

SERUM ZINC LEVEL IN CHILDREN WITH RELAPSING NEPHROTIC SYNDROME

ABSTRACT

Background: zinc as a second trace element of human body plays an essential role in numerous function. Abnormality in the metabolism of zinc in renal problem especially nephrotic syndrome is well documented. We aim in this research to measure the serum zinc level in patients with relapsing nephrotic syndrome.

Patient and method: A hospital based case control study that conducted at nephrology clinic at Al-Sadder and AL-Zahra teaching Hospitals for period between 1st January 2013 to end of October 2013. A total of 60 pediatric patients with relapsing nephrotic syndrome were enrolled in this research. They were divided in two groups, (30) patients constituent of group A (patients with infrequent relapsing) and (30) patients constituent group B (patients with frequent relapsing). Control group consist of 32 healthy children. Serum zinc was measured by atomic absorption spectrophotometry.

Results: patients aged 2-14 years, boys were 40 and girls were 20. The mean age of patients was 7.5 years. The Mean serum zinc level in group B (frequent relapse) (58.45 µg/dl) that was significantly lower than that of group A (infrequent relapse) (61.58/dl) and control group (89.64 µg/dl) respectively. P-value < 0.001. There was no significant difference between patients of both groups and control in the mean of serum zinc level and sex of patients.

Conclusion: Hypozincemia can occur in chronic renal problem like nephrotic syndrome. The low level of serum zinc mainly found in those with frequent relapses. Routine follow up of serum zinc level and other possible causes of hypozenicemia should be studied before giving zinc to the patients.

Keywords; Frequent relapses. Nephrotic syndrome. Zinc

INTRODUCTION Nephrotic syndrome was mainly a disease of children because it is 15 times more common in children than adults. The incidence was 2-3/100,000 children/year; and most of them are minimal change disease.^[1] The nephrotic syndrome was caused by renal diseases that increase the permeability across the glomerular filtration barrier. It have the following features:

1. Proteinuria (Urinary protein excretion greater than 50mg/kg per day) or 40 mg/m² per hour.
2. Hypoalbuminemia(Serum albumin concentration less than 2.5 g/dL(25g/L))
3. Edema
4. Hyperlipidemia^[1]

CONDITIONS THAT INCREASE THE RISK OF INFECTION IN PATIENT WITH NEPHROTIC SYNDROME^[2]

1. Cold and infections. Both are very important cause of relapse in nephrotic syndrome. children patients. Children are more liable for infection with various microorganism such as viruses, bacteria and protozoa ; and all of these infection may cause relapse.
2. Poor compliance. It is very difficult to ensure that the child take his medicine at proper time and dose.

Hormones and immunosuppressant can control the disease manifestation but cannot solve the disease pathology, that is why patients often become drug dependent and any missing or decreasing the dose may cause relapse.^[3]

Infection is an important cause of morbidity and mortality in nephrotic children. Patients with steroid sensitive nephrotic syndrome (SSNS) have increased susceptibility to bacterial infections and various infections may result in relapses or steroid resistance or may trigger the onset of disease^[4]. Relapses in SSNS often follow infections of upper airway or gastrointestinal tract and cellulitis. It is estimated that 52–70% of relapses among children in developing countries chiefly follow the upper respiratory tract infection^[5,6]. Common infections associated with either onset of disease or in the course of disease are acute upper and lower respiratory infections (ARI) including pneumonia with or without empyema, skin infections including impetigo and cellulitis, acute watery or invasive diarrhea, urinary tract infections (UTI) and primary peritonitis^[9]. Studies have shown that use of prophylactic antibiotics, immunoglobulins replacement therapy, vaccination against streptococcus pneumoniae, thymosin as immuno-modulating agent, use of Chinese medicinal herb (TIAOJINING) and zinc supplements may have a role in prevention of these infections^[12]. However, in a recent Cochrane Database of Systemic Review, it has been concluded that there is no strong evidence for any of above interventions for prevention of infection in nephrotic

syndrome^[7]. Though pneumococcal peritonitis and cellulitis are decreased with use of pneumococcal vaccine and antibiotics but these infections are still responsible for 1.4-10% of mortality and repeated relapses in more than 80% of cases, requiring high dose steroids and hospitalization^[5]. A high frequency of infections in children with nephrotic syndrome (38–83%) has been reported from developing countries like India, Pakistan & Bangladesh in different studies^[8]. Studies from developing countries have also suggested that increasing the maintenance dose of steroid from alternate day in a child with remission to daily during the episode of mild infections can prevent relapse^[8, 9]. Thus a strong suspicion regarding infections in a nephrotic child is important not only for treatment but also to prevent infection associated relapse.

