Iranian J Parasitol: Vol.2, No.1, 2007, pp. 35-38

Original Article

Vitamin B12 and Serum Mineral Levels in Children with *Enterobius vermicularis* Infection

**J Sadraei, J Jabaraei, F Ghaffarifar, AH Dalimi, SM Nikbakhtzadeh*

Dept. of Parasitology, Medical School, Tarbiat Modares University, Tehran, Iran

(Received 22 Jan 2007; accepted 18 Mar 2007)

Abstract

Background: Intestinal parasitic infections are widespread in the general populations and entrobiasis is one of the most common parasitic diseases in the world. The aim of this study was to investigate the correlation between parasitic infection of *Enterobius vermicularis* and the absorbing levels of vitamin B12 and the minerals such as copper, zinc, and magnesium.

Methods: Nine hundred sixty eight stool samples and cello-tape anal swabs were collected from 3- 6 year old children in Tehran. From the whole population, 60 children were chosen for case group who had only *E. vermicularis* infection. Also 30 children without parasitic infection were chosen as the control group. Both groups had no record of serum shortage of mentioned factors and malnutrition. Amount of copper, zinc and magnesium along with vitamin B12 were measured in both groups.

Results: Comparison of the case and control groups showed a significant difference in serum mineral levels and vitamin B12 in patients and control groups ($P< 0.001$).

Conclusion: Early detection and treatment of intestinal parasitic infection could avoid these serum mineral and vitamin B12 deficiencies.

Key words: Vitamin B12, Copper, Zinc, Magnesium, *Enterobius vermicularis*

Introduction

Intestinal parasitic infection is an important public health concern world-wide because of the high frequency in several countries as well as its nutritional consequences (1). Zinc, copper, magnesium and vitamin B12 perform important functions in children's growth and development (2-3). Vitamin B12 deficiency is characterized by unspecific symptoms like irritability, failure to thrive, muscular weakness and growth retardation (4).

Although childhood zinc, copper, magnesium and vitamin B12 deficiencies are rather unusual, recent studies suggest that several diseases (malnutrition, intestinal malabsorption syndromes and intestinal parasitoses) may produce them (5). Early detection and treatment of intestinal parasitic infection are very important to obtain optimal levels of the growth, development, immune response and intellectual capacity (5-6).

The aim of this study was to investigate a probable correlation between vitamin B12 and the level of mineral absorption such as copper, zinc and magnesium in children with E. vermicularis infection in case and control groups.

Materials and Methods

In this study, 968 stool samples and cello-tape anal swabs were collected from 3- 6

***Corresponding author:** E-mail: sadraeij@yahoo.com
Fax: +98 21 88013030

year old children in Tehran, capital of Iran. We collected three samples from children which were tested for parasitic infection using ether instead of acetyl acetate and cello-tap methods. From the whole population, 60 children were chosen for case group who had only *E. vermicularis* infection. In addition, we chose 30 children without parasitic infection as the control group. Some questionnaires were completed by parents including questions about records for malabsorption, analyzed parameter deficiencies and infection with parasites. For intestinal parasite identification, concentrations on fecal stools were performed using ether instead of acetyl acetate (7). Identification of *E. vermicularis* was carried out by Graham technique (8).

Blood samples were collected from the case and control groups after taking parent's permission. All blood samples were measured for the amount of copper, zinc, magnesium and vitamin B12. Vitamin B12 was measured by gamma counter system (9). Copper, zinc, magnesium levels were assessed by spectrophotometer (10).

Gamma counter model (Genesis-5500) and spectrophotometer model (Colman) were used for measuring vitamin B12 and the copper, zinc and magnesium levels. The index of weight was also measured by the digital scale.

Student *t*-test was employed to analyze the data and the statistical significance was defined as $P< 0.05$.

