SUMMARY: Previous epidemiological studies have revealed that adolescent patients with chronic bronchial asthma are selenium deficient and have also lowered activity of glutathione peroxidase (GSH-Px). The aim of this study was to evaluate the effects of selenium supplementation on lung function in a clinical trial of adolescents with asthma from southwestern Romania. A randomized observational longitudinal prospective and comparative multicenter study was performed on 112 nonsmoking adolescent patients (13 to 18 years), with chronic infectious-allergic bronchial asthma during June 2012-July 2013. All the patients reported inhaled salmeterolum/fluticasolum combination use at baseline and experienced this therapy for at least two years. As a pharmacologic therapy, the patients were given 200 μg Se/day for a study period of 1 year (Selenium forte, 100 μg, two tablets daily, Walmark). Venous blood samples were withdrawn for selenium analysis and its concentrations were measured by atomic absorption spectrophotometry, at baseline and at the end of the study. Exclusion criteria: adolescents with history of renal or liver disease or if they were taken supplements containing selenium. One revealed a significant increase of 35% plasma selenium concentrations, when compared with baseline. When serum selenium concentrations were correlated with forced vital capacity levels, a significant correlation was found at the end of the studied period (p<0.005). In contrast of other authors, we observed a direct correlation between serum selenium concentrations and forced expiratory volume in one second in the adolescent patients enrolled in the study (p<0.005). This study reveals a direct correlation between low selenium levels and the ventilatory lung function parameters in adolescent patients with chronic infectious and allergic asthma. Selenium supplementation certainly represents a useful adjunct to salmeterolum/fluticasolum combination therapy for this category of patients.

Keywords: selenium deficiency, adolescents, chronic infectious-allergic bronchial asthma, ventilatory lung function.

Abbreviations: GSH-Px = glutathione peroxidase; FVC = forced vital capacity; FEV1 = forced expiratory volume in one second

Deficitul de Seleniu la pacienþii adolescenþi cu astm bronºic cronic

REZUMAT: Studii epidemiologice anterioare au relevat faptul cã pacienþii adolescenþi cu astm bronºic cronic prezintã o deficienþã de seleniu însoþitã de reducerea activitãþii glutation peroxidazei (GSH-Px). Scopul acestui studiu a fost de a evalua efectele suplimentãrii de seleniu asupra funcþiei pulmonare într-un trial clinic de adolescenþi cu astm din sud-vestul României. Am efectuat un studiu randomizat, longitudinal, observaþional, prospectiv, comparativ și multicentric pe 112 adolescenti nefumãtori (13 la 18 ani), cu astm bronºic cronic infecto-alergic, în perioada iunie 2012-iaiulie 2013. Toþi pacienþii au raportat tratamentul pe cale inhalatorie cu salmeterolum/fluticasolum la momentul iniþial la înrolarea în studiul și au experimentat acest tratament pentru cel puþin doi ani. Ca terapie farmacologicã, pacienþii li s-au administrat 200 μg Se/zi pentru o perioadã de studiu de 1 an (seleniu formulã forte, 100 μg douã tablete zilnic, Walmark). Probele de sânge venos au fost recoltate pentru analiza
Adolescence is a complex and distinct period in the life of the individual, characterized by profound physical and psychological changes (1). The changes of the body found in the transition between childhood and adulthood cause important and interesting pharmacotherapeutic features, difficult to manage by most of the healthcare providers. Noting the specific features of this age, Hein and Cohen initiated the pharmacotherapy teen 20 years ago, paving the way for some interesting future research (2), (3).

Chronic infectious-allergic bronchial asthma is a common burden in the adolescent patient (4). In this context, identifying nutrients that could help reduce severity of the disease by improving the ventilatory lung function in this population is a worthy public-health aim. Selenium is an essential component of a wide number of functional seleno-proteins required for normal health. It is specific because it is the only trace element to be specified in the genetic code - as selenocysteine (5). Among these selenoproteins, the antioxidant glutathione peroxidase (GSH-Px) is definitely the most important and well known, because it has the role to remove hydrogen peroxide and other damaging lipid and phospholipid hydroxides generated by free radicals and other oxygen derived species in airway epithelial fluid (6).

