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RESEARCH OF THE POST-TRAUMATIC STRESS INFLUENCE ON THE RISK OF CARBOHYDRATE METABOLISM DISORDERS IN WOMEN – VETERANS

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ABSTRACT

Research aim. to assess the impact of post-traumatic stress on the risk of carbohydrate metabolism disorders in concussed female veterans. Systematization of multidisciplinary analysis and obtained data on the impact of PTSD on the development and course of carbohydrate metabolism disorders.

Material and methods. A comprehensive clinical and laboratory examination of women veterans with PTSD and women from the comparison group was carried out. Group I consisted of examination data of women who suffered contusion during combat operations with PTSD, group II – control one, consisted of healthy women. Complaints, obstetric – gynaecological and somatic history were studied in detail, anthropometric data, the state of carbohydrate metabolism, and mental health were assessed.

Results and conclusions The results of the conducted research show that the correction of carbohydrate metabolism disorders and treatment of pre-existing pathology caused by the influence of stress factors in combatants in order to preserve reproductive health is expedient and necessary.

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Introduction.

The prevalence of carbohydrate metabolism disorders in the world population is growing steadily. Ukraine is no exception. Disorders of carbohydrate metabolism include diseases: fasting blood glucose (FBG) - fasting plasma glucose levels from 6.1 to 6.9 mmol / l; impaired glucose tolerance (IGT) - plasma glucose levels after oral glucose tolerance test (OGTT) vary from 7.8 to 11.0 mmol / l; combination of IGT and FBG. Also for the assessment of carbohydrate metabolism disorders important diagnostic criteria are the levels of glycated hemoglobin, fructosamine, insulin and HOMA-IR index[22-25]. Among all disorders of carbohydrate metabolism nationwide statistics are mainly increasing due to patients with type 2 diabetes. In fact, nowadays, much of the disorders remain undetected, precisely because of the current rhythm of life and the impact of chronic stress [1,4,7,10].

In the development of type 2 diabetes there is interconnection between metabolic syndrome and chronic psychological stress. As a result of the latter, the hypothalamic-pituitary axis is activated, the level of cortisol increases; the autonomic nervous system is activated; the level of interleukins increases. Insulin resistance develops, the level of glycated hemoglobin (HbA1c) and triglycerides increases, the content of high-density lipoprotein (HDL) decreases, endothelial dysfunction is formed. Phenotypically, such changes are manifested in the development of metabolic syndrome [2-6,14].

Clinical manifestations of metabolic syndrome (MS) in women of childbearing age are not only metabolic and endocrine disorders of the reproductive system [8,12,15-18], but also various psychopathological disorders [9,11,13]. These days, the impact of post-traumatic stress disorder (PTSD) in the development of carbohydrate metabolism disorders is an extremely important issue. For the Ukrainian nation, taking into account the psychosomatic component is an urgent need, in particular because the citizens of Ukraine are under a strong stressful burden of military conflict. There is an increase in the number of carbohydrate metabolism disorders in women servicemen. Among all veteran women examined, 17% of cases were diagnosed with PTSD, and 10% had severe depression [19-21]. The impact of chronic stress and women's history of participation in hostilities significantly disrupt their somatic and psychological state.

Objective: To assess the impact of post-traumatic stress on the risk of carbohydrate metabolism disorders in concussed female veterans. Systematization of multidisciplinary analysis and obtained data on the impact of PTSD on the development and course of carbohydrate metabolism disorders.

Materials and Methods: the research was conducted at the Department of Obstetrics, Gynecology and Reproductology of the Shupyk National Healthcare University of Ukraine. A comprehensive clinical and laboratory examination of women veterans with PTSD and women from the comparison group was carried out. There were 239 examinees in total. Group I consisted of examination data of 127 women who suffered contusion during combat operations with PTSD, group II – control one, consisted 112 of healthy women.

Complaints, obstetric – gynaecological and somatic history were studied in detail, anthropometric data, the state of carbohydrate metabolism, and mental health were assessed. All women underwent anthropometric studies: waist circumference (WC), hip circumference (HC) measurements with the calculation of their ratio (WC/HC) and body mass index (BMI).

