

Research Article

# Adjunctive Role of Elemental Zinc in Infants and Children with Severe Pneumonia

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Received: 25.06.2026, Revised: 17.08.2026, Accepted: 20.08.2026

## ABSTRACT

**Objective:** To assess the adjunctive role of elemental zinc in infants and children hospitalized with severe pneumonia in terms of duration of remission of signs of severe pneumonia and hospital stay. Study Design: Randomized controlled study.

Duration and place of study: The study was conducting in the department of Pediatric Medicine, Fauji foundation hospital, Rawalpindi from February 2026 till May 2026.

**Methodology:** All infants and children with clinical diagnosis of pneumonia were enrolled. Group A (intervention group) received 10mg and 20mg daily of elemental zinc for children younger than 6 months and older than 6 months respectively, from the first day of treatment for 14 days along with standard treatment and Group B (control group) received standard treatment alone. Patients were monitored daily for the remission of signs till their discharge from the hospital. All the information was entered on the predesigned Performa and analyzed by using the SPSS 23 version.

**Results:** Duration of symptoms remission in the Zinc+ Standard care group & standard care alone group was (4.33±0.64 days vs 5.58±0.81 days, p=0.0001 respectively). The duration of hospital stay in the Zinc+ Standard care group & standard care alone group was (4.87±0.67 days vs 6.33±1.00 days, p=0.0001).

**Conclusion:** Zinc supplementation with standard care resulted in earlier remission of signs of severe pneumonia and shorten hospital stay in infants and children hospitalized with severe pneumonia.

**Keywords:** Elemental Zinc, Infants, Children, Pneumonia.

## INTRODUCTION

Pneumonia is the largest cause of under-5 mortality in children. (1). In developed and resource-rich countries, the annual incidence of pneumonia is estimated to be 3.3 per 1000 in children younger than 5 years and 1.45 per 1000 in children 0 to 16 years of age. Approximately one-half of children younger than five years of age with community-acquired pneumonia require hospitalization. (2) Recent evidence showed higher annual incidence in resource-limited countries and estimated to be 231/1000 in children <5 years and 50-80% of children with severe pneumonia required hospitalization. In 2015, lower respiratory tract infections (LRTIs) accounted for nearly 1 million deaths among

children under 5 years of age worldwide. (2) In observational studies in resource-rich countries, the case fatality rate among hospitalized children <5 years of age was <1%. A systematic review demonstrated that the case fatality rate among hospitalized children <5 years in resource-limited countries ranged from 0.3 to 15%. Viruses are the most common etiology of pneumonia and account for up to 70% of cases in young children.<sup>3</sup>

The classification and recommendations for the management of pneumonia in health facilities have recently been modified in light of new evidence generated from research carried out in the last decade. Integrated Management of Neonatal and Childhood Illness

(IMNCI) at the health facility level has been updated accordingly. The guidelines classify the respiratory symptoms of children 2 to 59 months of age into three categories, no pneumonia, pneumonia and severe pneumonia or very severe disease<sup>4,5</sup>.

Data shows that the majority of childhood pneumonia deaths are due to severe pneumonia/severe disease; management of these cases requires early identification and prompt referral<sup>6</sup>. WHO undertook a review of the evidence, with the aim of developing a simplified approach that could increase the number of children receiving the correct diagnosis and treatment for pneumonia.<sup>7</sup> Zinc has immune-enhancing properties and The UNICEF recommends daily supplementation of zinc 10 mg for younger than 6 months and 20 mg for older than 6 months result in decreased incidence of diarrhea and pneumonia<sup>8</sup>.

The present study was designed to determine the effects of elemental zinc plus standard care and standard care alone in the management of pneumonia in infants and children. The adjunctive therapy with zinc if proven better than standard care alone shall subsequently be administered to these children in routine clinical practice. This will result in earlier discharge from the hospital thereby decreasing the burden on our inpatient department.

## METHODOLOGY

This randomized controlled trial was conducting in the department of Pediatric Medicine, Fauji foundation hospital, Rawalpindi from February 2026 to May 2026. The sample size was calculated by using WHO sample size calculator with the following parameters with level of significance = 5 %, power of test = 90 %, anticipated population proportion I (duration of hospital stay of >5 days in intervention group) =20%<sup>9</sup>, anticipated population proportion II (duration of hospital stay of >5 days in control group) =40%<sup>9</sup>, 55 patients in each group and a total of 55+55=110 patients were included in the study. Non-probability consecutive sampling technique was used for sampling. Admitted Infants and children with clinical diagnosis of severe pneumonia with age 2 months to 59 months were included in the study. Children with severe pneumonia having history of bronchial asthma. with congenital lung malformations, congenital heart disease and malnourished children were excluded from the

study.

