender distribution of the study patients (n=120)

Table-I: Clinical findings of the study patients

Clinical findings	Placebo group (n=60)	Zinc group (n=60)	p value
Respiratory rate	117.35±16.14	113.27±23.41	0.268 ^{ns}
Chest indrawing	111.86±14.17	93.62±25.33	0.001*
Nasal flare	30.37±5.45	28.34±6.68	0.070 ^{ns}
Temperature	36.12±14.13	25.78±5.72	0.001*
SPO ₂	30.95±17.52	24.53±9.17	0.035*
Crepitation	98.78±51.37	78.82±44.91	0.025*

*=Significant, ns= not significant

Table-II: Time for normalization and length of hospital stay of the study patients.

Variables	Placebo group (n=60) (mean±SD)	Zinc group (n=60) (mean±SD)	p value
Time for normalization of all parameters (hours)	127.12 ±24.58	111.23 ±35.47	<0.005*
Length of hospital stay (day)	6.78±0.42	5.42±0.81	<0.001*

*=Significant, ns= not significant

Discussion

This randomized double-blind placebo-controlled trial was conducted in the Department of Pediatrics, Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh during the period from 1st July 2013 to 30th June 2015 with a view to explore the role of zinc as adjuvant therapy for severe pneumonia in under-5 children. For this purpose, 120 patients with childhood pneumonia were selected according to inclusion and exclusion criteria.

In this study most patients belonged to the age group 6 months to 2 years in both groups. Mean age was found 11.62±11.13 months in placebo group and 11.49±9.73 months in zinc group. This study also showed that maximum patients were in the age group of 6 months to 2 years in both placebo and zinc group (60.0% versus 65.6%). The difference was not statistically significant between the two groups. Sempertegui et al¹² also found that the mean age of the patients in placebo group was 12.99±11.24 months and that of zinc group was 13.06±10.32 months. In this regards Srinivasan et al¹³ found that age of their patients ranged from 6 to 59 months with a mean of 17.9±12.2 months in the zinc group and 18.1±11.7 months for the placebo group. In another study the mean age of the patients in placebo group was 7.1±5.6 months and that of zinc group was 7.8±6.0 months¹⁴.

This study showed that most of the patients were male in placebo group (78.3%) and in zinc group (73.3%). The difference was not significant between the two groups. This result was supported by Shah et al¹⁵ in which 67% patients were male and 32.8% patients were female in zinc group; while 62.3% patients were male, and 37.7% patients were female in placebo group.

In a current study observed time for normalization of chest indrawing was 111.86±14.17 hours in placebo group and 93.62±25.33 hours in zinc group. Time for normalization of temperature was 36.12±14.13 hours in placebo group and 25.78±5.72 hours in zinc group. Time for normalization of SPO₂ was 30.95±17.52 hours in placebo group and 24.53±9.17 hours in zinc group. Time for normalization of crepitation was 98.78±51.37 hours in placebo group and 78.82±44.91 hours in zinc group, that was significant ($p < 0.05$) between two groups. Time for normalization of all parameters (clinical recovery) in placebo group and zinc group was 127.12±24.58 hours and 111.23±35.47 hours respectively which were statistically significant ($p < 0.05$). Howie et al¹⁶ reported that the time to resolution for all respiratory symptoms of severity was not significantly different between placebo and zinc arms (42.3 vs 30.9 hours; $p = 0.24$). Bose et al¹⁰ also revealed in their study that time for

normalization of chest indrawing in placebo group and zinc group did not differ significantly (RR=0.92; 95% CI=0.70-1.22). Conversely Brooks et al¹⁷ found early recovery of chest indrawing in zinc group (RR=0.68; 95% CI=0.48-0.96). On the other hand, this result correlated with the study of Mahalanbis et al¹⁸ which found time for normalization of fever was earlier in zinc group.

This study showed the mean length of hospital stay was significantly longer in placebo group than zinc group. In a study by Valavi E¹⁹ et al showed that zinc-supplemented group experienced reduced time for symptom resolution and had shorter hospital stay durations compared to patients receiving a placebo. In other studies, also reported a significant improvement of symptoms in zinc-supplemented participants as compared to placebo^{17,20}. In contrast Das et al found no significant difference between zinc and non-zinc groups in terms of hospital stay²¹.

Conclusion

Supplementation of zinc therapy in childhood pneumonia causes early clinical recovery and less duration of hospital stay in comparison to the non-zinc therapy group. So, it can be concluded that zinc supplementation is effective and safe as an adjuvant treatment in childhood pneumonia to prevent morbidity in children.

Conflict of interest

The authors declared that they have no conflict of interest.

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