

## ОСОБЕННОСТИ ТЕЧЕНИЯ И ИСХОДЫ БЕРЕМЕННОСТИ У ЖЕНЩИН С ГЕСТАЦИОННЫМ САХАРНЫМ ДИАБЕТОМ

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Гестационный сахарный диабет (ГСД) представляет серьезную медико-социальную проблему, т.к. в значительной степени увеличивает частоту нежелательных исходов беременности для матери и для плода. Частота ГСД в общей популяции разных стран варьирует от 1% до 14% и составляет в среднем 7%; в России этот показатель оценивается в 4,5%.

**Цель.** Оценить распространенность ГСД в Рязанском перинатальном центре за последние 3 года и изучить его влияния на течение и исходы беременности. **Материалы и методы.** Проведен анализ историй родов и обменных карт 1690 беременных женщин за 2015-2017 гг. в областном клиническом перинатальном центре г. Рязани. **Результаты.** ГСД был диагностирован у 193 женщин (распространенность – 11,4%), при этом у 62 беременных – на основании результатов перорального глюкозотолерантного теста, выполненного на сроке 24-30 недель. Течение беременности и родов у пациенток с ГСД характеризовалось высоким процентом осложнений (поздний гестоз – 18,1%, анемия беременных – 11,3%, отеки – 11,9%, ранний токсикоз – 4,6%, многоводие – 12,4%, хронический пиелонефрит – 5,1%, угроза прерывания беременности – 3,6%). У большинства (60,6%) женщин беременность завершилась естественными родами. Преждевременные роды отмечались в 15% наблюдений, из них 2 случая перинатальной гибели плода. Частота родоразрешения путем операции кесарева сечения – 39,4%. Частота родов крупным плодом составила 21,8%, что выше, чем у женщин с нормальным уровнем глюкозы крови. **Выводы.** Распространенность ГСД в Рязанском перинатальном центре за последние 3 года составила 11,4%. Осложнения в период беременности наблюдались у 79,2% женщин с ГСД, при этом наиболее часто встречались поздний гестоз, анемия беременных, отеки, ранний токсикоз, многоводие, хронический пиелонефрит и угроза прерывания беременности. При ГСД суммарные неблагоприятные исходы беременности встречались чаще, чем у женщин с нормогликемией; статистически значимые различия получены по частоте преждевременных родов, макросомии плода и асфиксии во время родов.

**Ключевые слова:** гестационный сахарный диабет, беременность, осложнения.

## PREGNANCY COURSE AND OUTCOME PECULIARITIES IN WOMEN WITH GESTATIONAL DIABETES MELLITUS

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Gestational diabetes mellitus (GDM) is a serious medical and social problem, because it greatly increases the frequency of adverse pregnancy outcomes for mother and fetus. The frequency of GDM in the general population of different countries varies from 1% to 14% and average 7%, in Russia this figure is estimated at 4.5%. **Aim.** To evaluate the prevalence of GDM in Ryazan Regional clinical perinatal center for the last 3 years and examine its influence on the course and outcome of pregnancy. **Materials and Methods.** The analysis of the birth history data and exchange cards of 1690 pregnant women from 2015 to 2017 at Ryazan Regional clinical perinatal center. **Results.** GDM was diagnosed in 193 women (prevalence – 11.4%), with 62 pregnant women on the basis of the results of oral glucose tolerance test performed in the period of 24-30 weeks. It was established that the course of pregnancy and delivery in patients with GDM was characterized by a high percentage of complications (late gestosis – 18.1%, anemia – 11.3%, swelling – 11.9%, early toxicosis – 4.6%, poly-hydramnios – 12.4%, chronic pyelonephritis – 5.1% and threatened miscarriage – 3.6%). Pregnancy outcome study revealed that the majority – 60.6% of pregnancies ended in natural births. Preterm birth was noted in 15% of cases, of which 2 cases were of perinatal fetal death. The frequency of delivery by cesarean section – 39.4%. The frequency of childbirth large fetus was 21.8%, higher than in women with normal blood glucose levels. **Conclusions.** The prevalence of GDM in Ryazan Regional clinical perinatal center for the last 3 years was 11.4%. Complications during pregnancy were observed in 153 women (79.2%) of with GDM. The most frequent complications were; late gestosis, pregnancy anemia, edema, early toxemia, polyhydramnios, chronic pyelonephritis, and threatened miscarriage. In pregnant women with GDM, adverse outcomes of pregnancy were more common than in women with normoglycemia. Significant differences were obtained in the frequency of premature birth, macrosomia of the fetus and asphyxia during childbirth.