Permission and approval of the study were sought from the hospital's ethical and scientific board. All infants and children with clinical diagnosis of pneumonia according to WHO guidelines were enrolled. Written informed consent was taken from the parents/guardians. All the enrolled subjects were randomly allocated to two treatment groups by computer-generated random numbers method.

Group A (intervention group) received 10mg and 20mg daily of elemental zinc for children younger than 6 months and older than 6 months respectively from the first day of treatment for 14 days along with standard treatment and Group B (control group) received standard treatment alone.

Patients were monitored daily for the remission of signs till their discharge from the hospital. All the information was entered on the predesigned Performa by the researcher himself to comply with the study protocol attached as Annexure-A.

Data was entered on computer software SPSS version 23. Quantitative variables like age, duration of symptoms remission, and duration of hospital stay were measured as mean  $\pm$  SD. Frequencies and percentages were calculated for categorical variables like gender, symptoms duration, and hospital admission of <5 days or > 5 days. Independent sample t-test was applied to compare the duration of symptoms remission and hospital stay between both groups. A p-value  $\leq 0.05$  was considered as significant. Effect modifiers like gender, age, and duration of symptoms were controlled by randomization.

## RESULTS

We enrolled 110 patients in the current study with 55 in each group. The demographic profile of patients is given in table 1. The duration of cough in patients of Group A was  $4.47 \pm 2.6$  days and in Group B was  $4.33 \pm 2.29$  days with p-value ( $p=0.754$ ). The duration of fever in patients of Group A was  $4.36 \pm 2.68$  days and in Group B was  $4.18 \pm 2.33$  days with p-value ( $p=0.704$ ). The duration of feeding difficulty in patients of Group A was  $1.71 \pm 1.66$  days and in Group B was  $1.55 \pm 1.14$  days with p-value ( $p=0.548$ ) shown in table 2.

In Group A patients 32(58.2%) had history of drowsiness and in Group B 31(56.4%) had history of drowsiness with p-value ( $p=0.847$ ). Similarly, in Group A patients 6(10.9%) had

history of fits and in Group B 3(5.5%) patients had history of fits with p- value ( $p=0.297$ ). The duration of symptoms remission in Group A was  $4.33 \pm 0.64$  days and in Group B was  $5.58 \pm 0.81$  days with p-value ( $p=0.0001$ ). In Group A 54(98.2%) patients had a duration of symptoms remission  $<5$  days and in Group B 28(50.9%) patients had a duration of symptoms remission  $>5$  days with p-value ( $p=0.0001$ ).

The duration of hospital stay in group A was  $4.87 \pm 0.67$  days and in Group B was  $6.33 \pm 1.00$  days with p value ( $p=0.0001$ ). In Group A 8(14.5%) patients had a duration of hospital stay  $>5$  days and in Group B 42(76.4%) patients had a duration of hospital stay  $>5$  days with p- value ( $p=0.0001$ ). The effect modifiers result of age, gender, and duration of symptoms with duration of remission and hospital stay were significant.

Table1: Comparison of Demographic Features and Nutritional Status of Children with Pneumonia between the Two Study Groups

| Demographic features         | GroupA<br>(n=55)<br>Zinc + standard<br>care | Group B<br>(n=55)<br>Standard care alone | P value |
|------------------------------|---------------------------------------------|------------------------------------------|---------|
|                              | 6.74 $\pm$ 8.24                             | 8.38 $\pm$ 12.08                         | 0.406   |
| Gender                       |                                             | Total                                    | 0.848   |
| Male n(%)                    | 30 (54.5 % )<br>25 (45.5 % )                | 29(52.7 % )<br>26(47.3 % )               |         |
| Female n(%)                  |                                             | 59(53.6%)<br>51(46.4%)                   |         |
| Height in cm Mean( $\pm$ sd) | 64.42 $\pm$ 8.42                            | 65.75 $\pm$ 11.86                        | 0.500   |
| Weight in kg Mean( $\pm$ sd) | 6.89 $\pm$ 2.40                             | 7.04 $\pm$ 3.05                          | 0.774   |

Table 2: Results of Effect Modifiers of Age, Gender and Duration of Symptoms with Duration of Symptoms Remission $>5$ days Duration in Study Group

| Variables |                | Duration of symptoms remission $>5$ days duration | Study groups                      |                                    | Total       | p value |
|-----------|----------------|---------------------------------------------------|-----------------------------------|------------------------------------|-------------|---------|
|           |                |                                                   | GroupA<br>Zinc + standard<br>care | Group B<br>(Standardcare<br>alone) |             |         |
|           | 2-12<br>Months | Yes                                               | 1<br>1.9%                         | 25<br>54.3%                        | 26<br>26.5% | 0.0001  |
|           |                |                                                   | 51<br>98.1%                       | 21<br>45.7%                        | 72<br>73.5% |         |
|           |                | No                                                | 0<br>0.0%                         | 1<br>16.7%                         | 1<br>12.5%  |         |
|           |                |                                                   |                                   |                                    |             |         |

|            |              |     |        |       |       |        |
|------------|--------------|-----|--------|-------|-------|--------|
| Age groups | 13-24 months | No  | 2      | 5     | 7     | 0.5370 |
|            |              |     | 100.0% | 83.3% | 87.5% |        |
|            | >24 months   | Yes | 0      | 2     | 2     | 0.2480 |
|            |              |     | 0.0%   | 66.7% | 50.0% |        |
|            |              | No  | 1      | 1     | 2     |        |
|            |              |     | 100.0% | 33.3% | 50.0% |        |
|            | Male         | Yes | 1      | 12    | 13    | 0.0001 |
|            |              |     | 3.3%   | 41.4% | 22.0% |        |
|            |              | No  | 29     | 17    | 46    |        |
|            |              |     | 96.7%  | 58.6% | 78.0% |        |

|                           |          |     |        |       |       |        |
|---------------------------|----------|-----|--------|-------|-------|--------|
| Gender                    | Female   | Yes | 0      | 16    | 16    | 0.0001 |
|                           |          |     | 0.0%   | 61.5% | 31.4% |        |
|                           |          | No  | 25     | 10    | 35    |        |
|                           |          |     | 100.0% | 38.5% | 68.6% |        |
| Duration of cough in days | <7 days  | Yes | 1      | 23    | 24    | 0.0001 |
|                           |          |     | 2.4%   | 53.5% | 28.6% |        |
|                           |          | No  | 40     | 20    | 60    |        |
|                           |          |     | 97.6%  | 46.5% | 71.4% |        |
|                           | > 7 days | Yes | 0      | 5     | 5     | 0.0007 |
|                           |          |     | 0.0%   | 41.7% | 19.2% |        |
|                           |          | No  | 14     | 7     | 21    |        |
|                           |          |     | 100.0% | 58.3% | 80.8% |        |

|                           |          |     |        |       |       |        |
|---------------------------|----------|-----|--------|-------|-------|--------|
| Duration of fever in days | <7 days  | Yes | 1      | 23    | 24    | 0.0001 |
|                           |          |     | 2.4%   | 52.3% | 28.2% |        |
|                           |          | No  | 40     | 21    | 61    |        |
|                           |          |     | 97.6%  | 47.7% | 71.8% |        |
|                           | > 7 days | Yes | 0      | 5     | 5     | 0.0005 |
|                           |          |     | 0.0%   | 45.5% | 20.0% |        |
|                           |          | No  | 14     | 6     | 20    |        |
|                           |          |     | 100.0% | 54.5% | 80.0% |        |
|                           | <2 days  | Yes | 1      | 23    | 24    | 0.0001 |
|                           |          |     | 2.1%   | 47.9% | 25.0% |        |
|                           |          | No  | 47     | 25    | 72    |        |
|                           |          |     | 97.9%  | 52.1% | 75.0% |        |
|                           |          | Yes | 0      | 5     | 5     |        |
|                           |          |     |        |       |       |        |

