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MEDICAL SCIENCES

ВЛИЯНИЕ СЕЛЕНО-СОДЕРЖАЩИХ ПРЕПАРАТОВ НА УГЛЕВОДНЫЙ ОБМЕН У ПАЦИЕНТОВ С САХАРНЫМ ДИАБЕТОМ

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INFLUENCE OF SELENIUM-CONTAINING MEDICINES ON CARBOHYDRATE METABOLISM IN PATIENTS WITH DIABETES MELLITUS

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АННОТАЦИЯ

Введение. Сахарный диабет - нарушение обмена веществ. Около 4–5% населения мира страдает диабетом. Ожирение считается одним из самых серьезных факторов риска проявления диабета 2 типа. По данным ВОЗ, распространенность МС составляет 20-40%. Поиск новых путей коррекции углеводного обмена является перспективным направлением.

Цель. Улучшить лечение нарушений углеводного обмена у пациентов с сахарным диабетом 2 типа.

Материалы и методы. С целью установления влияния селеносодержащих препаратов на показатели углеводного обмена у лиц с сахарным диабетом 2-го типа нами было обследовано 65 пациентов, которые случайным образом были разделены на две группы: 31 пациент получал базисную терапию, 34 пациента на фоне стандартного лечения принимали препарат селена в дозе эквивалентной 100 мкг.

Результаты. В результате приема селенита натрия на фоне базисного лечения в течение 1 месяца наблюдается статистически значимое уменьшение проявления инсулинорезистентности (снижается НОМА-IR) у пациентов с сахарным диабетом 2-го типа в основной группе относительно группы контроля ($p < 0,05$).

Вывод. Полученные данные свидетельствуют о положительном эффекте селеносодержащих препаратов на фоне стандартного лечения на показатели углеводного обмена путем снижения резистентности к инсулину.

ABSTRACT

Introduction. Diabetes mellitus is a metabolic disorder. About 4–5% of the world population suffers from diabetes. Obesity is considered as one of the strongest risk factors for type 2 diabetes manifestation. According to WHO, the prevalence of MS is 20-40%, thus receiving the characteristic of the "XXI century pandemia". The search for new ways of correction of carbohydrate metabolism is a promising direction.

Objective. Improve treatment of carbohydrate metabolism disorders in patients with diabetes mellitus.

Materials and methods. In order to determine the effect of selenium-containing drugs on thyroid homeostasis indices in patients with diabetes mellitus type 2, we examined 65 patients who were randomized according to age and sex into two groups: 31 patients received basic therapy, 34 patients received selenium-containing supplements in a dose equivalent to 50mcg of selenium per day against the background of standard treatment.

Results. As a result of taking selenium on the background of basic treatment for 1 month, we have revealed an improvement in the state of carbohydrate metabolism comparing with control group - HOMA-IR ($p < 0,05$).

Conclusion. The obtained data suggest positive effect of selenium containing medicines on background of standard treatment on carbohydrate metabolism by reduction of insulin resistance.

Ключевые слова: углеводный обмен, метаболический синдром, диабет 2 типа, селен.

Keywords: carbohydrate metabolism, metabolic syndrome, type 2 diabetes, selenium.

Конфликт интересов: конфликт интересов отсутствует.

Conflicts of Interest: authors have no conflict of interest to declare.

Diabetes mellitus (DM) is a metabolic disorder. About 4–5% of the world population suffers from diabetes. According to WHO, the prevalence of metabolic syndrome (MS) is 20 - 40%. It most commonly affects middle aged and older people (30-40%) [7]. In general about 30% (16,8% women and 14,9% men) of the planet's population have excess body weight [2].

Obesity is considered as one of the strongest risk factors for type 2 diabetes manifestation. Pathophysiological processes that accompany obesity cause the development of hypertension, disorders of carbohydrate metabolism, dyslipidemia, which are components of the metabolic syndrome (MS) [4]. In patients with obesity of I-st class, the risk of developing type 2 diabetes mellitus increases three times, II class - 5 times and III degree - 10 times [5].

It is known that selenium is an antioxidant, has hypolipidemic, insulin-mimetic and immune-modulating

effects, but the use of selenium in the complex treatment of disorders of carbohydrate metabolism is still poorly studied [8].

All this indicates the relevance of the research in the chosen direction

The aim of the study: To improve the treatment of carbohydrate metabolism disorders in patients with metabolic syndrome.

Material and methods.