Previous epidemiological studies have revealed that adolescent patients with chronic bronchial asthma are selenium deficient and have also lowered activity of glutathione peroxidase (7). One has reported that selenium supplementation has a beneficial effect in chronic infectious-allergic bronchial asthma, because it decreases oxidative stress, which has a very important role in the pathology of this severe disease (8).

The aim of this study was to evaluate the effects of selenium supplementation on lung function in a clinical trial of adolescents with asthma from southwestern Romania.

MATERIAL AND METHOD

A randomized observational, longitudinal, prospective and comparative multicenter study was performed on 112 nonsmoking adolescent patients (13 to 18 years), with chronic infectious-allergic bronchial asthma during June 2012-July 2013.

Inclusion criteria: all the patients reported inhaled salmeterolum/fluticasolum combination use at baseline and experienced this therapy for at least two years for mild or moderate chronic infectious-allergic bronchial asthma.

Participants gave informed written consent.

Exclusion criteria: adolescents with history of renal or liver disease or if they were taken previously supplements containing selenium.

As a pharmacologic therapy, the patients were given 200 μg Se/day for a study period of 1 year (Selenium forte, 100 μg, Walmark).

Venous blood samples were withdrawn for selenium analysis and the plasma concentrations were measured by atomic absorption spectrophotometry, at baseline and at the end of the study. Serum selenium levels were evaluated by electrothermal atomic absorption spectrophotometry, using an AA1 - Shimadzu 2001 spectrophotometer, with control and computed processed data. The standardized zinc curve had a coefficient $r = 0.9939$. Blood samples were previously mineralized with nitrogenous acid at a temperature of 160°C, for 15 minutes, on a microwaves mineralizer MARS - 5, CEM 2001.
Results were expressed as mean and standard deviation.

In order to reveal forced vital capacity and the forced expiratory volume in one second, comparative results were recorded baseline and after one-year of selenium therapy, using an electronic portable peak flow meter, as well as spirometry tests.

**RESULTS AND DISCUSSIONS**

Mean age of enrolled adolescent patients was 14.7 ± 11.37 years.

Distribution by sex revealed 53.11% females and 46.89% males.

At baseline, all 112 adolescent patients taken in the study were selenium-deficient. Serum selenium concentrations were found to be significantly lower than normal ranges (Table 1).

One revealed a significant increase of 35% plasma selenium concentrations, after one-year selenium supplementation, when compared with baseline.

According with data from literature, we observed that all the investigated subjects had different degrees of selenium deficiency, like in other developing countries (9), (10), (11). The most decreased variations were revealed in 5 adolescents (4.46%), diagnosed HIV positive, and these results are in accordance with previous researches (12).

Correlations with the duration of the chronic infectious-allergic bronchial asthma were set up, pointing out that adolescents having a disease duration more than two years had a significant lower selenium concentration level, than those with a duration under two years (p<0.005).

When serum selenium concentrations were correlated with forced vital capacity levels, a significant correlation was found at the end of the studied period (p<0.005).

In contrast of other authors (13), we observed a direct correlation between serum selenium concentrations and forced expiratory volume in one second in the adolescent patients enrolled in the study (p<0.005). Measurements of lung function were used to determine asthma severity with <60%, 60-80%, and >80% predicted FEV1 values representing severe, moderate and mild asthma, respectively (14).

The most representative results concerned FEV1/FVC ratio, as falling a ratio of <70% implies obstructive disease, and was revealed in 75% of the enrolled patients. After 1-year of selenium supplementation, the FEV1/FVC ratio became >70%, therefore obstruction was effectively excluded (15), (16).

Further research is needed in order to reveal the correlation between the plasma selenium levels and the duration and severity of chronic infectious-allergic bronchial asthma in adolescent patients. The good compliance of selenium supplements reveals the clinically important improvements in the analyzed patient setting, in accordance with literature data (17).

**CONCLUSION**

This study reveals a direct correlation between low selenium levels and the ventilatory lung function parameters in adolescent patients with chronic infectious and allergic asthma. Selenium supplementation certainly represents a useful adjunct to salmeterolum/fluticasolum combination therapy for this category of patients.
References: