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# DEVELOPMENT OF PRE-ECLAMPSIA IN PREGNANT WOMEN WITH OBESITY

Zulfiya Shamsieva

*Junior researcher Republican specialized scientific-practical medical center of obstetrics and gynecology, Tashkent, Uzbekistan.*

Yusupbaev R.B.

*Doctor of Medicine Republican specialized scientific-practical medical center of obstetrics and gynecology, Tashkent, Uzbekistan.*

mexriban85@mail.ru

***Abstract. The aim of this study was to examine the impact of obesity in pregnant women in the development of preeclampsia. All women were divided into 2 groups: the study group included women with obesity (n=120) and the control group of pregnant women with physiological course of pregnancy without obesity (n=60).***

***Key words: pregnancy, preeclampsia, obesity, cytokines, triglycerides.***

**Introduction.** Despite the improvement of the antenatal monitoring and delivery, frequency of complications of pregnancy and childbirth in women with obesity has no tendency to decrease and ranges from 32.1 to 83%, therefore the relevance of this issue is of particular importance [1,3, 5,6, 9]. The World Health Organization considers obesity as a global epidemic [1,2,4]. According to several authors, women with obesity have not only higher risk but also a high percentage of delivery by cesarean section (10-28%). The proportion of maternal injury, uterine bleeding, infectious and inflammatory postpartum complications in women with disorders of fat metabolism is significantly higher compared to women of normal weight [7, 8].

It should be noted that among the extragenital types of pathology in obstetric practice great significance is given to obesity in pregnancy and childbirth. The proportion of this pathology and frequency of complications for both the woman and her newborn child continue to remain at a high level [5,8] and its frequency among pregnant women according to the literature ranges from 15 to 35%.

**Aim**. To study pregnancy with preeclampsia on the background of different degrees of obesity.

**Materials and methods**. In the process, clinical, laboratory and instrumental research was carried out. The basic methodology of the studies focused on the comparative evaluation of the state of cytokine profile, blood lipid profile, carbohydrate metabolism in pregnant women with obesity. The study group included women with obesity (n=120) and the control group of pregnant women with physiological course of pregnancy without obesity (n=60). General clinical tests under regulatory documents, biochemical blood tests, koagulogrammou were used of laboratory diagnostic methods. Besides standard laboratory

tests, in addition to 9-12, 24-26 and 32-34 weeks of gestation laboratory evaluation was conducted: in 120 patients carbohydrate and fat metabolism: the concentration of cholesterol, triglycerides, lipoproteins of low and high density, levels of glucose and insulin on an empty stomach were determined; in 42 pregnant women with obesity Pro-inflammatory cytokines were assessed: interleukin (IL) 1, 6, 8, and tumor necrosis factor (TNF-a)

**Results and discussion.** Depending on the severity of obesity, the patients of the main group were subdivided into 3 subgroups depending on the body mass index (BMI): 1 subgroup (n=60) - patients with I degree of obesity (BMI 30-34,9); 2 subgroup (n=30) - patients with II degree of obesity (BMI 35-39,9); 3 subgroup (n=60) - patients with III degree of obesity (BMI $\geq$ 40). The age of pregnant women of the main group ranged from 19 to 36 years and averaged a 28.5±4.36 years. The age of the patients in the control group ranged from 18 to 30 years and the average stood at 24.1±2.4 years. Along with clinical and anthropometric studies we assessed blood lipid profile (triglycerides, total cholesterol, HDL, LDL) in the blood plasma at a gestation period of 30-34 weeks.

In the first trimester of this pregnancy the most common complication was early gestational toxicosis. In the study group, it developed 2.5 times more than that of women in the control group (36 and 15%). In the subgroups, early toxicosis was diagnosed in 50% of pregnant women with III degree of obesity, 31% with I degree of obesity and 33% with II degree of obesity. The threat of termination of pregnancy developed 2 times more in women with obesity compared to the control group (28.3 per and 13.3%, respectively), while its frequency progressively, but unreliably increased from the 1st to the 3rd sub-group (25, 30 and 33.33% respectively). Urinary tract infection in the form of asymptomatic bacteriuria was detected only in the study group and predominantly in women with III degree of obesity (3.3 %, 3.3% and 16.6%, respectively). Significant complications of the second trimester of pregnancy was preeclampsia, the detection rate of which in pregnant women of the study group was 7 times higher than that in the group of women with normal body weight. Fetoplacental disorder (FPD) was diagnosed only in patients of the study group. The threat of termination of pregnancy was observed at 19,16 % patients of the study group and 15% of the control group. Compared to the 1st and 2nd subgroups in 3rd group, gestational pyelonephritis developed 5 times more (16%) and infections of the lower urinary tract (acute cystitis, asymptomatic bacteriuria) developed 4 times more (13%) .

In the third trimester, the most common complication of pregnancy was preeclampsia (PE). In the study group it was observed in 41% of women, which is almost 5 times higher than in the control group (8%). This complication was diagnosed in 35% of cases of women with I degree of obesity, in 36% of cases of women with II degree of obesity, and in 60% of cases of women with III degree of obesity. The risk of preterm birth was diagnosed almost every third women with I-III degree of obesity (31 and 33%) and every fifth (20%) with II degree of obesity. Infections of the lower and upper urinary tract significantly more often complicated the course of pregnancy in women with III degree of obesity (23% vs. 11% cases in the 1st subgroup and 16% of the cases in the 2nd subgroup). GSD developed only in patients of the study group: 1 (3%) pregnant women with obesity of II degree and two (6%) obesity of III degree. FPD was recorded in each third patient with I degree of obesity, each second with II degree of obesity and in 100% of cases in pregnant women with morbid obesity (table 1).

