

ORIGINAL ARTICLE

PLASMA ZINC AND SELENIUM LEVELS IN PRESCHOOL CHILDREN WITH PERSISTENT DIARRHOEA: A CROSS SECTIONAL STUDY

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ABSTRACT

BACKGROUND: Even today Diarrhoea is one of the most common factors for mortality and morbidity in children of developing countries. Diarrhoea causes loss of many micronutrients, which plays a prominent role in normal metabolism, development, growth, neurological and immunological functions of human body. Thus present study is aimed to assess serum levels of zinc and selenium in preschool children suffering from persistent diarrhoea. **MATERIALS AND METHOD:** for this study we selected 34 preschool children (both male and female) who were suffering from persistent diarrhoea and 47 age matched healthy control children who were attending our clinic for routine vaccination. In both group's serum zinc and selenium was estimated. **RESULTS:** in the present study we observed very low levels of serum zinc 6.38 ± 2.6 mmol/L in persistent diarrhoeal group when compared to healthy control 9.64 ± 4.1 mmol/L ($p < 0.01$) but moderately low levels of serum selenium 54.6 ± 6.4 µg/L ($p < 0.05$). From linear regression analysis of serum zinc and selenium, zinc showed significant relation with low body weight with $p < 0.01$. **CONCLUSION:** low levels of zinc and selenium persistent diarrhoea causes acute lose of zinc. Zinc also showed direct relation with low body weight, giving insight into the role of zinc in maintaining normal growth and function of human body.

Keywords: Micronutrients, Persistent diarrhoea, Zinc, Selenium

INTRODUCTION

Even today Diarrhoea is one of the most common factors for mortality and morbidity in children of developing countries. As per Vani K. Borooah¹ diarrhoeal diseases are responsible for about one in five deaths of children in the world wide and second biggest killers of children, ahead of malaria, tuberculosis and AIDS. 2.5 million Deaths each year take place in developing countries due to diarrhea, of which 80% are in the first 2 years of life.² Trace elements are essential nutrients for normal metabolism, development, growth, neurological and immunological functions of human body.^{2,3,4}

Zinc is an integral part of more than 200 enzymes, and has a significant role in DNA replication thus cell division, tissue repair and growth.^{3,4,5}

It has been observed that low plasma Zinc levels decreases thymus function thus resulting to loss of T cell resonance and increases susceptibility to infectious diseases⁶ Selenium was originally identified as a potentially toxic element long before it was recognized to be an essential trace mineral. Body requires selenium for the function of a special class of enzymes, called selenoproteins. The major function of selenoproteins is to prevent or reduce the damage (oxidative stress) caused by reactive oxygen species (ROS) or reactive nitrogen species (RNS). These can occur in the body mostly in the form of free radicals, such as peroxides. There are many types of selenoprotein enzymes like glutathione peroxidase (GSH-Px) that protect cells from these damaging molecules. Selenoproteins are also required to maintain balanced thyroid gland function and participate in the production of white blood cells of immune system. Many epidemiological studies^{7,8} observed extensive Zinc deficiency in young children of Indian subcontinent, no studies are available till date on prevalence of selenium deficiency. Micronutrient status of individual depends on various factors like dietary quantities, factors effecting absorption and to major extent depends on endogenous losses from body like diarrhea, bleeding and so on. Thus the present study was designed to study the influence of persistent diarrhea on plasma Zinc and selenium levels in preschool children.

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MATERIALS AND METHODS

This cross sectional study was done in department of Paediatrics, J. K. Hospital & L.N.Medical College-Bhopal, INDIA and is approved by institutional ethical committee and written consent was taken from parents of participants. For this study selected preschool children were divided in to two groups

Group-I (n=34): both male and female children who were suffering from persistent diarrhoea (**loose stools that lasts for at least four weeks**) and were admitted to paediatric diarrhoea management unit of our tertiary care hospital.

Group-II (n=47): healthy control group (5 to 26 months) both male and female children who visited hospital for routine vaccination. None of the participants were suffering from any acute or chronic infections.

