

ORIGINAL ARTICLE

Serum Zinc Levels in Children with Upper Respiratory Tract Infection in the Age of 2-12 Years in Pakistan

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ABSTRACT

Objective: The aim of this study is to determine the zinc levels in children with upper respiratory tract infection in the age of 2-12 years in Pakistan.

Study Design: A prospective observational

Place and Duration: Conducted at department of Paediatrics Hamdard University hospital, Karachi and PIMS Children Hospital, Islamabad for four months duration from October, 2020 to January, 2021.

Methods: Total 90 children of both genders were presented in this study. Patients' detailed demographics including age, sex, socio-economic class and maternal education were recorded after taking informed written consent from the authorities. Patients with upper respiratory tract infection were included. Mean serum zinc among children was calculated as 55.14±17.68 µg/dl. Outcomes were measured in terms of risk factors associated with URT and lower level of serum zinc among patients. Complete data was analyzed by SPSS 24.0 version.

Results: There were 60 (66.7%) males and 30 (33.3%) were females. Mean age of the cases were 08.44±7.65 years. 62 (68.9%) patients were from lower socio economic status and literacy rate of mothers were 35 (38.9%). Symptoms of URTI were cough, sore throat, runny nose and headache. Previous family history of URTI found in 55 (61.1%) cases. Rhinovirus was the most common cause of URTI found in 70(77.8%) cases. Severity of cold was found among 18 (20%) children. Mean serum zinc was 38.76±6.88 µg/dl and found among 87 (96%) cases.

Conclusion: We concluded in this study that the zinc level was significantly lower among children who had rhinovirus due to severe cold.

Keywords: Serum Zinc Level, Children, Upper Respiratory Tract Infection

INTRODUCTION

There are various elements of cell metabolism where zinc is involved. For catalytic activity, zinc is required by around 100 enzymes. It's crucial for immunological function, protein synthesis, wound healing, antioxidation, DNA synthesis, and cell division, to name a few functions. During lung inflammation and injury, it also protects the respiratory cells' integrity. There is an increased risk of stunted growth, diarrheal illnesses and respiratory tract infections in children with zinc insufficiency (Zinc deficiency). [1]

Zinc absorption occurs mostly in the jejunum, where it is carried by Zip4. [1,2] Metallothionein and cysteine-rich proteins help in its absorption through passive diffusion or by attaching to the apical membrane of enterocytes. [3,4]

After other symptoms of a cold have subsided, coughing and nasal discharge may continue for up to 14 days. [5] There are several acute upper respiratory tract infections (URTIs) that are commonly referred to as a common cold (though bronchi are generally classified as part of the lower respiratory tract.) Cough, sore throat, runny nose, nasal congestion, headache, low-grade fever, facial pressure, and sneezing are frequent symptoms of URTIs. [6]

Rhinovirus symptoms in children usually appear 1–3 days following exposure to rhinovirus. 7–10 additional days are usually required to recover from the illness. [5]

Yellow, thick, or green mucous discharge is a natural course of viral URTI and does not require antibiotic treatment. An otitis media infection causes pain and pressure in the middle ear, while viral conjunctivitis causes reddening of the eye. In many cases, [7] are connected with urinary tract infections. Rhinovirus infection mirrors the immune response in terms of pathogenesis. In the upper respiratory tract, the viruses do not harm the cells, but they do alter the tight connections of epithelial cells. Innate and adaptive immune responses are triggered as a result of this. [8] Oral and pharyngeal infections have been linked to sexually transmitted infections. [9] Each year, children suffer from two to nine viral respiratory diseases. 18 and a half billion URTIs were reported in 2013. There were approximately 3,000 fatalities in 2014, down from 4,000 deaths in 1990. [11] Acute respiratory infections (URIs) are the most frequent infectious disease among adults in the United States, and they are a primary cause of absence from work and school.

Children with ALRI have not been examined in the Gambia and Burkina Faso in West Africa, despite some interventional trials on zinc supplementation. [12,13] In addition, while some sections of Nigeria have conducted studies on blood zinc levels in children, there are very few studies that specifically target ALRI children. [14]

MATERIAL AND METHODS

This prospective observational study was conducted at of Paediatrics Hamdard University hospital, Karachi and PIMS Children Hospital, Islamabad for four months duration from October, 2020 to January, 2021. The study comprised of 90 children. Patients' detailed demographics were recorded after taking in formed written consent. Patients greater than 12 years and those had any other medical illness were excluded from this study.

Patients were aged between 2-12 years. Patients with upper respiratory tract infection were included. Mean serum zinc among children was calculated as 55.14±17.68 µg/dl. Outcomes were measured in terms of risk factors associated with URT and lower level of serum zinc among patients. Complete data was analyzed by SPSS 24.0 version.