Zinc was an essential trace element. Protein increase zinc absorption so when there is deficiency in protein intake it may cause zinc deficiency.^[10]

The daily cause of zinc was 4–14 mg; the recommended dietary allowance (RDA) was 8 mg/day for children ages 9 to 11 years; ^[21]. The essential sources of zinc include animal products such as meat, seafood, and milk. Ready-to-eat cereal contains the greatest amount of zinc consumed from plant products^[11].

about 10 - 40 % of dietary zinc was absorbed in the small intestine; absorption was decreased by the presence of phytates and fiber in the food that bind to zinc^[22]. about 0.5 - 1.0 mg/day was secreted in the biliary system and discharged in the stool. Zinc circulates at a serum level of 70 - 120 mcg/dL with 60 % bound to albumin and 30 % bound to macroglobulin. Urinary excretion about 0.5 - 0.8 mg/day. The main stores of zinc are hepatic and renal. Most of the body zinc are stored inside the cell where zinc was bound to metalloproteins.^[11]

In nephrotic syndrome of steroid-sensitive the relapses usually occur after upper respiratory tract infections and gastroenteritis. Some research suggests that zinc may decrease the risk of infections, we assess the role of such supplements in reducing relapse rates in nephrotic syndrome patients.^[18]

MATERIALS AND METHOD : This was a hospital based case control study on samples at nephrology clinic at Al-Sadder and AL-Zahra teaching Hospitals for period between 1st January 2013 to end of October 2013 as following.

Sample Size

A total of 60 pediatric patients age 2-14 years with relapsing nephrotic syndrome were included in this study, male were 40 and female were 20. They were separated into two groups: Group A(infrequent relapsing),30 children, where there were 20 males and 10 females(relapse once time during 6 months since diagnosis of disease). Group B (frequent relapsing),30 children, where there were 20 males and 10 females (relapse two or more during 6 months since diagnosis of disease).

These patients were compared with 32 healthy children called"control group", where there were 17 males and 15 females.

For both groups and control, blood samples were collected to measure the serum zinc concentration level by using Spectrophotometer.

Zinc Measurement .This occur by spectrophotometry which measure color intensity that formed from reaction between zinc and chromogen.

We draw a three ml of blood from each nephrotic patients and control . then we centrifuge it at 3000 rpm for 10 minutes, the serum were kept at -70°C. Serum zinc was measured by atomic absorption device model Carl Zeiss Jena (Jena, Germany)

Model AAS3 flame atomic absorption spectrometer. Serum zinc level less than 70µg/dl was considered as hypozincemia.

Data analysis was done by SPSS version 20 from IBM. P value less than 0.05 was considered as significant. This is blind study so the laboratory personnel did not know the patient and control sample. The study was approved by the local research and the ethics committee in the hospital and the college, parents consent was taken.

RESULTS

We made the statistical analyses to correlate the different conditions groups (Control, A, and B). These different conditions were divided according to the historical background of the patients (frequent and infrequent relapsing) in the mentioned hospitals during the lifetime of the disease (nephrotic syndrome).

Table (1) shows the samples sizes for each group.

Table1: The Samples Sizes for Each Group.