**Keywords:** *gestational diabetes, pregnancy, complications.*

The prevalence of gestational diabetes mellitus (GDM) worldwide is growing steadily. Frequency of GSD in the general

population of different countries varies from 1% to 14% and average 7%, in Russia this figure is estimated at 4.5%. GDM is a serious

medical and social problem, because it greatly increases the frequency of adverse pregnancy outcomes for both mother and fetus (newborn) [1]. GDM is a risk factor for future development of obesity, type 2 diabetes and cardiovascular disease in mother and offspring [2,3]. To prevent adverse effects on pregnancy and its outcomes, many countries, including Russia, use new criteria for diagnosis of GDM. According to the international multicenter study on the effect of glycemic level during pregnancy on its outcomes (HAPO study) there is a direct correlation between the fasting level of glycemia and during glucose tolerance test and the frequency of adverse pregnancy outcomes [4]. When using the new diagnostic criteria, the frequency of GDM increased from 9.3 to 25.5% depending on the center. With timely use of new diagnostic criteria of GDM, a reduced frequency of pregnancy complications associated with hyperglycemia (hypoglycemia in the newborn, macrosomia, perinatal mortality) was observed as a result of reducing its degree.

In December 2012, the Russian national consensus "Gestational diabetes: diagnosis, treatment, postpartum care," was adopted, and in 2013 was approved by the Ministry of health of the Russian Federation. The document identified that the examination for the detection of GDM is required for all pregnant women regardless of risk factors [5].

Pregnancy is a state of physiological insulin resistance, therefore, is itself a significant risk factor for disorders of carbohydrate metabolism. The concept of

"diabetes", "if (newly diagnosed) diabetes in pregnancy" and directly "GSD" require clear clinical and laboratory definitions. The introduction of new approaches in the diagnosis of GDM requires some time. Therefore, the influence of hyperglycemia on the course and outcomes of pregnancy, estimated on the basis of the new criteria has not been well studied.

The aim of our study was to assess the prevalence of GDM in Ryazan perinatal center for the last 3 years and examine its influence on the course and outcome of pregnancy.

### Materials and Methods

The analysis of the birth history data and exchange cards of 1690 pregnant women from 2015 to 2017 was conducted at the Ryazan Regional perinatal clinical center. The average age at the time of pregnancy was  $29.1 \pm 6.0$  years, and body mass index (BMI) –  $24.5 \pm 4.7$  kg/m. The following aspects were investigated; glycemia and period of its determination, the outcomes of pregnancy (birth by cesarean section, macrosomia, perinatal fetal death, neonatal jaundice, hypoglycemia, congenital disorders, birth trauma, intrauterine hypoxia of the fetus, a syndrome of delayed fetal growth). Screening was conducted in two phases: the 1<sup>st</sup> stage was determined by glycemia during the first antenatal clinic visit; at the 2<sup>nd</sup> stage was determined by the oral glucose tolerance test at 24-28 weeks of pregnancy. The results of the screening identified 193 (11.4%) pregnant women with GDM. Their average age was

30.7±5.6 years, BMI at the time of pregnancy was 28.3±5.7 kg/m. In this group the complications and outcomes of pregnancy were evaluated. Blood glucose was determined in venous plasma at the perinatal center laboratory by glucoseperoxidase method [6,7], the boundaries of the reference values for pregnant women were 3.3–5.0 mmol/l. Statistical processing of data was performed using SPSS 13.0. The significance of differences was estimated by Student's t-criterion. The statistical significance of the results was confirmed by  $p < 0.05$ .