Laboratory methods: level of glycated hemoglobin, fructosamine, insulin. An oral glucose tolerance test (OGTT) was performed using a standard technique. The level of fasting glycemia in venous blood was studied, 1 hour after standard glucose dose and then 2 hours later. The degree of insulin resistance was determined by the HOMA index, total cholesterol (TC), triglycerides (TG), low-density lipoproteins (LDL), and high-density lipoproteins (HDL).

Post-concussive symptoms at the time of examination were determined by the Cicero questionnaire. At the same time, patients performed self-assessment of their own symptoms in view of the present. For PTSD screening, a PCL-m (Military Version) questionnaire was used. The study of the state of vegetative regulation was carried out by filling out a questionnaire for the subjective assessment of dystonia (according to the A.M. Wein Questionnaire, 1998).

Statistical processing of the research results was performed using Statistica 6.0 software package and Microsoft Office software package using standard descriptive statistics methods (Mintser O.P., 2016). The level of probability was determined according to the Student's criterion. The differences were considered significant at a level of $p < 0.05$.

Results and discussion: In the course of the research, we studied the data of life history. Carbohydrate metabolism was investigated in women who had experienced concussion during the hostilities. Fasting glycemia was determined in 239 women (127 with PTC and 112 in the comparison group), after loading 75 g of dry glucose in 1 and 2 hours – 128 patients (110 with PTSD - group I and 108 - group II).

Table 1. Results of women's glycemia levels.

The level of glycemia in the blood venes, mmol/l	Group		P	P	P	P	P
	I	II					
Fasting	I	5,5±0,98 (n=42)	0,514	4,8±0,8 (n=61)	<0,001	6,2±2,4 (n=24)	<0,001
	II	3,2±0,5 (n=30)	0,460	3,4±0,6 (n=58)	<0,001	4,1±0,4 (n=24)	<0,001
P		<0,001		<0,001		<0,001	
One hour after standard glucose dose	I	9,0±2,59 (n=38)	0,380	9,1±2,5 (n=56)	<0,001	11,3±2,8 (n=16)	0,002
	II	8,4±1,2 (n=30)	0,702	8,5±0,7 (n=58)	0,407	9,2±0,9 (n=20)	0,078
P		<0,021		<0,001		<0,001	
Two hours after standard glucose dose	I	5,1±1,75 (n=38)	0,380	6,4±2,4 (n=56)	<0,001	7,5±0,82 (n=16)	<0,001
	II	4,1±0,4 (n=30)	0,702	4,2±0,8 (n=58)	0,407	5,2±0,9 (n=20)	<0,001
P		<0,021		<0,001		<0,001	
							P age

P age – P age – results of univariate analysis – correlation between age and carbohydrate metabolism

In women with PTSD aged 26-35, normoglycemia was significantly less frequent than in group II – 57.1% and 83.3% (p=0.023) accordingly. The incidence of impaired fasting glucose (IFG), glucose intolerance (GI), diabetes was not statistically significantly different between the groups. In patients aged 36-45 years, normoglycemia was found in only half of cases in Group I, than in Group II IFG and GI were detected significantly more often. Diabetes was found in women from group I in

