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Arterial Blood Hypertension in the Aspect of Some Risk Factors

Nadciśnienie tętnicze krwi w aspekcie wybranych czynników ryzyka

Progressive contamination of natural environment with heavy metals makes the risk of toxic influence on living organisms more real and becomes a very important ecological issue. Out of many risk factors, in the case of idiopathic arterial hypertension, the role of these metals is considered in the ethiopathogenesis of the illness especially when it occurs in the areas of environmental threat. It refers to such elements as lead and cadmium, the pathogeneiity of which is often noted by a number of researchers (7, 9, 13, 18).

The toxicity of substitution doses of these metals, especially the ones of lead, on the living organisms including man, is still controversial and stands as a subject of inquiry in many epidemiological and clinical studies. The bulk of research performed in the last few years suggests the possibility of subclinical lead poisoning in the releasing mechanism of arterial blood hypertension. mainly in patients with genetically predisposed illness. In the mechanism of metal contamination the way of releasing hypertension may present itself as an activation of a reninangiotensin system, stimulation of α -adrenergic receptors and weakening of an enzyme system (10, 17).

The problem of cadmium participation in the pathogenesis of arterial blood hypertension has not been fully recognized, so far. In his experiments Shroeder pointed out that cadmium exerts an elevating effect on the arterial blood hypertension in animals (14). The experiments results do not hold true, however, for humans as far as the clinical and epidemiological examinations are concerned Beevers et al., did not find any distinctive features between the cadmium concentration in healthy patients and in those with arterial blood hypertension. However, during examining the level of cadmium in human urine the elevation of its excretion was observable. On the basis of research literature it was pointed out that cadmium excretion is strictly connected with kidneys competence (5, 18).

The aim of the study was to mark out the levels of two heavy metals: lead and cadmium in blood and urine of the chosen population of healthy people and of those with arterial blood hypertension.

MATERIAL AND METHOD

The examination was performed on 56 patients, including 41 with clinically diagnosed hypertension illness and 15 healthy persons being a control group. The group with arterial blood hypertension included 11 women (average age 48 years) and 30 men (average age 51 years). Beside the general physical examination and manifold blood pressure taking, the biochemical tests were performed to state the health condition of the examined population.

As stated by WHO, the term "arterial blood hypertension" is defined by the values of 160 mm Hg and above for the contraction pressure and 95 mm Hg and above for decontraction pressure. 16 persons were reported in the group of labile hypertension (Ist period according to WHO). 11 persons belonged to a group of fixed hypertension (IInd period according to WHO). Finally, 14 persons created a group of hypertension connected with kidneys and heart failure (IIIrd period according to WHO). The level of cadmium and lead in blood and urine was evaluated on the basis of atomic absorbtion spectrophotometry (8, 15). The results were elaborated on by using statistic method and counting medium values (\bar{x}), standard deviation (SD), and statistic significance as compared with the control group. That was done with the sid of Cox and Cochran test (11).

RESULTS AND DISCUSSION

Arterial blood hypertension medium values for the created groups were established as follows:

group I — Ist period — contraction pressure 171.1 mm Hg, decontraction — 106.2 mm Hg;

group II — IInd period — contraction pressure 187.7 mm Hg, decontraction — 112.2 mm Hg;

group III — IIIrd period — contraction pressure 192.0 mm Hg, decontraction — 117.5 mm Hg.

Table 1 visualizes medium lead and cadmium values in blood and urine of the examined population. Collected medium values of these metals in blood of the hypertension group were nonsignificantly higher in comparison with the ones in the control group, including the fact that a sex factor at female patients did not discover any significant differences in comparison with medium values of the

Groups	Numerous group (n)	Lead (Pb)		Cadmium (Cd)	
		The value in blood ($\mu g/100$ ml) $\bar{x} \pm SD$	The value in urine $(\mu g/1)$ $\bar{x} \pm SD$	The value in blood ($\mu g/100$ ml) $\tilde{x} \pm SD$	The value in urine ($\mu g/1$) $\bar{x} \pm SD$
Control group	15	12.80 ±9.09	22.67 ±12.23	1.04 ±0.51	1.99 ±1.79
Tested group	41	16.24 ± 7.19 c = 1.162	$\begin{array}{c} 22.29 \pm 11.57 \\ c = 0.107 \end{array}$	1.14 ± 0.36 c = 0.722	3.0 ± 2.11 c = 0.181
Women	11	12.19 ± 8.07 c = 0.180	25.09 ± 15.88 c = 0.422	1.02 ± 0.43 c = 0.108	2.09 ± 1.51 c = 0.475
Men	30	17.72 ± 9.40 c = 1.171	21.27 ± 3.50 c = 0.388	1.19 ± 0.33 c = 1.037	$3.34 \pm 2.22*$ c=2.359

Table 1. Mean contents of lead and cadium in blood and urine of tested population

**p*≤0.05.

control group. Analyzing these metals' level in the urine similar levels of lead in urine in case of the examined group and the control group were observed. The cadmium level in the urine of blood hypertension patients was non-significantly higher as compared with the control group patients.