### Results and Discussion

The average fasting levels of glucose in venous plasma amounted to 5.2±0.7 mmol/l. The results of the initial survey reveal that 87 (45%) women were diagnosed with GDM on the basis of increasing fasting levels of glucose in venous plasma from 5.1 to 6.5 mmol/l. At the second stage of the screening period at 20-30 weeks of pregnancy, GDM was observed in 95 (49,2%) women. 33 (17%) pregnant women were diagnosed with GDM on the basis of fasting hyperglycemia, without oral glucose tolerance test. 62 pregnant women were diagnosed with GDM on the basis of the results of oral glucose tolerance test performed in the period from 24 to 30 weeks (average of 25.3±2.2 weeks), while fasting glucose was in the normal range of 4.5±0.5 mmol/l. GDM diagnosed based on blood glucose studies after 60 and 120 minutes revealed glucose levels above normal 60 minutes after exercise in 25 pregnant women, 18 pregnant women – through 120

minutes and 19 pregnant women during both. Thus, after introduction of the 2012 criteria for the diagnosis of GDM, the prevalence of the disease in 2015–2017, is estimated at 11.4%. For years, there has been growth in the number of identified pregnant women with GDM (2015 – 58, 2016 – 62, 2017 – 73 cases), indicating efficient implementation of new criteria for the diagnosis of GDM not only among endocrinologists but general practitioners and obstetrician-gynecologists, hence improving GDM diagnostics [5]. In 11 (5.7%) women, GDM was detected in the third trimester of pregnancy and was usually caused by late registration or refusal to perform oral glucose tolerance test.

All women diagnosed with GDM were assigned to the diet limiting consumption of foods containing digestible carbohydrates and were recommended daily self monitoring of blood glucose. Pregnant women with initial overweight or obesity was also recommended to limit consumption of fatty foods. In the absence of achievement of target indicators of glycemia with a 2 week diet, patients were prescribed insulin therapy. Of the 193 cases, insulin was needed in 37 (19.2%) pregnant women with GDM, half of whom (18 women) were prescribed insulin therapy in the first trimester of pregnancy.

Pregnancy was unfavourable and characterized by various obstetric and perinatal complications, which is consistent with the data of domestic and international studies [1,4]. The most frequent were: late preeclampsia in 35 (18.1%) pregnant women, anemia in 22 (11.3%), swelling in 23

(11.9%), and early toxicity in 9 (4.6%), polyhydramnios in 24 (12.4%), chronic pyelonephritis in 10 (5.1%) and threatened abortion in 7 (3.6%) pregnant women. Mul-

tiple complications occurred in 28 (14.5%) pregnant women with GDM. Thus, complications in pregnancy were observed in 158 (81.8%) women (Fig. 1).