Variables	Group	Sample Size	Total
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	Symbol	Male	Female	
Control	control	17	15	32
Infrequent Relapsing	A	20	10	30
Frequent Relapsing	B	20	10	30

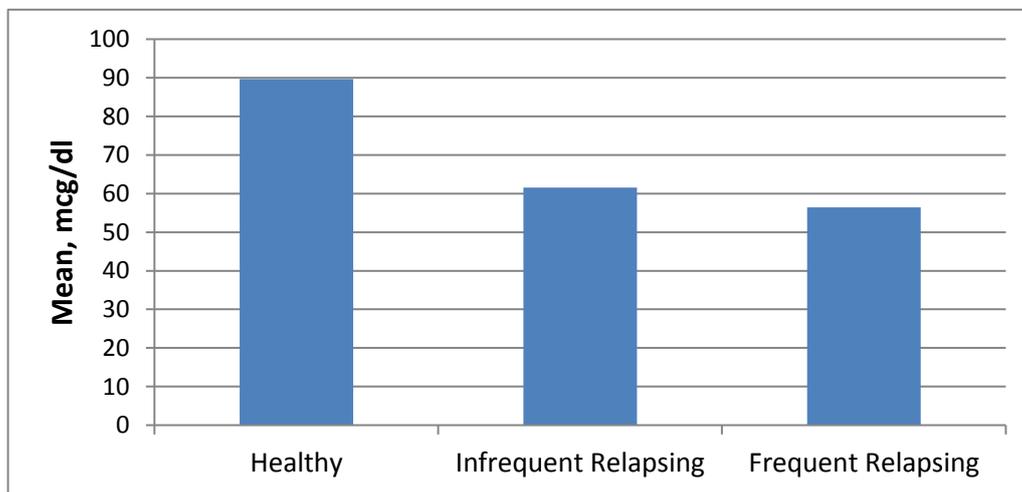


Figure 2: Mean serum zinc concentration for in all groups studied

Table 3: Mean Serum Zinc Concentration for Males and Females in all groups studied

Groups	Sex	Mean, mcg/dl	Standard Deviation	Standard Error	P-Value
Control	Male	92.159	17.25	4.18	*0.209
	Female	86.787	19.46	5.025	
A	Male	62.095	4.07	0.91	**0.214
	Female	60.55	5.26	1.66	
B	Male	58.45	6.60	1.47	***0.498

	Female	58.46	5.97	1.888	

Table 4: Statistical Analyses to Correlate the Different Groups.

Variables	Sample Size	Mean	Standard Deviation	P-Value
Control	32	89.64	18.223	<0.001
A	30	61.58	4.469	
Control	32	89.64	18.223	<0.001
B	30	58.45	6.286	
A	30	61.58	4.469	0.028426
B	30	58.45	6.286	

DISCUSSION;In this study The Mean serum zinc level in group B (frequent relapse) (58.45 µg/dl) that was significantly lower than that of group A (infrequent relapse) (61.58/dl) and control group (89.64 µg/dl) respectively. P-value <0.001 these finding can be explained by Mild zinc deficiency is believed to result in a reduced production of Th1 cytokines, resulting in Th2 cytokine bias^[13, 14]. In contrast, zinc intake is thought to increase gene expression for IL-2 and IFN-γ, so it result in

augmentation of the Th1 immune response^[15]. Since the Th1–Th2 cytokine imbalance is also believed to result in relapses of SSNS.

So this results support the findings that suggest the patients with SSNS who take RDA of zinc show a less relapses and higher possibility of remission. The response was better in the frequent relapsers^[16, 17]. The Mean serum zinc level of group A (infrequent relapse) is also low (61.58/dl), this finding can be explained by the increase in urinary zinc excretion in children with NS (whether in relapse or in remission) was attributed as a cause for low serum zinc level by many authors who reported a positive correlation between urinary zinc and protein excretion in their studies.^[18, 19, 20, 21] Also several studies demonstrated low blood or serum zinc levels among children with NS compared to that of the control groups.^[16, 18]

This study certifies insignificant difference corresponding to sex in all groups of patients studied. This result was also stated by Rahi, K. et. al., 2009^[22], with M:F ratio of 1.8:1. This result moreover was stated by Sarker, MN. et. al., 2012, with M:F ratio of 2:1.^[23]

CONCLUSION: Hypozincemia can occur in chronic renal problem like nephrotic syndrome. The low level of serum zinc mainly found in those with frequent relapses there is no effect of sex on mean serum level in all group studied

RECOMMENDATIONS

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