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## Complications in the early adaptation period of neonates of mothers with gestational diabetes mellitus

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### ABSTRACT

Diabetes is one of the common complications during pregnancy. Insulin-dependent diabetes, lasting from childhood, is an outcome of 0.5% of pregnancies, while significantly more pregnant women is diagnosed with gestational diabetes. It is believed to be a risk factor of more frequent occurrence of neonatal complications. The aim of our research was to present the most common complications in the early adaptation period of diabetic mothers' neonates. Retrospective research included 222 neonates of mothers with GDM that were hospitalized in the Neonatal Unit in Katowice from 2009 to 2017. In the study group 199 newborns were born by caesarean section and 23 by natural labour. 23 (10.36%) neonates had features of hypertrophy, whereas 30 (13.51%) – hypotrophy. 33 children (14,86%) have been diagnosed with carbohydrate disorders. Complications in the early adaptation period occurred in 44.1% of neonates and hyperbilirubinaemia was the most frequent (55.1%). Among the developmental anomalies, the most common was the congenital heart disease - 10.81% of newborns. Complications in the early adaptation period occur often in diabetic mothers' neonates, in particular: carbohydrate disorders, pathological jaundice and PIVH features in additional examinations. 10.81% of neonates have been diagnosed with non-critical heart disease.

**Keywords:** gestational diabetes mellitus, early adaptation period, hyperbilirubinaemia, hypotrophy, hypertrophy

## **1. INTRODUCTION**

Gestational diabetes mellitus (GDM) is defined as a chronic metabolic disorder manifesting as a glucose intolerance of variable degree with onset or first recognition during pregnancy [1]. Three to ten percent of all pregnancies are complicated by abnormal glycemic control and GDM is 80% of these [2,3]. The definition let us distinguish two subtypes of gestational diabetes. The first type is pregestational diabetes which existed prior to pregnancy and this type is 10-20% of GDM. The second type is gestational diabetes with onset of glucose intolerance during pregnancy and it represents 80-90% of GDM [4,5].

The GDM is the most common complication of pregnancy that is associated with maternal and neonatal adverse outcomes. Those complications includes higher risk of preterm labour, increased rate of congenital defects and perinatal mortality of infants [6]. To prevent excessive transplacental glucose transfer we should strive to metabolic adjustment of glucose through glucose control. The fasting glucose level goal is between 60-100 mg/dl and the postprandial (2 hours after meal) goal is between 80-100 ml/dl [7]. This management decreases the amount of complications connected with the level of glycemia in pregnant women. When infant glucose level exceeds 110 mg the chance of macrosomia, hyperbilirubinemia, polycythaemia and hypocalcemia is higher. Also growth of glucose level to 120 mg increases the risk of respiratory distress syndrome in neonate. The level above 140mg% is a triggering factor of congenital defects. Glycemia above 180mg% is associated with miscarriage and preterm labour [5,8]. Among the mentioned complications, macrosomia is the most common and determines 25-45% of pregnant women with diabetes. It occurs mostly in women who had suffered from diabetes for short time before pregnancy or women who developed gestational diabetes [9-11]. The main cause of macrosomia in neonates is hyperglycemia and hyperinsulinism of mother, associated with increased lipogenesis and growth of fat [12]. It results in higher risk of perinatal traumas, perinatal hypoxia, occurrence of congenital abnormalities, especially of cardiovascular and central nervous system and also more severe or prolonged jaundice [13]. Less likely we can observe infant hypotrophy in mothers who suffer from diabetes for a long time and have revealed vascular complications. Those infants are in the high risk group of perinatal shock, hypoglycaemia, perinatal hypoxia, hypokalaemia and polycythaemia [11]. In contrast, intracranial haemorrhages and damage to the infant's cortex may be due to prolonged hypoglycaemia [14].

