

Original Research

Role of zinc levels in acute lower respiratory infections

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ABSTRACT:

Background: Acute lower respiratory tract infection is any acute infection involving the lower part of the respiratory system, from the trachea to the lung parenchyma, is a leading cause of morbidity and mortality, especially in developing countries. The present study was conducted to assess role of zinc levels in acute lower respiratory infections in adults.

Materials & Methods: Groups were prepared in which group I comprised of cases and group II were control. 5 ml of venous blood was taken in a test tube for zinc estimation using colorimetric test. **Results:** Group I had 22 males and 18 females and group II had 21 males and 19 females. The mean zinc level in group I was 54.6ug/ dl and in group II was 82.7 ug/ dl. The difference was significant ($P < 0.05$). The time to cessation of ALRIa was 3.2 days, time to disappearance of tachypnea was 8.4 hours, time to achieve SpO₂>94% in room air was 1.2 days, time to resolution of fever was 10.3 hours and hospital stay was 3.5 days. **Conclusion:** Patients with acute lower respiratory tract infection had lower serum zinc level as compared to healthy subjects.

Key words: Acute Lower Respiratory Tract Infection, Oxygen, Zinc

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INTRODUCTION

An Acute Lower Respiratory Tract Infection (ALRI), which is defined as any acute infection involving the lower part of the respiratory system, from the trachea to the lung parenchyma, is a leading cause of morbidity and mortality, especially in developing countries.¹ It is estimated that approximately 120-156 million children suffer from ALRI globally per year and that around 7-13% of all ALRI cases may progress to become severe diseases that warrant hospitalization.²

Zinc deficiency decreases the ability of the body to respond to infection, and also adversely affects both cell-mediated and humoral immune responses. The impaired immuno-competence due to low zinc states would not only enhance the establishment of a particular infection but is also associated with a reduction in the clearance of infectious agents.³ The zinc concentration in plasma, hair and urine can be assessed in detecting zinc deficient states but

measuring the serum zinc level has been recommended as an appropriate biomarker. The serum concentration is affected by factors such as age, dietary intake and infections.⁴ Zinc deficiency has been a particular focus of attention because of its high frequency in developing countries and its debilitating effects on immune function.⁵ The present study was conducted to assess role of zinc levels in acute lower respiratory infections in adults.

MATERIALS & METHODS

The present case control study was conducted among 40 cases with acute lower respiratory infections of both genders. All were part of the study after their written informed consent.

Demographic data, history, clinical findings, laboratory findings and details of clinical course were recorded. Groups were prepared in which group I comprised of cases and group II were control. 5 ml of venous blood was taken in a test tube for zinc

estimation using colorimetric test. Results thus found considered significant. were analysed statistically. P value less than 0.05 was

RESULTS

Table I Distribution of patients

Groups	Group I (Cases)	Group II (Control)
Male: Female	22:18	21:19

Table I shows that group I had 22 males and 18 females and group II had 21 males and 19 females.

Table II Assessment of zinc level in both groups

Groups	Mean (ug/ dl)	P value
Group I	54.6	0.02
Group II	82.7	

Table II, graph I shows that mean zinc level in group I was 54.6ug/ dl and in group II was 82.7 ug/ dl. The difference was significant (P< 0.05).