Results

During the study 968 stool samples were collected from 3-6 year old children in Tehran. All samples were tested for parasitic infection using ether instead of acetyl acetate and cello-tap methods. Table 1 is showing information about serum mineral levels and vitamin B12 in patient and control groups with a significant difference between two groups ($P< .05$).

No significant differences in the index parameter of weight were found. Average and the standard deviation in the control and case groups are showing in Table 1.

Table 1: Comparing Serum Mineral Levels and vitamin B12 in patients and control groups

Mean and S.D / Study factors	Mean and S.D in patients	Mean and S.D in control group
Cu mg/dl	* 94.75 +/- 12	127.75 +/- 12.02
Zn mg/dl	* 79.92 +/- 6.63	93.32 +/- 3.33
Mg mg/dl	* 1.54 +/- 0.08	1.63 +/- 0.05
Vit. B12 pg/ml	* 580.97 +/- 100.19	649.47 +/- 101.55
BMI kg/m2	17.62 +/- 1.47	17.74 +/- 1.69

*$P< 0.001$

Discussion

Intestinal parasitic infection is an important public health concern world-wide because of the high frequency in several countries as well as its nutritional consequences. Intestinal parasites use carbohydrates, lipids, minerals, vitamin and other food sources of the host in order to essential energy of the life cycle (1). Minerals

have important function in the metabolic and physiological process of the human body especially in the growing children. Copper, zinc and magnesium have a great role in the structure of some cellular enzyme, different immunologic process and the resistance to the free radicals damage by stabilizing the cellular membrane.

Absorption of copper in small intestine occurs by means of active and passive transfer in the mucosal cells of intestine as a combination with metallothionein (2-11-13). Fructose and sucrose have more roles in intensifying emergence of copper deficiency comparing to the starch and glucose. However zinc absorption mechanism is not completely understood. Intestinal absorption involves picking up by the intestinal cells, transfer in mucosal cells, transfer to portal circulation and the secretion of the endogenous zinc back into the intestine cells (11-12). Amount of the received zinc in the diet and the body storage are two important factors in the control of the haemostatic absorption by means of regulating absorption from intestinal mucus cells. Magnesium absorbs in ileum and colon of the digestive system by passive diffusion (11-13).

Vitamin B12 derives from diet and is greatly found in the food products such as the fresh meat. The absorption of vitamin B12 is done in the small intestine. This vitamin has important role in blood making and the development of the nerve cells (12-13). After absorption, vitamin B12 attaches to the internal factors which are secreted by side cells of gastric vitamin B12 complex and this factor protects vitamin B12 against gastric acid. Vitamin B12 deficit is extremely rare and there is limited information about the prevalence of vitamin B12 deficiency (4). Vitamin B12 deficit may be due to dietary deficiency, breast-fed infants of mothers with vegetarian diets, poorly controlled phenylketonuria, and inborn errors of vitamin B12 absorption (14-15). Although our study is showing significant differences in case and control groups but for claming we need more study about vitamin B12 deficiency because this item is rare and information is limited.

Kotlas *et al.* (12) showed the mean levels of serum zinc, copper, and magnesium were significantly lower in the case group comparing to the control group in children infected with E. vermicularis. Study of 64 children infected with this parasite showed significant differences in the serum zinc, copper, and magnesium before and after treatment (3). Our study is in agreement with the studies of Kotlas *et al.* (12) and Olivares *et al.* (3) Study of 40 children with E. vermicularis infection indicated significant increase of vitamin B12 after three months of anti-parasite treatment (3). Our study showed a non-significant difference of body mass index in both groups ($P > 0.05$).

In conclusion this study shows significant differences in serum copper, zinc and magnesium levels in the patients with E. vermicularis intestinal infection comparing to the control groups. Although, this study is showing significant differences in patients and control groups in serum concentration vitamin B12, but for claming it needs more research study.

Acknowledgements

We thank the people who helped for this work. This study was supported by Medical School, Tarbiat Modares University, Iran.

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