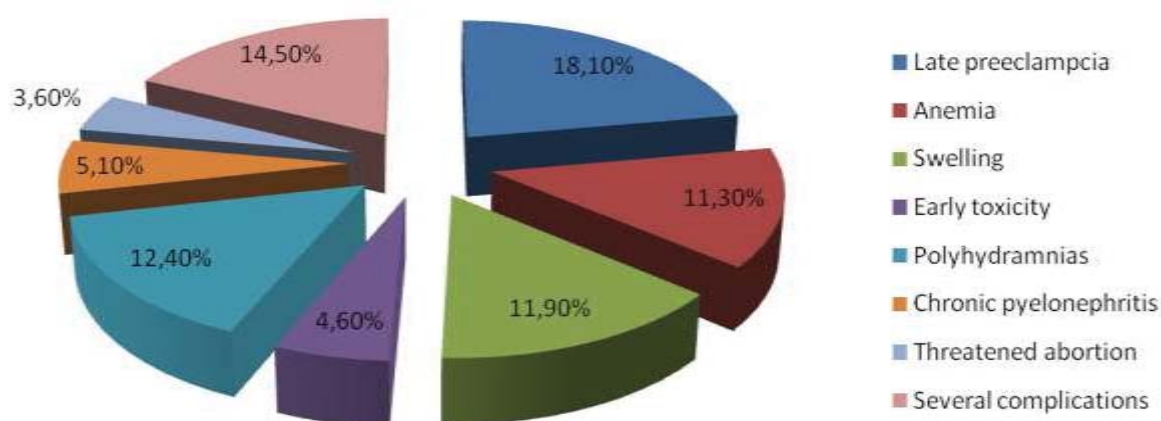


Fig. 1. Perinatal obstetric complications in women with GDM

The pregnancy outcome study revealed that the vast majority of pregnancies (117 women; 60.6%) ended with normal delivery. Delivery was at  $38.3 \pm 2.3$  weeks, corresponding to the normal term of pregnancy. Preterm birth was noted in 29 (15.0%) cases, including 2 cases of perinatal fetal death. The frequency of delivery by cesarean section – 39.4%. The weight of the fetus at birth averaged at  $3.7 \pm 0.5$  kg. The frequency of large fetus delivery (fetal weight more than 90 percentile for gestational period) was 21.8%, higher than in women with normal blood glucose level.

Other adverse pregnancy outcomes were identified in 40 (20.7%) cases, including: 6 – fetal malnutrition, 8 – fracture of clavicle, 17 – moderate birth asphyxia, 3 – congenital malformations (cleft lip and palate, open spinal hernia, agenesis of the kidneys), 2 – cephalhaematoma removed and 1 case of congenital hypothyroidism, chronic intra-uterine hypoxia, syndrome of delayed fetal growth and cutaneous hemorrhagic syndrome.

In order to compare pregnancy outcomes with regard to presence or absence of GDM, women with normal and elevated glu-

cose levels were compared. Pregnant women were divided into 2 groups: the 1<sup>st</sup> group included 193 pregnant women with GDM, the 2<sup>nd</sup> – 185 pregnant women with fasting glucose <5.1 mmol/l. Women in the two groups were comparable by age, time of examination and the number of births in history. The average BMI of patients in the 1<sup>st</sup> group was in compliance with the excess body weight, and 2<sup>nd</sup> – normal body weight, however, no statistically significant differences were obtained ( $p>0.05$ ). In pregnant women with

GDM total adverse outcomes of pregnancy were more common than in women with normoglycemia (53.2% and 24.3%, respectively;  $p<0.05$ ). A detailed comparison of the outcomes (table. 1) revealed statistically significant differences in the frequency of premature births (15.0% and 7.1%, respectively;  $p<0.05$ ), macrosomia of fetus (21.8% and 12.3%, respectively;  $p<0.05$ ) and the frequency of asphyxia in childbirth (8.8% with GDM compared with 2.7% in pregnant women without GDM;  $p<0.05$ ).

Table 1

***Pregnancy outcomes in women with GDM and normoglycemia***

Pregnancy outcome	1 <sup>st</sup> group – GDM (n=193)	2 <sup>nd</sup> group – normoglycemia (n=185)
Premature birth	29 (15%)*	13 (7.1%)
Macrosomia of fetus	42 (21.8%)*	23 (12.3%)
Birth asphyxia	17 (8.8%)*	5 (2.7%)
Fetal malnutrition	6 (3.1%)	5 (2.7%)
Clavicular fracture	8 (4.1%)	7 (3.8%)
Congenital malformations	3 (1.5%)	3 (1.6%)

Note: \*-  $p<0.05$

No significant differences in the malnutrition of the fetus, clavicular fractures and congenital malformations were obtained ( $p<0.05$ ).

Thus, the conducted study confirmed the data of domestic and foreign authors [1-5] showing that gestational diabetes is a serious medical and social problem, because it greatly



increases the frequency of adverse pregnancy outcomes for both mother and fetus.

### Conclusions

1. The prevalence of gestational diabetes in Ryazan perinatal center for the last 3 years was 11.4%.

2. Complications during pregnancy were observed in 153 women (79.2%) with gestational diabetes mellitus. The most frequent

were late gestosis, pregnancy anemia, edema, early toxemia, polyhydramnios, chronic pyelonephritis, and threatened miscarriage.

3. In pregnant women with gestational diabetes mellitus, total adverse outcomes of pregnancy were more common than in women with normoglycemia. Significant differences were obtained in the frequency of premature birth, macrosomia of the fetus and asphyxia during childbirth.

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### Дополнительная информация

#### [Additional Info]

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