

Early Specific Metabolic Markers of Deadaptation of the Organism of Pregnant Women in Preeclampsia in The Conditions of the Hard North

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Abstract

Preeclampsia is one of the most common obstetric pathologies affecting the level of maternal and perinatal loss. Preeclampsia is manifested maladjustment state organ of the body for pregnancy, depending on the climatic conditions due to changes in temperature and atmospheric pressure.

Objective: To identify the frequency of severe preeclampsia in the Far North and the determination of the most sensitive markers of the state of maladjustment pregnant.

Results: the incidence of preeclampsia in the northern areas of the Irkutsk region is higher than in its southern region. The frequency of severe preeclampsia in these regions did not differ.

The most sensitive markers of the state of maladjustment pregnant as a mild form of preeclampsia are the concentration ratios dienes and cortisol.

Keywords: Preeclampsia, The Frequency, The Far North, Markers: Dienes, Cortisol.

Preeclampsia remains one of the most frequent and formidable complications of pregnancy and childbirth, being one of the main causes of maternal and perinatal morbidity and mortality (Ushakova G.A., Retz Yu.V., 2008, Tsakhilova S.G., Torchinov A.M., Sarakhova D.Kh., Jonboeva G.N., 2010).

It accounts for up to 25% of maternal deaths. With preeclampsia, the incidence of preterm birth reaches 20-30%, perinatal morbidity is 560% 0, and perinatal mortality is 3-4 times higher than the population one, reaching 12% [1].

The dependence of the frequency of preeclampsia on climatic conditions was noted, which can be explained by the maladjustment of the body for pregnancy in conditions of "overstrain" of the hypothalamic-pituitary-adrenal system of a pregnant woman. Regions of Siberia and the Far East in terms of the frequency of preeclampsia are approximately 1.5 times ahead of the average Russian indicator [2, 3]. Preeclampsia ranks second among the

causes of maternal mortality in the Siberian region (15.3%) [2, 3]. Considering the multi-organ nature of dysfunctional disorders in the body of a pregnant woman with preeclampsia, with varying degrees of their manifestations in systems, depending on the prevailing adverse factor, it becomes necessary to identify the priority changes in metabolism and its laboratory parameters in climatologically unfavorable conditions.

Of particular importance is the early determination of metabolic disorders or dysfunctional state of the adaptation system at the initial stages of the development of the disease, when the possibility of stopping its progression and prolonging pregnancy with the preparation of the fetus for delivery is not ruled out.

The leading role of preeclampsia in the structure of the causes of maternal and perinatal losses, the increase in the frequency and severe forms of this pathology in the absence of its effective prevention and correction determine the urgency of this problem.

Purpose of The Study

To study the frequency of the spread of preeclampsia in the Far North on the example of the Ust-Kutsk district of the Irkutsk region, in comparison with similar indicators in the city of Irkutsk, located in the south of the region, and to identify the most sensitive zones of metabolic disturbances in preeclampsia of unexpressed severity.

Research Materials and Methods

A statistical analysis of the frequency of distribution and features of the structure of preeclampsia in the Ust-Kut region for the period 2006-2010 was carried out. according to the MUZ "Ust-Kutskaya CRH", Branch No. 3 - Osetrovskaya hospital of the Federal State Institution "SOMTS FMBA of Russia" and the data of the Irkutsk City Perinatal Center. Also, 2 groups of pregnant women at 34-39 weeks of gestation were studied. The first group of 78 women, whose pregnancy was complicated by preeclampsia of unexpressed severity. The second group, 90 people, with a physiologically proceeding pregnancy. Assessment of the severity of preeclampsia was carried out according to the method developed by us (Kramarsky V.A., Chulun Bayar Saykhan, 1998). Before treatment, with informed consent, in both groups of women, the concentration of nitrites was determined to assess the antihypertensive adaptation system, malondialdehyde (MDA) and conjugated proteins - dienes, indicating the intensity of peroxidation. Evaluation of the hypothalamic-pituitary-adrenal system (HPAS) was carried out by determining the level of cortisol, trophoblast function by identifying the concentration of β -microglobulin in the blood serum of pregnant women.

Mathematical processing and analysis of the results obtained were carried out by the method of variation statistics. For quantitative indicators, the mean value (M), error of the mean (m), standard deviation (δ), median (Me) and interquartile range (25 - 75%) were determined. The significance of differences in biochemical parameters in the study groups was assessed by Student's t-test. Differences were considered significant at $P < 0.05$.

Results and Discussion

The city of Ust-Kut is located in the central part of the Irkutsk region in the upper reaches of the Lena River at the confluence of the Kuta River. The city is located on the territory of the Leno-Angarsky plateau. The terrain is highly dissected. The absolute heights of the area reach 700-800 m above sea level. The territory of the city is equated to the regions of the Far North. The climate is sharply continental. The average temperature in January is 25°C , in July $+17^{\circ}\text{C}$. The minimum temperature is 58°C , the maximum is $+42^{\circ}\text{C}$. Annual precipitation is 350 mm.

