Serum Level of Selenium, IL-4, IL-10 & IFN-γ in Patients with Allergic Asthma, Allergic Rhinitis and Healthy Controls

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ABSTRACT

Background: Allergic diseases have increased during the past decade worldwide. Th2 type lymphocyte response is known to play an important role in the process of allergic inflammation. IL-4, a mediator of type II cytokine response increases IgE synthesis and Interferon gamma, a cytokine of type I response interferes with IL-4 and inhibits IgE production. Selenium is an essential component of glutathione peroxides and changes in its plasma level has been proposed to be associated with allergic diseases. **Materials and Methods:** This study comprised of 21 cases of allergic asthma (AA), 33 cases of allergic rhinitis (AR) whose age and sex were matched with 28 healthy controls. IL-4, IL-10, IFN-γ levels were tested by ELISA assay, and serum selenium was measured by atomic absorption spectorphotometery method. **Results:** Mean serum selenium level of AA and AR groups were lower than controls. Mean serum IL-4 level of AA was higher than the AR group. Mean serum IL-4 level of AA and AR group were higher than controls. **Conclusion:** The results of this study indicate that low selenium level may have a role in the pathogenesis of allergic diseases.

Keywords: Allergic rhinitis, Eosinophilia, Prevalence

INTRODUCTION

The prevalence of allergic diseases has increased substantially over the past fifteen years. It is estimated that more than 150 million persons suffer from asthma worldwide (1). Asthma is a complex inflammatory disorder of the

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airway associated with air flow limitation as well as a variety of clinical signs. Allergic asthma is the most common disorder, worldwide. It has been well established that T helper type 2 (Th2) lymphocytes and their cytokines have an important role in allergic inflammation. (3)
Th2 cells are recognized by their secretion of IL-4, IL-5, IL-9, IL-13 as opposed to Th1 cells, which secret IL-2 and Interferon gamma. IL-4 mediates important pro-inflammatory functions in asthma including the IgE isotype switching and expression of vascular cell adhesion molecule-l (VCAM-1). In addition, promotion of eosinophil transmigration across endothelium, mucus secretion, and differentiation of Th2 lymphocytes are mentioned. Interferon-gamma produced by Th1 lymphoytes can inhibit IL-4 dependent IgE synthesis. Interleukin 10 (IL-10), a Th2 cytokine, which is produced by activated macrophages, some lymphocytes, and some non lymphocytic cell types exerts an inhibitory function on the IL-12 production. IL-10 and IL-12 are key cytokines in determining Th2 and Th1 differentiations from Th0 cells, respectively (3). Recent studies suggest that an association may exit between a low intake of certain micronutrients (selenium, zinc and copper) and asthma (1). Selenium is an essential component of glutathione peroxidase and many other mammalian enzymes and plays an important role in the metabolic as well as anti-oxidative processes (2). A case-control study was conducted in order to determine the selenium status of allergic sufferers.

MATERIALS AND METHODS

The study population was comprised of 21 cases of allergic asthma (13:8, Female: Male), 33 allergic rhinitis subjects (21:12, Female: Male), and 28 age/sex-matched healthy controls (Fig 1). A thorough medical history and physical examination were obtained. Serum selenium was determined by atomic absorption spectrophotometery method and, IL-4, IL-10 and Interferon-gamma were measured by ELISA method. Mean age of the study groups was 30 ± 10 years. Mean height (cm), weight (kg) and body mass index (BMI) of study groups were (166 ± 8(cm), 61 ± 10(kg), 22.2 ± 3) for allergic asthma (AA), (163 ± 9, 62 ± 12, 23.3 ± 5) for allergic rhinitis (AR) and (167 ± 6, 72 ± 18, 25.3 ± 5) for control groups, respectively.

RESULTS AND DISCUSSION

There was no significant difference between height, weight and BMI variables among the study groups (P=0.28, P=0.46 and P=0.45, respectively).