## **2. EXPERIMENTAL**

### **2. 1. Aim of the study**

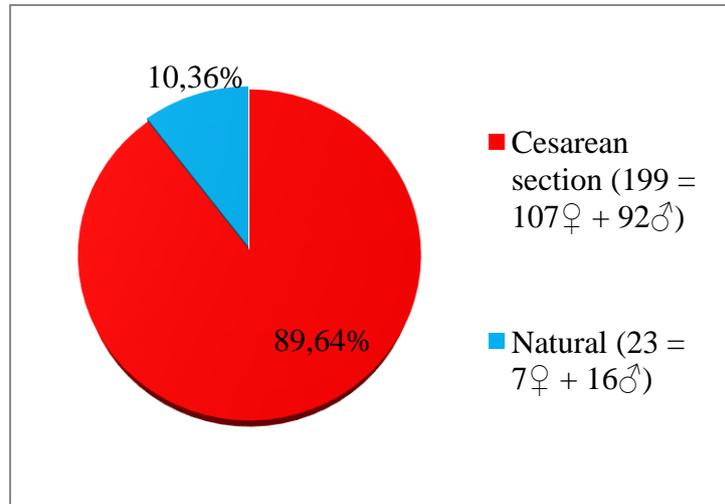
The aim of our research was to present the most common complications in the early adaptation period of diabetic mothers' neonates.

### **2. 2. Materials and method**

Retrospective research included 222 neonates of mothers with gestational diabetes that were hospitalized in the Neonatal Unit in Katowice from 2009 to 2017. All of the pregnant women were treated with a special diabetic diet. The information about parents' demographic profile, perinatal period and complications after childbirth was obtained. In addition, the results of diagnostic tests and imaging examination of neonates were analyzed.

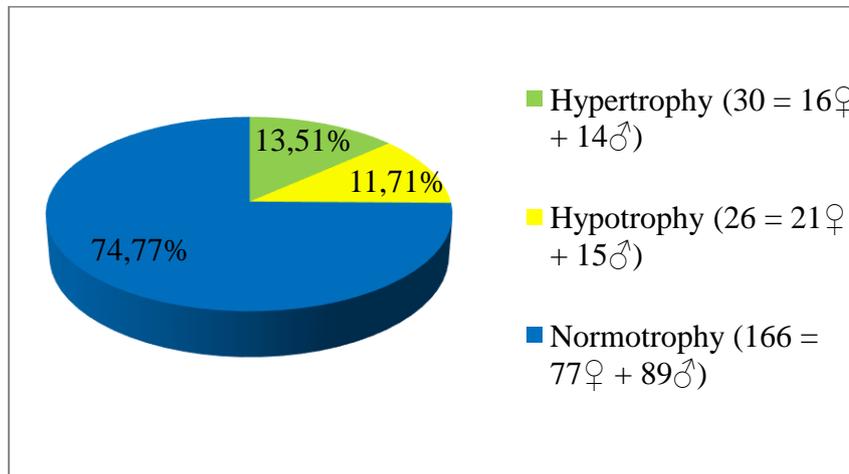
**2. 3. Results**

In the study group 199 (89,64%) newborns were born by caesarean section and 23 (10,36%) by natural labour. By analyzing the results, it can be seen that the danger of fetal asphyxia was the most common indication of urgent caesarean section - 16,16%.



**Figure 1.** Types of labours.

The diabetic mothers’ newborns are more likely to develop growth abnormalities, which can be divided into two types: hypertrophy and hypotrophy. Hypertrophy defined as body weight of more than 90 centile (for gestational age and neonatal sex) occurred in 23 children – 10.36%. Hypotrophy is a fetal body weight of less than 10 centile (gestational age and gender) and was diagnosed in 30 newborns (13.51%). Average body weight of diabetic mothers’ newborns were 3045.61 grams. The lowest body weight was 600 grams, whereas the highest was 5320 grams.



**Figure 2.** Neonatal birth weight.

Another common disorders were carbohydrate disorders, which occurred in 33 children and that constituted 14.86% of the study group. Among them hypoglycaemia dominated – was diagnosed in 22 newborns. Hyperglycaemia occurred in 5 neonates. 6 children (2,70%) were affected by glycaemic fluctuations. As a result, 12 newborns had to be given intravenous glucose in order to compensate hypoglycaemia.