RESULTS

There were 60 (66.7%) males and 30 (33.3%) were females. Mean age of the cases were 08.44±7.65 years. 62 (68.9%) patients were from lower socio economic status and literacy rate of mothers were 35 (38.9%). Symptoms of URTI were cough, sore throat, runny nose and headache. Previous family history of URTI found in 55 (61.1%) cases.(Table 1)

Table 1: Baseline details demographics of enrolled cases

Variables	Frequency	%age
Mean age (years)	08.44±7.65	
Gender		
Male	60	66.7
Female	30	33.3
Socio-Economic status		
High	28	31.1
Low	62	68.9
Literacy		
Yes	35	38.9
No	55	61.1
Symptoms		
Cough	40	44.4
Sore throat	25	27.8
Runny nose	19	21.1
Headache	6	6.7
Previous History		
Yes	55	61.1
No	35	38.9

Table 2: Clinical profile of children with URTI

Variables	Frequency	%age
Virus		
rhinovirus	70	77.8
influenza	45	50
adenovirus	32	35.6
enterovirus	18	20
respiratory syncytial virus	12	13.3
Cold		
Severe	18	20
Normal	72	80

Rhinovirus was the most common cause of URTI found in 70(77.8%) cases, influenza found in 45(50%) cases, adenovirus in 32 (35.6%), enterovirus in 18 (20%) and respiratory syncytial virus was among 12 (13.3%).

Severity of cold was found among 18 (20%) children. (Table 2)

We found that mean serum zinc was 38.76±6.88 µg/dl which was significantly lower and found among 87 (96%) cases. Except this Low albumin 40.41±4.88 g/l, low Serum protein 47.64±0.77 g/l and low Serum CRP 33.24±4.29 mg/l were observed among these cases. (Table 3)

Table 3: Prevalence of low serum zinc level and the other factors among enrolled cases

Variables	Frequency (n=90)	%age
Low Serum Zinc (µg/dl)	38.76±6.88	-
Low albumin (g/l)	40.41±4.88	-
low Serum protein (g/l)	47.64±0.77	-
low Serum CRP (mg/l)	33.24±4.29	-
Low Serum Zinc		
Yes	87	96
No	3	4

DISCUSSION

Common throughout the winter months, upper respiratory infections (URIs) can have a negative impact on quality of life for a few weeks. Pneumonia, meningitis, sepsis, and bronchitis may occur in some individuals. A URI is responsible for a few deaths each year. Work and school vacations are typical occurrences. Furthermore, patients spend billions of dollars on ineffective therapies. No treatment has been proven to reduce the duration of a viral upper respiratory infection. As a result, although the vaccine is only effective in 40-60% of individuals, at most.[15] In this prospective study 90 children were presented with mean age 08.44±7.65 years. Most of the cases 66.7% were males and the rest were females. According to socio-economic status 68.9% cases had low status and most of the mothers were illiterate 61.1%. These findings were comparable to the previous studies.[16,17]

In current study cough, sore throat, runny nose and headache were the symptoms. Previous family history of URTI found in 55 (61.1%) cases.[15] Rhinovirus was the most common cause of URTI found in 70(77.8%) cases, influenza found in 45(50%) cases, adenovirus in 32 (35.6%), enterovirus in 18 (20%) and respiratory syncytial virus was among 12 (13.3%). Severity of cold was found among 18 (20%) children. These results showed resemblance to the many previous studies.[19-21] "Modest but persistent" benefit of vitamin C prophylaxis at doses of 0.2 grams or more on duration and severity of common cold symptoms was found in a Cochrane Review[22] (8 percent and 13 percent decreases in duration for adults and children, respectively). A high dose of vitamin C, on the other hand, has not been proven to be effective in clinical trials when taken therapeutically after the onset of symptoms.

We found that mean serum zinc was 38.76±6.88 µg/dl which was significantly lower and found among 87 (96%) cases. It is consistent with past data from India and Bangladesh that zinc levels in the serum of ALRI patients were lower than those in controls.[23,24] Serum zinc levels were substantially higher in the control group (p0.01) than in the pneumonia patient group, according to Arica et al [25]. Among Sri Lankan pre-school children, Hettiarachchi M et al [26] found that 38.3 percent had both vitamin A and zinc deficits. Children with protein energy deficiency were


studied by Singla PN et al [27]. In children with severe malnutrition, zinc and copper levels were found to be considerably low (grades III and IV PEM). Height-forage showed a substantial positive connection (p0.001).

The link between dietary status, vitamin A and zinc levels, and oxidative stress in patients with ataxia-telangiectasia was also examined in da Silva R et al's study.[27] Compared to the control group, ataxia-telangiectasia patients had high malnutrition rates and low lean body mass, according to research published by the authors. Ataxia-telangiectasia (AT) patients, on the other hand, had zinc levels equivalent to those of the control group. Vitamin A and zinc levels in AT patients were unchanged. It was determined that there was a relationship between zinc and copper levels in preterm newborns by Sharda B et al [28].

CONCLUSION

We concluded in this study that the zinc level was significantly lower among children who had rhinovirus due to severe cold.

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