All patients in AA or AR groups had at least one positive skin prick test. Mean duration of allergic diseases was 7.7 ± 7.8 years, with a maximum

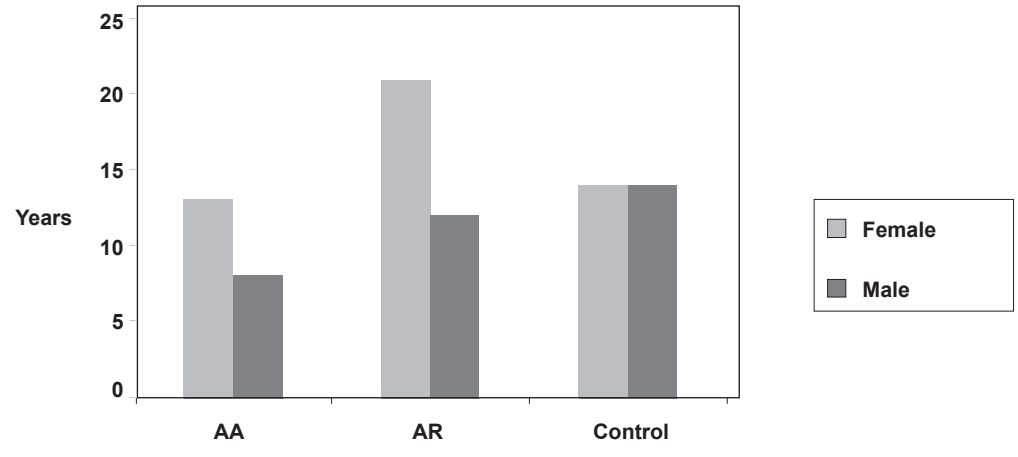

Figure 1. Sex Distribution in Patients

duration of 30 years, and a minimum duration of 1 year. Asthma symptom score of the asthmatic group was variable. Most of the patients were in stage I of GINA (GLOBAL INITIATIVE FOR ASTHMA). There was a significant correlation between serum IL-4 and asthma severity (P<0.001), (odd ratio = 2.7).

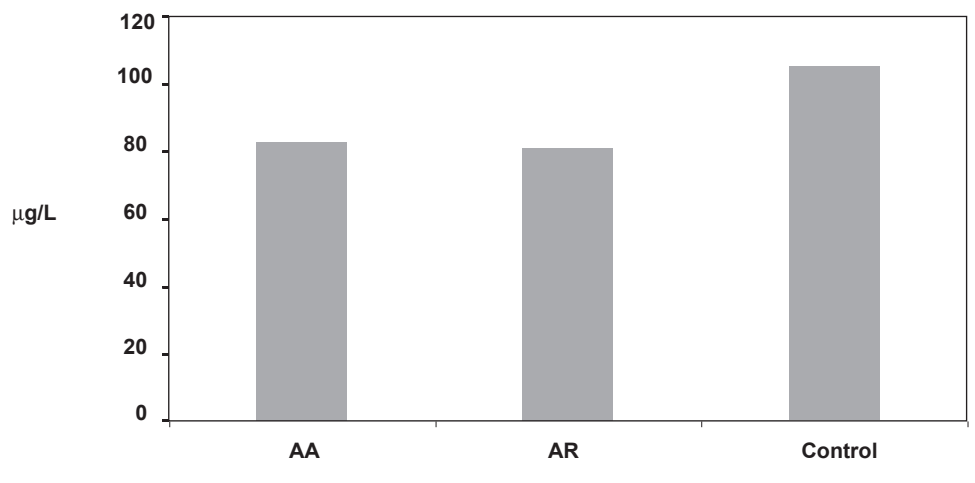

Figure 2. Mean Serum Selenium Level

Mean serum selenium level of asthmatic (84 ± 11 µg/L) and rhinitis (82 ± 10 µg/L) groups was significantly lower than control subjects (106 ± 11 µg/L): P<0.001 (Fig2). Mean serum IL-4 of AA group (2.1 ± 1.4 pg/ml)

was significantly higher than AR group (1.3 ± 0.7 pg/ml), P<0.05. Mean serum IL-4 level of AA and AR groups was significantly higher than the control group (1.0 ± 0.2 pg/ml), P<0.001 (Fig 3). Mean serum level of IL-

