Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2015, 7(10): 978-981

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Relationship between serum selenium level and asthma in children

Ahmadipour S. Hokoufeh[1], Mohsenzadeh Azam[1*], Anbari K. Hatereh[2], Sabzevari Zahra[3] and Khodakaramifard Zahra[4]

[1]Department of Pediatrics, Lorestan University of Medical Sciences, Khorramabad, Iran
[2]Department of Epidemiology, Lorestan University of Medical Sciences, Khorramabad, Iran
[3]Medical Student, Lorestan University of Medical Sciences, Khorramabad, Iran
[4]Young Researchers Club, Khorramabad Branch, Islamic Azad University, Khorramabad, Iran

---

ABSTRACT

Asthma is a chronic inflammatory disease of respiratory ducts caused by genetic and environmental factors. Free radicals play a role in pathogenesis of asthma on one hand and antioxidants, which are comprised of rarely found ingredients such as selenium and zinc, act as defense factors against negative effects of radicals on the other hand. Knowing that asthma increases oxidative stress it is assumed that selenium plays a key role in asthma pathogenesis. Relationship between prevalence/severity of asthma and selenium level has been proven by empirical findings of studies on some of the human studies. All the asthmatic children who referred to pediatric clinic of Khorramabad Shahid Madani Hospital, Iran constituted the study population of the present analytical cross-sectional study. 65 asthmatic and 65 healthy children were selected as experiment and control groups. Variables such as: age, gender, domicile, exposure to cigarette smock, number of family members, history of asthma and allergy in the family, and type of feeding during infancy were surveyed by a questionnaire. In addition, blood samples were collected to measure selenium level. The experiment group was comprised of 40 boys and 25 girls and these figures in the control group were 36 and 29 respectively. 8% of girls and 5% of boys in the asthma group had selenium deficiency However; Fisher's test showed that the difference was not significant. Among the asthmatic children from rural areas, 12.9% had selenium deficiency and no such deficiency was observed among children from urban areas. Therefore, there was significant relationship between selenium deficiency and domicile of asthmatic children ($p = 0.031$). In addition, no significant difference was observed regarding serum level of selenium of asthmatic children based on number of family members, asthma, family history of asthma and allergy, type of infancy nutrition, and exposure to cigarette. Deficiency of selenium was observed in 2.6% and 1.3% of asthmatic and healthy children respectively, which indicated no significant difference. There was no significant difference between asthmatic and healthy children in Khoramabad city regarding serum level of selenium. Therefore, there is no need for selenium supplements for asthmatic children.

Keywords: Asthma, children, selenium

INTRODUCTION

Asthma is a chronic respiratory disease and 6.9% of children in the USA are afflicted with the disease [1]. The disease is characterized with increase of respiratory duct response, wheezing, coughing, and shallow breath; which leads to increase of oxidative stress [2-4]. There are several factors in etiology of asthma such as genetic, allergic, environmental factors, infections, psychological factors and nutrition [5]. Allergic asthma is defined as chronic inflammation of respiratory ducts because of disorders in immune system response. On the other hand, congenital asthma is caused by factors other than allergic elements such as doing sport, feelings, and chemical agents [6]. Inflammation of respiratory ducts because of increase of immunity cells' activity (e.g. macrophages, neutrophils, and lymphocytes) increases risk of oxidative damages. Activity of the cells disseminates active oxygen types and generates pre-inflammatory cytokine [7, 8]. Imbalance between antioxidant activities of enzymes has to do with

development of asthma symptoms, which highlights stressor role of oxidative in allergic asthma of children [8, 9]. Oxidative stress plays key role in pathogens of asthma including mucus secretion, bronchitis contraction and increase of activity of respiratory ducts [9-11]. Therefore, adding antioxidants to diet decreases pulmonary oxidative stress and asthma symptoms. [12]

Prevalence of allergic diseases in the West since the 1960s has increased from 25% to 75%. The increase might be due to environmental factors such as food diet change, decrease of vegetables, fruits, and minerals portion [13-15]. The relationship between nutrition and chronic diseases is a proven fact and changes of food program in the developed countries have resulted in decrease of micronutrients. [16-17]

Selenium is an essential micronutrient that plays a key role in human health by ensuring proper metabolism of thyroidal hormones, cardiovascular system health, preventing neurodegenerative diseases and cancer, and improving immune system response [18-19]. Selenium is cofactor of glutathione peroxidase enzyme, which protects the organism from oxidative stress risk by reducing active oxygen types. It also plays a key role in preventing and treating asthma through decreasing oxidative stress and regulating Th2 response. [4, 11, 20-23]

Mothers' nutrition during pregnancy affects development of immune system of the fetus [14]. Some studies have shown that there is a relationship between decrease of intake of some nutrients such as vitamin E & C, selenium, and zinc by mothers during pregnancy and development of asthma during infancy. So that providing enough amount of these nutrients to mothers during pregnancy decreases risk of asthma during early years of life. [15, 24, 25]

Epidemiological studies have reported frequently that selenium level is related to prevalence and severity of asthma so that asthmatic patients were characterized with lower levels of selenium comparing with control group [26, 27]. Therefore, the present study is aimed at comparing serum level of selenium in asthmatic and healthy children living in Khoramabad city, Iran.