During the study period, relatively high rates of preeclampsia, which complicated the course of pregnancy, were observed in the Ust-Kutsk region. The average daily temperature fluctuations in the Ust-Kut region reach 10-15 degrees, and the minimum and maximum atmospheric pressure is 20-30 mm, which undoubtedly leads to an overstrain of the body's adaptive mechanisms in conditions of developing pregnancy and their disruption (in the form of preeclampsia).⁵

The number of pregnant women who were under the supervision

of an antenatal clinic and who completed pregnancy in childbirth in the reporting year in the Ust-Kutsk region was in 2006. - 592, in 2007. - 735, in 2008. - 836, in 2009. - 810, in 2010. - 768.

During the period under study, there is an increase in the absolute number of births from 2006 to 2008 and a dynamic decrease in this indicator in 2009, 2010. So the number of all genera in the Ust-Kutsk region was in 2006. - 709, in 2007. - 824, in 2008. - 915, in 2009. - 865, in 2010. - 798.

The incidence of preeclampsia complicating pregnancy was in 2006. - 17.6%, in 2007. - 18%, in 2008. - 20%, in 2009. - 14.9%, in 2010. - 23%; on average - $18.7 \pm 1.2\%$. At the same time, in the city of Irkutsk, located in the south of the region, these indicators were respectively equal: 2.6%, 2.7%, 2.8%, 3.2%, averaging $2.8 \pm 0.2\%$, which is almost an order of magnitude lower than in the northern region of the region.

The frequency of severe forms of preeclampsia and eclampsia in the Ust-Kutsk region, complicating pregnancy, was in 2006. - 4.7%, in 2007. - 5.4%, in 2008. - 5.3%, in 2009. - 2.7%, in 2010. - 2.2%; on average - 4.1%.

The frequency of severe forms of preeclampsia in the structure of all preeclampsia complicating pregnancy was in 2006. - 26.9%, in 2007. - 30.1%, in 2008. - 26.3%, in 2009. - 18.2%, in 2010. - 9.6%; on average - $22.2 \pm 1.8\%$ and exceeded the average population indicators (6-7%) in the country by about 4 times. In Irkutsk, this frequency was respectively equal to 25.8%, 13.4%, 18%, 26%, 21.8% and on average was $21 \pm 1.7\%$.

Thus, the frequency of pronounced forms of preeclampsia in the general structure of this pathology in the Ust-Kut region did not significantly differ ($p > 0.05$) from the same indicator in Irkutsk, which can only be explained by the adequacy of therapeutic measures and the timeliness of delivery of women whose pregnancy was complicated by severe preeclampsia.

When determining the features of changes in metabolic processes in women with preeclampsia and its most sensitive markers, it was noted that a specific indicator of the state of early maladjustment of the body was the concentration of dienes in the blood serum of pregnant women, indicating a decrease in the antioxidant activity of the body with preeclampsia of unexpressed severity. This indicator in 97.7% of observations exceeded the reference values, and its average level was 2.5 times higher than during the physiological course of pregnancy, averaging $3.7 \pm 0.4 \text{ nmol / l}$.

A high degree of specificity for mild preeclampsia was also found in cortisol, an indicator of which indicated early adaptation stress in pregnant women with mild preeclampsia. The average cortisol value exceeded the reference values typical for the group of women with the physiological course of pregnancy by 1.7 times, averaging $916.2 \pm 32.1 \text{ nmol / l}$.

The mean values of other studied biochemical markers of preeclampsia corresponded to the reference values typical for the group of women with the physiological course of pregnancy, from which they did not differ significantly ($P \geq 0.05$). So the average

values of these indicators were equal: nitrites - 3.3 ± 0.2 mmol / l (group 1), 2.8 ± 0.1 mmol / l (group 2); MDA - 3.3 ± 0.3 mmol / l and 2.9 ± 0.2 mmol / l, respectively; b-microglobulin - 1.7 ± 0.07 mmol / l (group 1) and 1.8 ± 0.05 mmol / l. (group 2).

Thus, in the conditions of the Far North, the earliest manifestation of maladjustment in pregnant women with mild preeclampsia is a violation of lipid peroxidation, manifested by an increase in the concentration of dienes, as well as tension in the hypothalamic-pituitary-adrenal system with a significant increase in the level of cortisol compared with similar indicators in women with physiological course of pregnancy [3, 4].

Findings

The analysis carried out for the period 2006-2010. in the Ust-Kutsk region revealed a higher frequency of preeclampsia compared to the frequency of preeclampsia in the southern regions of the Irkutsk region (Irkutsk), which can be explained by the peculiarities of climatic conditions.

The frequency of severe forms of preeclampsia in the structure of this complication of pregnancy in the Ust-Kutsk region did not differ significantly from the analogous indicator in the city of Irkutsk, located in the south of the region.

Preeclampsias in the regions of the Far North have been little studied, therefore, they require a more in-depth study of the features of their course in the Far North and the need to develop a set of effective measures to prevent the maladaptive state of pregnant women in the form of preeclampsia.

To identify early forms of preeclampsia in the Northern regions, it is most advisable to determine the level of dienes and cortisol in the blood serum.

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