A comprehensive examination of 65 patients with DM type 2 was performed with the aim to estimate the efficiency of selenium-containing medicines on carbohydrate metabolism. The examined patients were randomly divided into two groups: 31 people with DM received standard treatment: antihypertensive drugs (ACE inhibitors - enalapril 10 - 20 mg / day), antiplatelet agents (acetylsalicylic acid 75 - 100 mg / day), statins (atorvastatin - 10 - 20 mg / day), patients with type 2 diabetes received biguanides (metformin at average daily dose of 1000 - 2000 mg / day) and formed comparative group. The main group consisted of 34 people who received a medicine containing 0,333 mg of sodium selenite, equivalent to 100 µg of selenium for 30 days, against the background of basic therapy. The results obtained were evaluated before the beginning of treatment and immediately after the treatment.

Disorders of carbohydrate metabolism were diagnosed according to WHO criteria (1999). Fasting immunoreactive insulin (IRI), C-peptide were determined by immunoassay method on analyser of immune-enzymatic reactions “Uniplan” using DRG (Germany) reagents.

Glucose content was determined by glucose oxidase method using standard set of reagents of the “Fylisyt diagnosis” (Ukraine).

Content of glycated hemoglobin (HbA_{1c}) was studied by the method of ion-exchange high performance liquid chromatography (HPLC) on Automatic

analyzer of glycated hemoglobin D10 “Bio-Rad Laboratories Inc.», using the “Biomedinvest” reagents (Ukraine).

To study the proinflammatory activity of adipocytes, the level of leptin was studied by immunoassay method on analyser of immune-enzymatic reactions “Uniplan” using DRG (Germany) reagents.

To assess the degree of insulin resistance a small model of homeostasis (Homeostasis model assessment – HOMA) was used, calculated by means of the HOMA Calculator Version 2.2 Diabetes Trials Unit at the University of Oxford (UK).

Anthropometric indices were calculated: such as waist to hip (W/H) ratio and body mass index (BMI), according to Quetelet [1].

Results and discussion. The results of previous studies indicate the presence of carbohydrate metabolism disorders associated with insulin resistance in diabetic patients [1].

Therefore, the aim of the study was to study the effect of selenium-containing medicines on carbohydrate metabolism in diabetic patients (tab.). Significant reductions in fasting glycaemia, glycated haemoglobin, and HOMA-IR were observed in both groups (p < 0,05), more pronounced changes were obtained against the background of additional selenium administration.

In the group of people who received selenium with basic therapy, HOMA-IR was significantly lower (by 26,6 %) compared to the other group (p < 0,05).

The positive effect of the selenium-containing medicines on carbohydrate metabolism is due to its insulin-like properties as it activates the insulin-signaling mechanism by phosphorylation of Akt and PI3 protein kinases, stimulates tyrosine kinase, and the combination of the use of this microelement with physical exercises promotes an increase in the activity of proteins involved in glucose metabolism (AMPK, PGC-1A, GLUT-4) and lactate (LDN, MCT-1, MCT-4, COX-IV) in heart and skeletal muscles in an experiment on mice [8].

Table

Dynamics of carbohydrate metabolism as a result of treatment with selenium-containing medicines in patients with diabetes mellitus

Indices	Groups, number of observations, probability of changes		
	Groups	Basic treatment + selenium-containing medicines M±m, n=34	Basic treatment M±m, n=31
Glucose, mmol/l	Before treatment	8,18±0,638	8,12±0,403
	After treatment	6,23±0,437 P ₁ <0,05 P ₂ >0,05	5,94±0,322 P ₁ <0,05
Immune-reactive insuline, mIU/ml	Before treatment	18,36±3,226	19,15±3,311
	After treatment	18,76±4,362 P ₁ >0,05 P ₂ >0,05	19,24±3,415 P ₁ >0,05
HOMA-IR	Before treatment	5,94±0,072	6,18±0,064
	After treatment	4,36±0,078 P ₁ <0,05 P ₂ <0,05	5,62±0,081 P ₁ <0,05

Leptin, ng/ml	Before treatment	21,72±4,178	22,14±3,521
	After treatment	21,31±4,242 P ₁ >0,05 P ₂ >0,05	22,07±3,375 P ₁ >0,05
C-peptide, ng/ml	Before treatment	6,16±0,247	6,48±0,364
	After treatment	5,24±0,328 P ₁ >0,05 P ₂ >0,05	6,22±0,378 P ₁ >0,05
HbA1c, %	Before treatment	8,42±0,456	8,67±0,514
	After treatment	7,56±0,434 P ₁ <0,05 P ₂ >0,05	7,74±0,438 P ₁ <0,05

Notes:

1. n - s the number of patients in the group;
2. P₁ - the probability of changes in relation to indicators before treatment;
3. P₂ - the probability of changes in relation to the comparison group

Conclusion: As a result of taking selenium-containing medicines, statistically significant decrease of insulin resistance (decreased HOMA-IR) in patients of the main group compared with the other group on the background of basic treatment for 1 month, which indicates the insulin-mimetic properties of selenium.

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