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Zn AND Cu LEVELS IN THE BLOOD PLASMA IN CHILDREN WITH ATTENTION DEFICIT AND HYPERACTIVITY DISORDER (ADHD) WHOSE MOTHERS SMOKED DAILY DURING PREGNANCY

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Zn, Cu-ის შემცველობა ყურადღების დეფიციტის და ჰიპერაქტივობის სინდრომის მქონე ბავშვების სისხლის პლაზმაში, რომელთა დედები ორსულობის პერიოდში მუდმივად ეწეოდნენ სიგარეტს

[1]თბილისის ბალნეოლოგიური კურორტი, საქართველო; [2]ფსიქიკური ჯანმრთელობის და ნარკომანიის პრევენციის ცენტრი, თბილისი, საქართველო; [3]ი. ჯავახიშვილის სახელობის თბილისის სახელმწიფო უნივერსიტეტი, საქართველო; [4]თბილისის სახელმწიფო სამედიცინო უნივერსიტეტი, საქართველო

რეზიუმე

განისაზღვრა თუთიის და სპილენძის შემცველობა ყურადღების დეფიციტისა და ჰიპერაქტივობის სინდრომის მქონე ბავშვების სისხლის პლაზმაში და მიღებული მონაცემები შედარებულ იქნა იმ ბავშვებთან, რომელთა დედებიც ორსულობის პერიოდში მუდმივად ეწეოდნენ ან არ ეწეოდნენ სიგარეტს. თუთიის დეფიციტი აღმოჩენილ იქნა ყველა გამოკვლეული ბავშვის სისხლის პლაზმაში, თუმცა მეტად გამოხატული იყო იმ ბავშვებში, რომელთა დედებიც ორსულობის პერიოდში ეწეოდნენ სიგარეტს. სპილენძის შემცველობა ყველა გამოკვლეული ბავშვის სისხლის პლაზმაში შეესაბამებოდა ასაკობრივ ნორმას. აუცილებელია ქცევითი აშლილობების (ადგილობრივი ან სპეციფიკური) განვითარებაში მონაწილე მიზეზ-შედეგობრივი ურთიერთობების დიფერენცირება.

During the development of the children neurotic spectrum disorders usually occur, which manifest in characteristic behavioral changes, hyperactivity, impulsivity, and attention deficit (ADHD syndrome). The global prevalence of ADHD is 3-10%. In Georgia, ADHD syndrome is diagnosed in 4% of preschool and early school-age children [3].

The etiology of the syndrome involves many similar and overlapping factors: genetic risks, neuroanatomical, and neurochemical processes, among which essential microelements - particularly zinc - are especially important. The impact of the environment on a child's health and development is multifactorial. An important environmental factor that increases the risk of developing ADHD is nicotine exposure. This is primarily associated with maternal smoking during pregnancy or in the presence of the child (active and passive smoking, mainstream tobacco smoke) [4].

Purpose of the study was to determine the levels of zinc (Zn) and copper (Cu) in the blood plasma of children with ADHD whose mothers smoked consistently during pregnancy. The data were compared with those of children with ADHD whose mothers did not smoke during pregnancy.

Material and Methods. The study involved children aged 5-6 years with ADHD syndrome (Diagnostic criteria DSM-V), whose mothers smoked continuously during pregnancy (target group-N 19). As well as in the study were involved 39 children of the same age with ADHD whose mothers never smoke at all and were always in the fresh air during pregnancy (control group).

Trace elements (Zn, Cu) in the blood plasma in children with ADHD were identified using a Perkin Elmer 3100 atomic absorption spectrometer. The obtained data were analyzed using the IBM OASIS-740 computer software, version 4 (USA).

According to clinical data [2], the target group was divided into three subgroups: (1) Children with predominantly hyperactive-impulsive symptoms (7 children); (2) Children with pronounced attention deficit (6 children); (3) Children with mild behavioral and attention disorders (6 children). The control group consisted of 39 children with ADHD whose mothers never smoked.

Results: According to the obtained data, Zn level in the blood plasma of children of the first target subgroup did not exceed 8.6±0.2 micromol/l, and the Cu was 14.1±0.3 micromol/l. In children of the second target subgroup, Zn was 9.1±0.3 micromol/l, and Cu was 13.4±0.1 micromol/l. In children of the third target subgroup, Zn did not exceed 9.2±0.2 micromol/l in the blood plasma and Cu was 13.2±0.2 micromol/l. In the control group, Zn level also did not exceed 10.1±0.1 micromol/l in the blood plasma, and the Cu was 13.6±0.2 micromol/l.

Thus, in all the examined children with ADHD, the Zn level in the blood plasma is lower ($P<0.001$) than the age standards accepted in medical practice (13.01±0.6 micromol/l). At the same time, children with ADHD whose mothers did not smoke during pregnancy, had significantly higher Zn level in the blood plasma ($P<0.01$) compared to children whose mothers smoked.

The following difference also attracts attention. The Zn content in the blood plasma in the first target subgroup was significantly lower ($P<0.01$) compared to the second and third target subgroups. Cu level in the plasma in all subgroups was within age-related norms.

Conclusion: Zn deficiency in blood plasma was detected in the children of the target and control groups. Cu level in the blood plasma of all groups children corresponded to the accepted age standards (13.02±0.7 micromol/l). The decrease of Zn level was more pronounced in children whose mothers were constant smokers. Zinc and copper belong to a same chemical group [1], have similar mechanisms of absorption, and compete in most cases. Therefore, the deficiency of one of them is significant. It is necessary to differentiate the cause-and-effect relationships involved in the development of behavioral disorders (whether local or specific).

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SUMMARY

It was determined Zn and Cu level in the blood plasma in children with ADHD syndrome, whose mothers smoked constantly during pregnancy. The obtained data were compared with the data of children with ADHD, whose mothers never smoked during pregnancy. Zinc deficiency was detected in the blood plasma of all the examined children. The decrease in Zn level was more pronounced in children whose mothers smoked during pregnancy. Cu level in the blood plasma corresponded to age standards in all the examined children. It is necessary to differentiate the cause-and-effect relationships involved in the development of behavioral disorders (local or specific).

Keywords: microelements, Zn, Cu, ADHD, blood plasma