EXPERIMENTAL SECTION

The present analytical cross-sectional study was carried out with participation of asthmatic children referred to pediatric clinic, Shahid Madani Hospital, Khoramabad, Iran in 2014. The experiment and control groups were comprised of 65 participants. The participants with hypothyroid, heart, liver, and renal diseases were excluded. Variables age, gender, domicile, exposure to cigarette smock, number of family members, history of asthma and allergy in family, type of feeding during infancy were measured by questionnaire. After collecting a written letter of consent, 4cc blood sample was collected from each participant in a sterile condition. Serum level of selenium was measured quantitatively and through atom absorption method using Younglin (made in Korea). Selenium level below 46mic/L (microgram/litter) was construed as deficiency of selenium, 46-143mic/L as normal condition, and above 143mic/L as above normal level. Independent T-test and Chi Square were employed to compute and compare mean level of selenium of the two groups.

RESULTS AND DISCUSSION

The experiment group was comprised of 40 boys and 20 girls and these figures in the control group were 36 and 29 respectively. Selenium shortage was observed in 2.6% of asthmatic and 1.3% of healthy children, which was not significant based on Fisher's test. Eight and five percent of asthmatic girls and boys had low serum selenium level respectively, which was also not significant. In addition, there was significant relationship between selenium deficit and domicile region so that 12.9 % of residents of rural area suffered from selenium deficiency ($P = 0.031$). Furthermore, independent t-test showed that serum level of selenium in asthmatic participants was significantly different based on gender and domicile.

Independent t-test indicated no significant difference among asthmatic children regarding mean serum level of selenium based on number of family members and record of asthma and allergy in family. Square Chi indicated that difference in frequency of selenium serum in asthmatic children based on number of family member, and nutrition during infancy (breastfeeding, infant formula or the both) was not significant. Despite the fact that serum level of selenium in asthmatic children fed by infant formula (70.1) was less than that of breastfed children (79.6), one-way variance analysis showed that the difference was not significant. Selenium deficiency in asthmatic children who had been exposed to cigarette smock was 8% and in the case of the subjects who had not been exposed to cigarette smock was 5%. The difference, according to Fisher's test, was not significant.

Selenium deficiency in asthmatic and healthy children was 2.6% (serum level mean = 80.5mic/L) and 1.3% (serum level mean = 77.7mic/L) respectively. The difference between the experiment and control groups was not significant.

These results are consistent with a study over several regions supported by European Network of Supervision on Asthma and Allergy, where information from 14 centers in Europe was used. The study showed considerable relationship between selenium level and asthma (28). In addition, a systematic and meta-analysis study on role of nutrition on asthma and allergy showed that there were no relationship between selenium and the disease. [29]

Several epidemiological studies have shown that there is relationship between level of selenium, prevalence and severity of asthma. For instance, a study showed that asthmatic patient were characterized with lower level of selenium and higher level of oxidative stress such as thio barbituric acid [25, 26, 27]. Several studies have also reported low selenium and zinc level in plasma and serum of asthmatic patients. Carneiro et al. showed that high level of selenium and zinc decrease chance of asthma and the risk of asthma is higher in children with low serum level of selenium [30].

Surveys on pregnant women showed inverse relationship between selenium level of umbilical cord blood and developing wheezing in childhood [31, 32].

Our results are inconsistent with some other studies; for instance, some have shown that there was a direct relationship between selenium level and severity of response of respiratory ducts. [33]

Inconsistencies of the results problematize drawing a conclusion regarding relationship between selenium and asthma based on descriptive-cross sectional studies in particular. The inconsistencies might be due to multifactor nature of asthma, demographical differences (age of developing allergy), geographical condition, nutrition, variation of selenium level over the course of the disease, effects of selenium on immunity system, and T-helper response (cause of allergic asthma).

CONCLUSION

The findings showed no significant difference between asthmatic children referred to Shahid Madani Hospital and healthy children regarding serum level of selenium. Therefore, selenium supplementary is not recommended for the study population. Given that the main sources of selenium are the climate and soil, the regions under study apparently is rich of selenium reservoirs. Further studies on different regions and larger sample groups can be conducted in the future.

REFERENCES

[1] Reznik M, Bauman LJ, Okelo SO, Halterman JS. Annals of Allergy. Asthma and Immunology. **2015**, 114(1), 67-68.
[2] Locksley RM. Asthma and allergic inflammation. **2010**, 140(6), 777-783.
[3] Hoffmann PR, Jourdan-Le Saux C, Hoffmann FW, Chang PS, Bollt O, He Q, et al. The journal of immunology. **2007**, 179(5), 3258-3267.
[4] Hoffmann P. Allergy. **2008**, 63(7), 854-6.
[5] Maddox L, Schwartz DA. Annual review of medicine. **2002**, 53(1), 477-498.
[6] Guo C-H, Liu P-J, Lin K-P, Chen P-C. Altern Med Rev. **2012**, 17(1), 42-56.
[7] Kirkham P, Rahman I. Pharmacology and therapeutics. **2006**, 111(2), 476-494.
[8] Barnes PJ. The Journal of clinical investigation. **2008**, 118(11), 3546.
[9]Reddy PH. Pharmaceuticals. **2011**, 4(3), 429-456.
[10] Bakkeheim E, Mowinckel P, Carlsen KH, Burney P, Lødrup Carlsen KC. Pediatric Allergy and Immunology journal. **2011**, 22(2), 178-185.
[11] Hoffmann PR, Berry MJ. Molecular nutrition and food research. **2008**, 52(11), 1273-1280.
[12] Shaheen SO, Newson RB, Rayman MP, Wong AP, Tumilty MK, Phillips JM, et al. Thorax. **2007**, 62(6), 483-490.
[13] Tozzi AE, Armenio L, Bernardini R, Boner A, Calvani M, Cardinale F, et al. Journal of Pediatric Allergy and Immunology. **2011**, 22(3), 267-276.
[14] Devereux G. Session 1: Allergic disease Nutrition as a potential determinant of asthma. Proceedings of the Nutrition Society. **2010**, 69(01), 1-10.
[15] Peroni DG, Bonomo B, Casarotto S, Boner AL, Piacentini GL. Italian Journal of Pediatric. **2012**, 31(38), 22.
[16] Sánchez C, López-Jurado M, Aranda P, Llopis J. Science of the total environment. **2010**, 408(5), 1014-1020.

[17] González-Solanellas M, Romagosa A, Zabaleta del Olmo E, Grau-Carod M, Casellas-Montagut C, Lancho-Lancho S. Estudio de prevalenciasobre los hábitos alimentarios y el estado nutricional en población adulta atendida en atención primaria. Nutr Hosp. **2011**, 26(2), 337-344.
[18] Vieira F, Di Pietro PF, Boaventura B, Ambrosi C, Rockenbach G, Fausto MA, et al. Nutr Hosp. **2011**, 26(3), 528-536.
[19] Norton RL, Hoffmann PR. Molecular aspects of medicine. **2012**, 33(1), 98-106.
[20] Adame EM, Florea D, Perez LS, López JM, López-González B, de la Cruz AP, et al. Nutrición hospitalaria. **2012**, 27(2), 524-528.
[21] Alves MR, Starling AL, Kanufre VC, Soares RD, Norton RdC, Aguiar MJ, et al. Journal de pediatria. **2012**, 88(5), 396-400.
[22] Rakhshanizadeh F, Esmaeeli M. Reviews in Clinical Medicine. **2014**, 1(1), 21-24.
[23] Riedl MA, Nel AE. Current opinion in allergy and clinical immunology. **2008**, 8(1), 49-56.
[24] Shaheen SO, Rutterford CM, Lewis SJ, Ring SM, Holloway JW, Golding J, et al. Journal of Allergy and Clinical Immunology. **2015**, 135(4), 1083-1085.
[25] Allan K, Devereux G. Journal of the American Dietetic Association. **2011**, 111(2), 258-268.
[26] Huang Z, Rose AH, R. P, Hoffmann. Antioxidants and Redox Signal. **2012**, 16(7), 705–743.
[27] Guo C-H, Liu P-J, Hsia S, Chuang C-J, Chen P-C. Annals of clinical biochemistry. **2011**, 48(4), 344-351.
[28] Burney P, Potts J, Makowska J, Kowalski M, Phillips J, Gnatiuc L, et al. Allergy. **2008**, 63(7), 865-871.
[29] Nurmatov U, Devereux G, Sheikh A. Journal of Allergy and Clinical Immunology. **2011**, 127(3), 724-733.
[30] Carneiro MFH, Rhoden CR, Amantéa SL, Barbosa Jr F. Biological trace element research. **2011**, 144(1-3), 244-252.
[31] Shaheen S, Newson R, Henderson A, Emmett P, Sherriff A, Cooke M. European Respiratory Journal. **2004**, 24(2), 292-297.
[32] Devereux G, McNeill G, Newman G, Turner S, Craig L, Martindale S, et al. Clinical and Experimental Allergy. **2007**, 37(7), 1000-1008.
[33] Chinn S, Arts I, Amigo H, Rona R. Atopy, Allergy. **2007**, 62(6), 714-715.