Graph I Assessment of zinc level in both groups

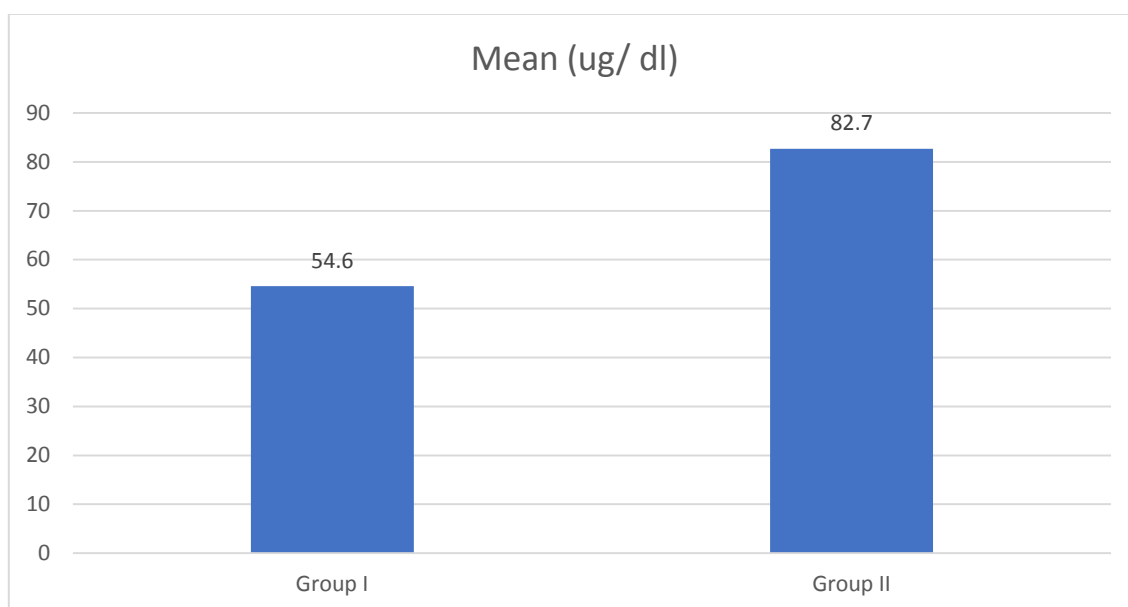
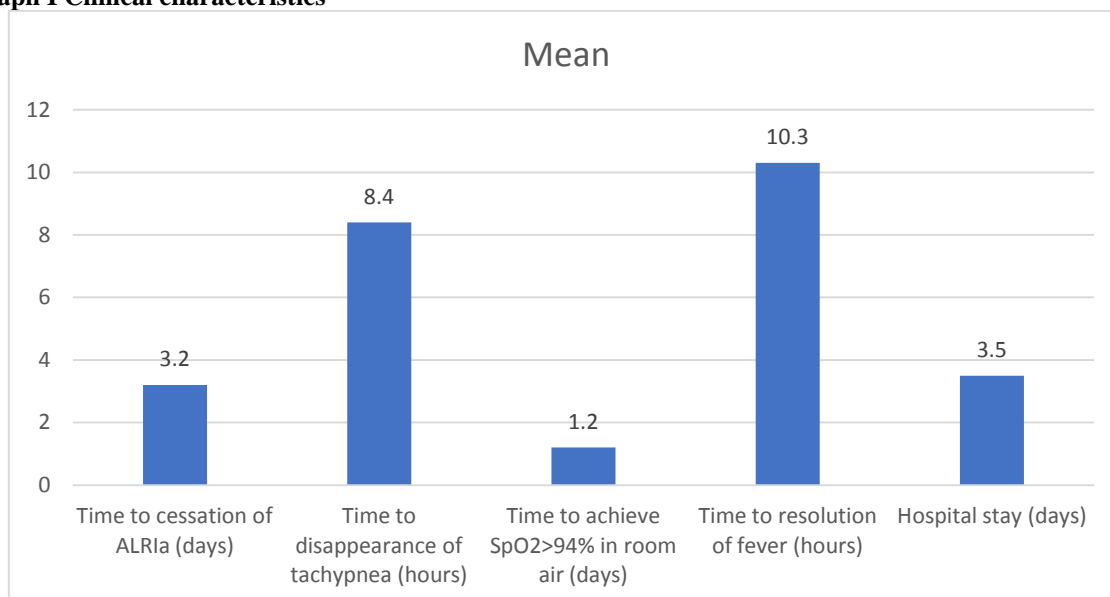


Table III Clinical outcome

Outcome	Mean
Time to cessation of ALRIa (days)	3.2
Time to disappearance of tachypnea (hours)	8.4
Time to achieve SpO2>94% in room air (days)	1.2
Time to resolution of fever (hours)	10.3
Hospital stay (days)	3.5

Table III, graph II shows that time to cessation of ALRIa was 3.2 days, time to disappearance of tachypnea was 8.4 hours, time to achieve SpO2>94% in room air was 1.2 days, time to resolution of fever was 10.3 hours and hospital stay was 3.5 days.

Graph I Clinical characteristics**DISCUSSION**

Zinc supplementation has been studied extensively in developing countries, where zinc deficiency is common, as this element is an essential micronutrient for many physiological functions.⁶ With regard to the immune response, zinc directly promotes an antiviral activity and the immune-related release of interferon, and regulates the host's immune response to infection, by enhancing the mucous membrane barriers, the leukocyte function, and the cytokine expression. Zinc is essential for the immune system, and a zinc deficiency has been reported to be associated with the increased chance of several infections, including ALRI.⁷ The present study was conducted to assess role of zinc levels in acute lower respiratory infections in adults.

In present study, group I had 22 males and 18 females and group II had 21 males and 19 females. Rerksuppaphol et al⁸ examined the effect of zinc supplementation on the treatment outcome in patients hospitalized with ALRI. A randomized, double blinded, placebo-controlled trial was conducted on 64 hospitalized children with ALRI, who were aged between 2 and 60 months. Children were randomly allocated to receive zinc (30 mg elemental zinc/day) or placebo. The primary outcome was the time to the cessation of ALRI, while the secondary outcomes were the length of the stay in hospital and the individual features of the disease. The study found that ALRI cessation was faster in children who received zinc supplementation (median (IQR): 3 (2-4) days and 4 (3-5) days, respectively; $P=0.008$), and that their hospital stay was shorter (mean (SD): 3.8 (1.3) days and 6.1 (3.2) days, respectively; $P<0.001$) than the placebo group. Zinc supplementation was well-tolerated, and no adverse events were reported.

We found that mean zinc level in group I was 54.6ug/dl and in group II was 82.7 ug/ dl. Brooks et al⁹ showed that the zinc supplementation of 20

mg/day, in the form of zinc acetate, reduced the duration of hospitalization and accelerated the recovery time from severe ALRI (pneumonia). Chang et al¹⁰ found that giving zinc gluconate supplementation (20-40 mg/day) to indigenous Australian children had no clinical benefit for the recovery from the symptoms, or on the duration of hospitalization. Instead, they found that children who were given zinc supplements had an increased risk of readmission with ALRI.

We found that time to cessation of ALRIa was 3.2 days, time to disappearance of tachypnea was 8.4 hours, time to achieve SpO₂>94% in room air was 1.2 days, time to resolution of fever was 10.3 hours and hospital stay was 3.5 days. Ibraheem et al¹¹ conducted a study on 120 patients with ALRI recruited as subjects, and 120 age- appropriate controls without ALRI. The male/ female ratio was 1.6:1. The mean (SD) serum zinc level in subjects with ALRI of 18.7(11.8) $\mu\text{g/dl}$ was significantly lower than the corresponding value of 53.1(18.5) $\mu\text{g/dl}$ recorded in the controls, $p=0.001$. The prevalence of 98.3% for low serum zinc levels recorded in cases with ALRI was significantly higher than that recorded in controls of 64.2%, $p=0.001$.

Supplementation of zinc could reduce the risk of pneumonia and the risk and duration of diarrhea, dysentery and malaria deaths among all infectious diseases, and they accounted for 3.9 million deaths worldwide.¹² Zinc deficiency decreases the ability of the body to respond to infection and also adversely affects both cell-mediated and humeral immune responses. It has a fundamental role in cellular metabolism, with profound effects on the immune system and the intestinal mucosa.¹³ The zinc concentration in plasma, hair and urine can be assessed in detecting zinc deficient states but measuring the serum zinc level has been recommended as an appropriate biomarker.¹⁴

CONCLUSION

Authors found that patients with acute lower respiratory tract infection had lower serum zinc level as compared to healthy subjects.

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