|                                |         |     |        |       |       |        |
|--------------------------------|---------|-----|--------|-------|-------|--------|
| Duration of difficulty in days | >2 days |     | 0.0%   | 71.4% | 35.7% | 0.0050 |
|                                |         |     | 7      | 2     | 9     |        |
|                                |         | No  | 100.0% | 28.6% | 64.3% |        |
| History of drowsiness          | Yes     | Yes | 1      | 17    | 18    | 0.0001 |
|                                |         |     | 3.1%   | 54.8% | 28.6% |        |
|                                |         | No  | 31     | 14    | 45    |        |
|                                |         |     | 96.9%  | 45.2% | 71.4% |        |
|                                | No      | Yes | 0      | 11    | 11    | 0.0001 |
|                                |         |     | 0.0%   | 45.8% | 23.4% |        |
|                                |         | No  | 23     | 13    | 36    |        |
|                                |         |     | 100.0% | 54.2% | 76.6% |        |

|                 |     |     |        |        |       |        |
|-----------------|-----|-----|--------|--------|-------|--------|
| History of fits | Yes | Yes | 0      | 3      | 3     | 0.0030 |
|                 |     |     | 0.0%   | 100.0% | 33.3% |        |
|                 |     | No  | 6      | 0      | 6     |        |
|                 |     |     | 100.0% | 0.0%   | 66.7% |        |
|                 | No  | Yes | 1      | 25     | 26    | 0.0010 |
|                 |     |     | 2.0%   | 48.1%  | 25.7% |        |
|                 |     | No  | 48     | 27     | 75    |        |
|                 |     |     | 98.0%  | 51.9%  | 74.3% |        |

## DISCUSSION

There are varied results from different researchers on the role of zinc in the reduction of the severity of pneumonia. Some researchers suggest using zinc supplements to treat pneumonia shortens hospital stays and symptom duration.<sup>9</sup> The results of Yasin et al. are comparable with our findings, in that, they also carried out the study at tertiary care hospital with the same sample size and results similar to ours<sup>10</sup>.

Brook et al. reported the use of zinc in expediting recovery<sup>11</sup>. Similarly a research on 200 school-age children at the University of Mashhad proved that the zinc-treated group had less incidence of flu.<sup>12</sup> Furthermore, another study, involving 153 hospitalized children with severe pneumonia in India, who were randomly divided into two groups, found that the group which received zinc, vitamin A, and antibiotics recovered more quickly than the group which received only antibiotics and

vitamin A.<sup>13</sup> Hashimi et al also studied the effectiveness of zinc as adjuvant therapy in children with severe pneumonia. In the group having zinc as adjuvant therapy 56% of the babies showed improvement, whereas only 38% of the children in the other group exhibited improvement and this difference was statistically significant.<sup>14</sup>

Another trial by Mazari et al. found that giving zinc together with conventional antibiotic treatment to children 2 to 60 months of age significantly reduced the length of time needed to recover from severe pneumonia and hospital stay. Zinc supplement effectiveness was determined to be 57.1 percent, compared to 19 percent for non-zinc adjuvant treatment.<sup>15</sup>

Children who received zinc in a study conducted in India by Somji et al. recovered quickly and experienced fewer treatment failures and episodes of severe pneumonia lasting 72, 96, or 120 hours.<sup>16</sup> Another finding

of their study was that zinc supplementation caused clinical symptoms to disappear sooner in children who did not wheeze. Shehzad et al. evaluated the role of zinc supplementation in children with pneumonia. They concluded that zinc supplementation is an effective therapy for treating children with pneumonia.<sup>17</sup>

In a Randomized controlled trial of 94 patients aged 6 to 36 months with pneumonia in Tanzania adjuvant therapy with zinc showed no significant reduction in the duration of hospitalization and remission of symptoms<sup>18</sup>.

In a meta-analysis of 9 randomized controlled trials done in 2016 in 3000 children younger than five years of age in China zinc supplementation did not show any statistical difference in the length of hospital stay<sup>19</sup>. These findings do not match our study results, but this could be because of the fact that some of these studies are done in middle-income or well-developed countries, where zinc deficiency is uncommon, also they gathered information from parents that may indicate the limitation of their study.

## CONCLUSION

This research demonstrates zinc as adjuvant therapy in the treatment of severe pneumonia hastens recovery by early resolution of symptoms and signs of pneumonia and shortens hospital stay.

## Disclaimer

The current manuscript has not been published or presented in any journal or conference before.

## Conflict of interest

No conflict of interest in terms of honorarium, funding, credits and promotion.

## Funding Disclosure

None to declare

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