From both control and study group, 1 ml of venous blood was taken with heparinized syringe and centrifuged at 4°C and was stored at -80°C till the biochemical investigations were done. Serum Zinc and Selenium were measured with readily available commercial kits by using fully auto clinical chemistry analyzer Biosystems A25.

Statistical analysis

All the values were expressed in mean ± SD. Student t test was applied to assess the statistical difference of the above said biochemical parameters between persistent diarrhoea and non diarrhea children groups. P<0.05 was considered as statistically significant and p<0.01 considered as highly significant. Linear regression was performed to evaluate the association among serum zinc and selenium as independent and body weight of children as dependent variable. P value <0.05 considered to be statistically significant and p<0.01 as highly significant. All the data were analyzed using statistical software SPSS version 19.

Table 2: showing multivariate linear regression in stepwise manner for the relationship between serum zinc, selenium levels with body weight as dependent variable

Model	Unstandardized coefficient		Standardized coefficient	P value
	B	Std. Error	Beta	
1 (constant)	2.75	0.338		.000
Zinc (mmol/L)	-0.140	.020	-.0389	.000*
Selenium (µg/L)	-.032	.011	-.299	.052**

*P<0.01; **P>0.05

mmol/L far less than in healthy control with p<0.01. Our results are in agreement with other previous studies.^{10,11} of serum zinc and selenium the same marginal decrease in selenium levels in diarrhoea was also observed by Chaudary S et al ¹¹

RESULTS

In the present study from table-1, of serum zinc and selenium levels in diarrhoeal group we observed statistically highly significant low levels of serum zinc 6.38 ± 2.6 mmol/L (p<0.01), but moderately low levels of serum selenium 54.6 ± 6.4 µg/L (p<0.05) when compared to healthy age matched control group whose serum zinc and selenium levels are 9.64 ± 4.1 mmol/L and 61.8 ± 8.3 µg/L respectively. Through linear regression analysis body weight as dependent variable we in this present study (table-2) observed direct relation and association of serum zinc with decreased body weight with p<0.01, but not with serum selenium (p>0.05).

Table 1: Mean difference in serum zinc and selenium between study and control groups

Biochemical markers	Persistent diarrhoea group	Healthy control group	P value
SerumZinc* (mmol/L)	6.38 ± 2.6	9.64 ± 4.1	<0.01
Serum Selenium* (µg/L)	54.6 ± 6.4	61.8 ± 8.3	<0.05

* all the values were expressed as mean ± SD.

DISCUSSION

Through this cross sectional study we tried to evaluate the effect of diarrhoea on serum zinc and selenium levels in preschool children of central India, as few epidemiological studies^{7,9} observed zinc deficiency in Indian preschool population. But till date no studies were available on selenium status in this population of India. In this study we observed persistent diarrhoea greatly influences serum zinc levels with 6.38 ± 2.6

in their study. As per study done by R Safaralizadeh et al¹² serum selenium levels varies widely worldwide and are much dependent of soil concentration. The loss of micronutrients in diarrhoea might be due to mucosal damage, low

intake and high metabolic demand. This loss might possibly aggravate due to altered metabolic consequences of infection. As zinc plays prominent role in replication thus cell division, low zinc delays repair and generation of new mucosal lining cells thus altering ligand binding, transport and internalization of zinc with in mucosal cells thus worsen the situation. Zinc deficiency also lowers the immune response of host cells, thus delays the clearance of infection, might inturn causes more malabsorption and more loss of nutrients. Serum selenium is much correlated with anemia rather than with diarrhoea. In a study done by Nguyen Ven Nhien¹³ et al in studying the association of serum micronutrients on anemia among primary school children, of serum zinc and selenium, selenium showed high association with OR 1.59. In the present study from table-2 we observed no association of serum selenium with weight loss due to diarrhoea, but zinc has a highest association with $p < 0.01$. The same association in serum zinc levels with body weight was observed by M N Islam et al.¹⁴ In their study they observed a sharp improvement in body weight of neonates on zinc supplement, indicating its prominent role in maintenance of proper growth and function of body.

CONCLUSION

Low levels of zinc and selenium persistent diarrhoea causes acute lose of zinc. Zinc also showed direct relation with low body weight, giving insight into the role of zinc in maintaining normal growth and function of human body.

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