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EVALUATION OF SERUM ZINC LEVELS IN HOSPITALIZED CHILDREN WITH ACUTE RESPIRATORY INFECTIONS

Gurnoor Singh[1], Anand Kumar Bhardwaj[2], Gauri Chauhan[3], Vikramjot Singh[4]

[1]Junior Resident, Department of Pediatrics, Maharishi Markandeshwar Institute of Medical Sciences and Research, Maharishi Markandeshwar (Deemed to be) University, Mullana, Ambala, Haryana.

[2]Professor and Head, Department of Pediatrics, Maharishi Markandeshwar Institute of Medical Sciences and Research, Maharishi Markandeshwar (Deemed to be) University, Mullana, Ambala, Haryana.

[3]Assistant Professor, Department of Pediatrics, Maharishi Markandeshwar Institute of Medical Sciences and Research, Maharishi Markandeshwar (Deemed to be) University, Mullana, Ambala, Haryana.

[4]Junior Resident, Department of Pediatrics, Maharishi Markandeshwar Institute of Medical Sciences and Research, Maharishi Markandeshwar (Deemed to be) University, Mullana, Ambala, Haryana.

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Corresponding Author: Anand Kumar Bhardwaj
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ABSTRACT:

Background: ARI is the leading cause of mortality and a common cause of morbidity in children below 5 years. Zinc deficiency may increase the risk of respiratory tract infection. Zinc is thought to decrease susceptibility to acute lower respiratory infections by regulating various immune functions. The aim of study was to study serum zinc levels in hospitalized children with acute respiratory infections aged 2 month to 5 years.

Material and Methods: Serum Zinc levels in a hundred children admitted with ARI were evaluated.

Results and conclusion: Out of a hundred patients with ARI, 60% had below normal levels. Mean serum zinc levels were 70.27 25.23 $\pm\mu$g/dL. Zinc levels in LARIs were significantly lower (P value<0.05) when compared to UARIs. There was no statistically significant correlation with age, gender, anemia and immunization status.

Keywords: ARI, UARIs, LARIs, Zinc serum levels.

Abbreviations: ARIs- Acute Respiratory Infections, UARIs- Upper Acute Respiratory Infections, LARIs- Lower Acute Respiratory Infections, NIS- National immunization Schedule

INTRODUCTION:

Acute respiratory infections (ARIs) are a major burden to the child health in developing countries like India, Bangladesh, Pakistan etc. Among ARI, lower respiratory tract Infections is the leading cause of death among children under 5 years of age in all over the world. It results in nearly 1.5 million childhood deaths per year[1]. In the most recent estimate ALRIs associated mortality in India, pneumonia was held responsible for 369000 deaths (25% of all deaths) among those 1-59 months, making it the single most important killer in this age group[2]. ARIs are either UARIs or LARIs[3].

Zinc is the second most abundant metal in organisms, second only to Iron, with 2-4 gram distributed throughout the human body. It is critical for cell growth, development and differentiation[4]. Zinc is in every cell of the human body and is required for normal functioning. Zinc enables hundreds of enzymes to function, facilitates protein synthesis, and regulates processes such as gene expression and apoptosis. Zinc is involved in both nonspecific and specific immune system processes, including phagocytosis, maintenance of gastrointestinal and respiratory tract linings, and development and function of T and B cells[5]. Low serum zinc levels are significantly associated with increased respiratory rate, increased respiratory distress and decreased saturation, increased leucocyte count. Some studies have shown low plasma zinc level is a marker of severe pneumonia[6]. Zinc has antioxidant effect and has a direct role in the immune system

and in maintaining the integrity of the respiratory tract. The antioxidant property of Zinc helps in reducing the inflammation of the respiratory tract and thus aids in healing and fastens the recovery from illness[7]. The aim of the study was to study the serum zinc levels of hospitalized children in acute respiratory infections aged 2 months to 5 years.

Material and Methods:

The present observational study was conducted in the Department Of Pediatrics at Maharishi Markandeshwar Institute of medical sciences and research, Mullana (Ambala.) 100 hospitalized children suffering from ARIs, 2 months to 5 years of age were enrolled in the study.

Inclusion criteria: All the hospitalized children between 2 months to 5 years of age suffering from acute respiratory infections either sex(male or female).

Exclusion criteria: Children with known zinc supplementation, chronic respiratory illness, for example, Pulmonary tuberculosis. Parents of children not willing to participate in the study.

Methods: Serum zinc estimation was done by colorimetric zinc kit using ERBA chem semi auto-analyzer.

Statistical Analysis: The data were analysed by specific statistical methods applicable to various sets of data. All the statistical methods were performed through SPSS for windows version 25, the P-value of <0.05 was considered statistically significant. Microsoft word and excel was used to generate Graphs and Tables.