16.4% of cases, in group II it was absent ($p < 0.001$). In women over 55 years old, normoglycemia was detected in only 2 cases, in group II - 16 (66.7%) ($p < 0.001$). Diabetes was detected in almost half of women in group I, in group II - only in 1 woman ($p < 0.001$). There was a statistically significant decrease in the frequency of normoglycemia with age in both groups ($p < 0.001$; $p = 0.022$). A statistically significant increase in the frequency of diabetes mellitus ($p = 0.005$) was noted in women of group I with age. The level of glycemia both under fasting conditions and after glucose loading, which is determined in venous blood in women of group I, was significantly higher than in women of group II at all ages. A statistically significant increase in fasting glucose was determined in Group I, as well as in Group II, in women aged over 55, compared to the subgroup of patients aged 46-55 ($p < 0.001$). One hour after standard glucose dose, a significant increase in glucose level was determined in patients in group I aged over 55 compared to the subgroup of patients aged 46-55 ($p < 0.001$), in women in group II no increase in glycemia level was registered 1 hour after glucose intake. Two hours after standard glucose dose, a statistically significant increase in the glucose level was found in patients in group I over 55 years old, compared to the subgroup of patients aged 46-55d, in group II, changes in the level of glycemia in women 46-55 years old and over 55 years old were insignificant ($0 = 0.402$). However, in patients over 55 years old, the glucose level was significantly higher than in patients aged 26-45 ($p < 0.001$). The results of univariate dispersion analysis showed a statistically significant effect of age on the level of fasting glycemia and 1 and 2 hours after a standard glucose dose, both in women who experienced concussion during combat with PTSD and in women from the comparison group. Characteristics of carbohydrate metabolism disorders in women from Group I are presented in Table 41. Women aged 26-35 years who had PCS were found to be normoglycemic significantly less frequently than in group I - by 57.1% and 83.3% ($p = 0.023$). The incidence of IFG, GI and diabetes did not vary significantly in groups. In patients of group I, aged 36-45, normoglycemia was found in only half of cases, IGT and IFG. were registered significantly more often than in group II. Diabetes was found in women of group I in 16.4% of cases, group II was absent ($p < 0.001$). Women over 35 years old were found to be normoglycemic only in 2 cases, in group II – in 16 (66.7%) ($p < 0.001$). Diabetes was detected in almost half of women in group I, in group II - only in 1 woman ($p < 0.001$). There was a statistically significant decrease in the frequency of normoglycemia with age in both groups ($p < 0.001$; $p = 0.022$). A statistically significant increase in the frequency of diabetes development ($P = 0.005$) was noted in women of group I with age.

Table 2. Impaired carbohydrate metabolism in women, abs (%).

Type of disorder	Group	26-45y.o. (n1=21; n2=30)	46-55y.o. (n1=61; n2=56)	>55y.o. (n1=24; n2=20)	P age
Normoglycemia	I	24 (57,1)	33 (54,1)	2 (8,3)	<0,001
	II	25 (83,3)	55 (95,0)	16 (66,7)	<0,022
P (I;II)		<0,023	<0,001	<0,001	
Changes in venous blood glucose, fasting	I	4 (9,5)	9 (14,8)	4 (16,7)	0,650
	II	2 (6,6)	1 (1,7)	3 (12,5)	0,135

P (I;II)		0,661	0,011	0,682	
Impaired glucose tolerance	I	8 (19,0)	8 (13,1)	7 (29,2)	0,220
	II	2 (6,6)	2 (3,3)	4 (16,7)	0,106
P (I;II)		0,138	0,055	0,309	
Diabetes	I	6 (14,3)	10 (16,4)	11 (45,8)	0,005
	II	1 (3,3)	0,0	1 (4,2)	0,326
P (I;II)		0,119	<0,001	<0,001	

Thus, the state of carbohydrate metabolism in women who experienced concussion during combat operations and PTS was characterized by a high frequency of disorders, which will manifest in the form of IGT, IFG and diabetes. The frequency of carbohydrate metabolism disorders increased with age, and was higher in older women groups.

Conclusions.

Numerous pathogenetic links in the development of carbohydrate metabolism disorders developed under the influence of chronic stress and PTS in veteran women negatively potentiate each other's action, which is why the solution to this problem should affect as many links as possible in order to reduce the negative impact on the reproductive system of women. Only targeted comprehensive work on the correction of carbohydrate metabolism disorders in combination with psychological support and appropriate medical and psychological rehabilitation will make it possible to achieve sustainable remission and preserve the reproductive health of women exposed to traumatic factors caused by hostilities.

The results of the conducted research show that the correction of carbohydrate metabolism disorders and treatment of pre-existing pathology caused by the influence of stress factors in combatants in order to preserve reproductive health is expedient and necessary.

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