Considering the sex division factor, the lead level in female patients appeared to be non-significantly higher and in male patients it showed to be lower in comparison with the ones in the control group. Cadmium value in female and male urine was higher as compared with the control group. In male patients the differences were statistically significant with the significance level of $p \leq 0.05$. In all arterial blood hypertension groups of patients there was statistically insignificant growth of lead and cadmium in blood and cadmium in the urine. The lead value in the urine of the arterial blood hypertension patients of group I appeared to be nonsignificantly higher and in the two other groups the lead value was non-significantly lower as compared with the control group patients (Table 2).

Groups		Numerous group (n)	Lead (Pb)		Cadmium (Cd)	
			Value in blood ($\mu g/100 \text{ ml}$) $\bar{x} \pm SD$	Value in urine ($\mu g/1$) $\bar{x} \pm SD$	Value in blood ($\mu g/100 \text{ ml}$) $\bar{x} \pm SD$	Value in urine ($\mu g/1$) $\bar{x} \pm SD$
Control group		15	12.80 ±9.09	22.67 ±12.23	1.04 ±0.51	1.99 ±1.79
Tested groups with blood hypertension	Period I	16	18.0 ± 13.76 c = 0.791	$23.44 \pm 14.89 \\ c = 0.157$	1.18 ± 0.31 c = 0.920	2.97 ± 2.23 c = 1.491
	Period II	11	15.28 ± 12.72 c=0.551	22.45 ± 5.43 c = 0.062	1.12 ± 0.35 c = 0.477	3.13 ± 2.47 c = 1.417
	Period III	14	15.0 ± 11.24 c = 0.576	20.86 ± 11.39 c = 0.388	1.11 ± 0.44 c = 0.395	2.94 ± 1.81 c = 1.571

 Table 2. Mean contents of lead and cadium in blood and urine of tested population with regard to period of blood hypertension

The acquired medium concentration values of cadmium and lead in blood and urine of the examined population did not exceed hygienic norms.

The role of heavy metals as a releasing factor of material blood hypertension has been an important subject of discussion for many years. In some regions, especially in those of high industrialization, the meaning of those metals is being equally taken into consideration as well as other reasons for arterial blood hypertension. The recent clinical and experimental research of many authors suggests that in some forms of the arterial blood hypertension the role of lead may be highly probable (2, 7). In former research there was no strict correlation to be observed between arterial blood hypertension in people exposed to the lead activity (4). However Berlin et al. showed that arterial blood hypertension is more frequent in people exposed to a toxic influence of lead than in those who are not exposed (1). The experiments' results of examinations of animals in establishing the role of cadmium in arterial blood hypertension have not been yet univocally acclaimed in epidemiological research on human population (5, 13).

In literature accessible now, the information given by Glauser et al., shows a significant level of elevation of cadmium in blood in people with arterial blood hypertension (6). The results' divergences point out the necessity of conducting further research. Progressive contamination of environment with heavy metals may appear to become a very important issue in prophylactic treatment.

Conclusions

1. Medium lead and cadmium values in systemic liquids (blood, urine) of the examined population are within the bounds of hygienic norms.

2. The lead and cadmium levels in blood and urine of the examined groups of patients with arterial blood hypertension was non-significantly higher in comparison with patients from the control group, with an exception of lead in urine which showed similarity to the control group.

3. Considering the division of arterial hypertension according to WHO, the statistic increase of lead and cadmium levels in blood and urine in the patients with hypertension did not show to be significant, the exception lead level in the urine in groups II and III as compared to the control group.

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STRESZCZENIE

W przeprowadzonych badaniach oceniano poziom metali ciężkich: ołowiu i kadmu we krwi i moczu wybranej populacji ludzi zdrowych oraz osób z rozpoznanym nadciśnieniem tętniczym. Badaniami objęto 56 osób, w tym 15 osób zdrowych (grupa kontrolna) i 41 osób z rozpoznaną chorobą nadciśnieniową (grupa testowa). Poziom ołowiu i kadmu we krwi i moczu badanych z grupy testowej był nieznamiennie wyższy w porównaniu z grupą kontrolną, z wyjątkiem ołowiu w moczu, gdzie stwierdzono poziom zbliżony do grupy kontrolnej. Uzyskane średnie wartości tych metali w płynach ustrojowych (krwi i moczu) znajdowały się w granicach obowiązujących norm.