Results and Analysis:

Table 1: Demographic profile of patients:

Characteristics	% age
Distribution according to age group	
<12 months	26%
> 12 months	74%
Distribution according to gender	
Male	61%
Female	39%
Distribution according to immunization status	
No	4%
Partial	58%
Complete	38%

Table 2: Clinical features of patients

Clinical symptoms at presentation	
Cough	97%
Fever	85%
Difficulty in breathing	59%
Cold	54%
Sore throat	27%
Clinical signs at Presentation	
Increased respiratory rate	64%
Retraction	47%
Crepitation	40%
Wheeze	35%
Distribution according to Diagnosis	
Pneumonia	23%
Severe Pneumonia	20%
Common Cold	12%
Pharyngitis	8%
Pharyngotonsillitis	16%
Bronchiolitis	9%
Severe pneumonia with CHD	12%
Distribution according to Anemia status	
Anemia present	61%
Anemia absent	39%
Distribution according to UARIs and LARIs	
UARIs	36%
LARIs	64%

Most of the patients in our study were >12 months (74%) with male predominance (61%). complete immunization was seen in 38 %, 61% were anemic. The most common symptom at presentation was cough 97% and fever 85%. Increased respiratory rate was the most common sign. LARI was seen in 64% patients.

Table 3: Distribution of patients as per Serum Zinc Levels

Percentage of Patients		Serum Zinc Level	
		< 59.99 μg/dL	> 60 μg/dL
Total	100%	60%	40%
Mean Zinc Level- 70.27 $\pm$25.23 μg/dL			

Table 4: Comparison of mean Serum Zinc levels in patients with ARI.

	Characteristics	Zinc levels (Mean Value) μg/dL	P value
Age	<12 Months	72.65±27.60	0.579
	> 12 months	69.43±24.48	
Gender	Male	69.05±24.41	0.549
	Female	72.20±26.66	
Anemia	Without anemia	73.3±25.7	0.34
	With anemia	68.34±24.96	
Immunization As per NIS	No Immunization	53.5±4.2	0.152
	Partial Immunization	68.07±25.6	
	Complete Immunization	75.4+-25.23	
ARIs	UARIs	85.45±31.28	0.04
	LARIs	60.78±14.13	

The majority of patients (60%) had low serum zinc levels. Patients more than 12 months of age had low serum zinc levels as compared to less than 12 months but not statistically significant. Serum zinc levels were more in females as compared to males but not statistically significant. Though serum zinc levels were more in patients who were completely immunized but not statistically significant. Similarly Serum zinc levels were less in anemic patients as compared to non anemic but were not statistically significant. Serum zinc levels were low in LARIs as compared to UARIs and was statistically significant (P-value <0.05).

Discussion:

The present study enrolled 100 hospitalized children with ARIs aged 2 months to 5 years. Mean age in our study was 26.35±17.36 months comparable to studies done by Pushpa et al(2009)[8], Hussain AM et al (2016)[9], Kumar D.E. et al (2019)[10]. Male predominance was seen in 61 %, male to female ratio was 1.56:1 which is consistent with the study of Rady H.I et al (2013)[11], Islam S.N.et al (2018)[12]. In our study 61 % of patients presented with anemia, similar observations were seen by Hussain S.Q. et al (2014)[13], Kumar D.E. et al(2019)[10] and Mourad S. et al(2010)[14]. In our study, 38% of patients were completely immunized and 4% were unimmunized. The same was observed by Broor S. et al (2001)[15]. The most common symptoms in our study were cough and fever, the same was observed by Kumar D. et al(2019)[10], Hussain A.M. et al(2016)[9]. 60 % patients had below-normal serum zinc levels. The normal range is 60-120 μg/dL. The mean serum zinc level in our study was 70.27± 25.23 μg/dL. In our study, mean serum zinc levels in patients, less than 12 months was 72.65±27.60 μg/dL and more than 12 months was 69.43±24.48 μg/dL. which is comparable to a study done by Pushpa et al(2009)[8], Islam S, N. et al(2018)[12]. Mean serum zinc level in male patients was 69.05±24.41 μg/dL and in females was 72.2±26.66 μg/dL which is comparable to study done by Islam N.S. et al (2018)[12] and Rady H.I. et al(2013)[11] and were not statistically significant. Mean serum zinc levels with no anemia were 73.3±27.7 μg/dL and with anemia was 68.34±2.96 μg/dL which is not statistically significant but this is, in contrast, to study done by Thakar S.et al (2004)[16] and Hussain A.M el at (2016)[9]. In our study mean serum zinc level with no immunization, partial immunization and complete immunization was 53.4±4.2 μg/dL, 68.07±25.6 μg/dL and 75.4±25.25 μg/dL respectively which is comparable to study done by Islam S.N. et al (2018)[12] and Hussain A.M et al(2016)[9]. Mean Serum zinc levels in patients with UARIs were 85.45±31.28 μg/dL and LARIs 60.78±14.13 μg/dL shows that serum zinc levels were lower in LARIs as compared to UARIs which was statistically significant. Our study is consistent with the study of Hussain A.M et al (2016)[9] Rady H.I. et al(2013)[11] Arica S. et al(2011)[17] and Ibraheem R.M. et al (2014)[18]

Conclusion:

Serum zinc levels were lower in 60% of patients with ARI. There is no statistically significant difference in mean serum zinc levels based on age, gender, immunization status, and anemia. Serum zinc levels are significantly lower in LARI than UARI (P-value <0.05). Zinc supplementation can be used as Adjuvant treatment in LARIs or as prophylaxis for LARIs in under 5 years of age but still more

studies are required to include this as standard therapy.

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