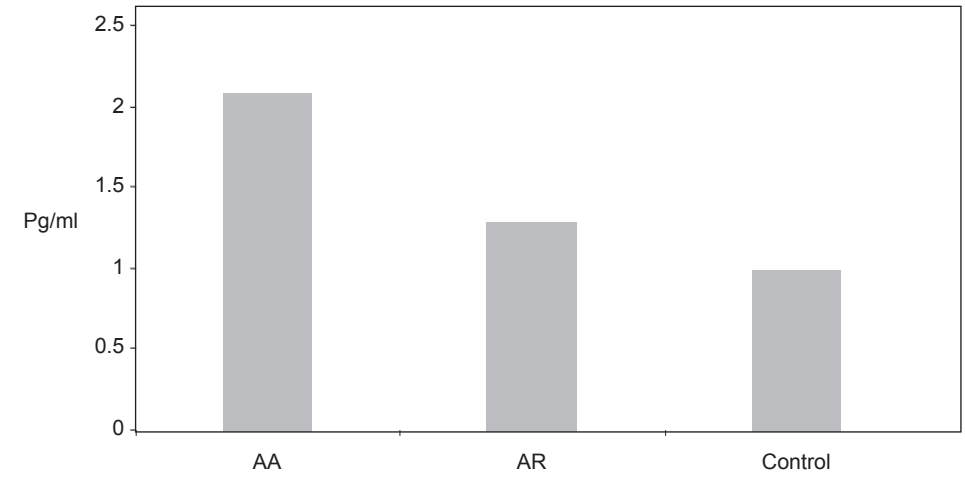

Figure 3. Mean Serum IL-4 Level

10 in the control group (10 ± 1 pg/ml) was significantly less than AA (33 ± 11 pg/ml) and AR (20 ± 5 pg/ml) groups, (P<0.001) (Fig 4). Gamma interferon was not detectable in the serum of any AR or AA subjects. There

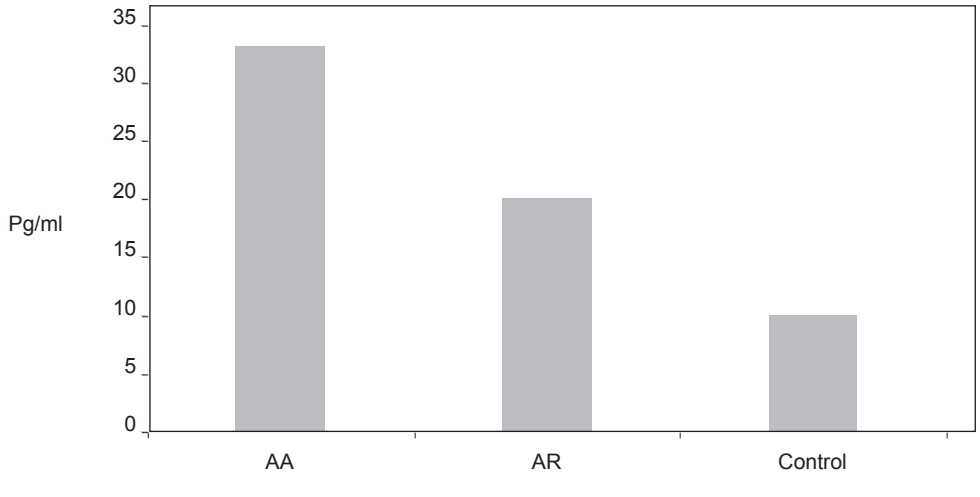

Figure 4. Mean Serum IL-10 level

was also a non significant trend of decrease in the serum selenium level in severe asthma (P=0.13). The result of this study indicates that low selenium may have a role in the pathogenesis of allergic diseases. This is in accordance with the previous studies in which selenium deficiency is suggested to

attenuate the immune response and block expression of adhesion molecules stimulated by IFN-γ, a type I cytokine, in a dose dependent manner (14). In addition, a higher risk of food allergy in children with selenium deficiency has been shown by Kalita et al. (15). Better understanding of basic mechanisms of low selenium status may inspire new treatment modalities and may promote the issue of selenium supplementation for selected diseases.

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