The result of the assessment of lipid metabolism in the patients showed that all pregnant women with obesity is characterized by the development of dyslipidemia with

increase in atherogenic coefficient (KA), maximally expressed in the 3rd subgroup. We analyzed the values lipidogram in patients of the study and control groups giving birth to a large and lipotropnyh children. We did not observe correlation between the frequency of fetuses with birth weight less than 2500 g and 4000 g from the severity of dyslipidemia. However, the simultaneous critical rise in triglycerides, total cholesterol, and LDL cholesterol was observed among those pregnant women from the study group, which the course of gestation was complicated by preeclampsia.

Determination of proinflammatory cytokines (interleukin-1, interleukin-8, interleukin-8, TNF-α) were carried out in 120 pregnant women with obesity and with various types of pregnancy in the third trimester of pregnancy (table 2). The distribution of women into groups was made with consideration of the peculiarities of pregnancy: 1st group – 38 women with obesity and with physiological course of pregnancy, 2 nd group – 35 individuals with obesity complicated course of gestation with the threat of termination of pregnancy and 3 rd group – 42 patients with preeclampsia (PE).

**Table 1.: Characteristics of lipid spectrum of blood in patients formed groups, M±m**

| Blood Lipid Profile (mmol/l) | The study group n=120 | | | The control group n=60 |
|---|---|---|---|---|
| | 1 st subgroup n=60 | 2 nd subgroup n=30 | 3 rd subgroup n=30 | |
| Total cholesterol | 6,37±0,64*** | 6,49±1,01* | 6,85±0,39*** | 4,91± 0,01 |
| LDL | 3,45±0,69*** | 3,63±0,71*** | 4,01±1,09*** | 2,77±0,03 |
| HDL | 1,03±0,11*** | 0,95±0,22* | 0,87±0,5*** | 1,48±0,03 |
| TG | 2,47±0,64*** | 2,61±0,47* | 2,79±0,37*** | 1,61±0,02 |
| KA | 5,15±0,95*** | 5,59±1,7*** | 6,82±3,56*** | 2,32±0,03 |

Note: *p <0.05 difference of indicators is significant in comparison with the control group; **p <0.05 difference of indicators is significant at the comparison between the subgroups.

In our research the maximum level of IL-1 was recorded in 3rd group of women with PE ($p < 0.05$) (table 3). The obtained differences were significant in relation to the 1st group of women with physiological pregnancy ($p<0.05$). In our opinion, this feature is associated with the specifics of antigenic load on a woman's body.

**Table 2.: As the concentration of proinflammatory cytokines blood of women with obesity depending on the body mass index (BMI)**

| | The study group n=120 | | | The control group n=60 |
|---|---|---|---|---|
| | 1 st subgroup n=60 | 2nd subgroup a n=30 | 3 rd subgroup n=30 | |
| IL-1 (0-10 пг/мл) | 67±0,64*** | 6,49±1,01* | 6,85±0,39*** | 3,8± 0,01 |
| IL-6 (0-10 пг/мл) | 7,45±0,69*** | 9,63±0,71*** | 12,01±1,09*** | 4,6±0,03 |
| IL-8 (0-10 пг/мл) | 6,5±0,11 | 7,4±0,22* | 12,3±0,5*** | 3,7±0,03 |
| TNF-a (0-6 пг/мл) | 8,7±0,64* | 12,61±0,47** | 19,4±0,37*** | 1,61±0,02 |

Mainly infectious load, which was demonstrated by patients in the 3rd group, resulted in a marked increase in the concentration of IL-1.

**Table 3. The frequency of increased levels of proinflammatory cytokines**

| | Increase in IL-1 | Increase in IL-6 | Increase in IL-8 | Increase in THF-a |
|---|---|---|---|---|
| Obesity | 0% | 89% | 5% | 100% |
| Obesity + UPR | % | 100% | 11,40% | 100% |
| Obesity+ PE | 26,2% | 71,40% | 66,60% | 100% |
| General | 9% | 91% | 28% | 100% |

According to the literature , an increase in the concentration of IL-1 contributes to a slight increase in IL-2 since this cytokine is a key in the system of natural cytotoxicity. This mechanism dominates in the antigenic load of noninfectious nature as a variant of cellular sensitisation (4th type immunopathological reactions).

**Conclusion.** 1. Thus, the most frequent obstetric complication in pregnant women with obesity is preeclampsia, the threat of miscarriages and birth that requires further study to develop measures of forecasting and prevention in this population of women.

2. Given the fact that the blood lipid profile in pregnant women with PE is reflected with severe dyslipidemia, as well as some features as Pro-inflammatory cytokines, women with

obesity should be attributed to the risk group on development of PE, who were characterized by an increase in the level of LDL, TG and a simultaneous decrease in TG with the confirmation of the high concentration of Il - 1 and TNF-a.

3. The results indicate that increased production of TNF-α (more than 6 PG/ml) and simultaneous increase in IL-1, IL-6 and IL-8 may be a prognostic risk factor for PN in pregnant women with obesity.

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