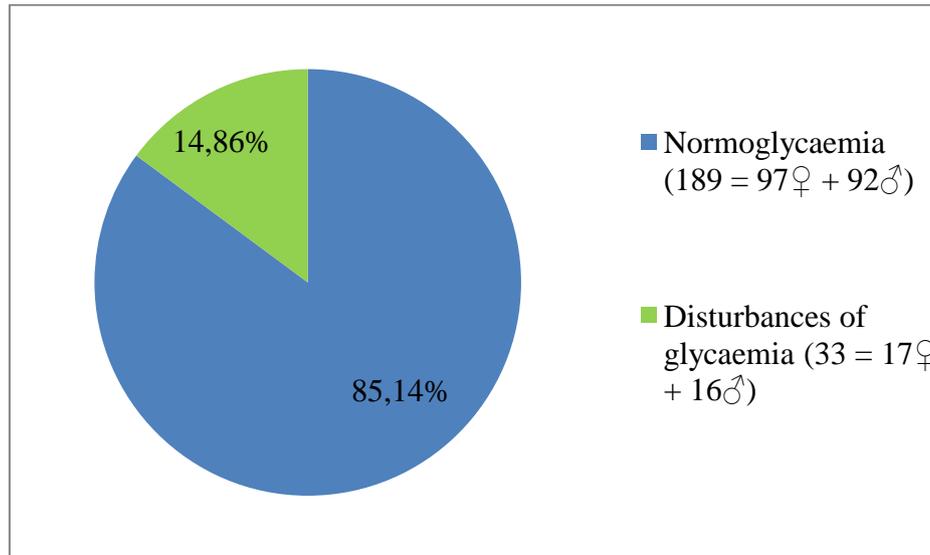


Figure 3. Glycaemia in neonates.

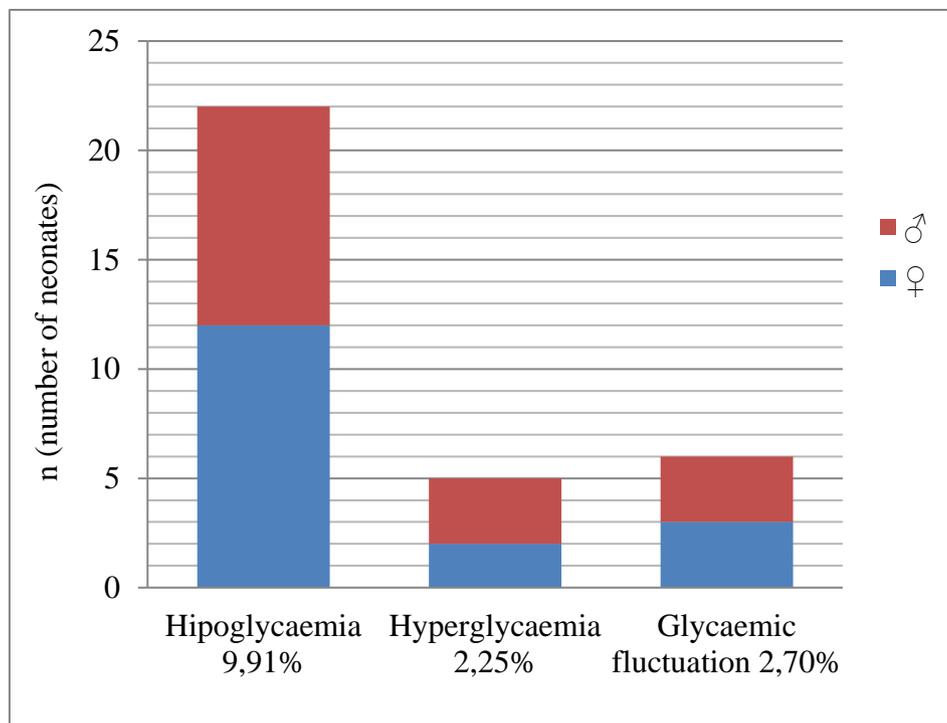


Figure 4. Disturbances of glycaemia.

Complications of early adaptation period occurred in 44.1% of newborns. The most common complication of the early adaptation was hyperbilirubinaemia. It affected 50 newborns (55,10% of children with complications). The next ones were respiratory disorders, that occurred in 37 children (16.67%). Thermoregulatory disorders were reported in 22 cases (9.91%). The least frequent were hypocalcaemia (1.35%) and anaemia (also 1.35%).

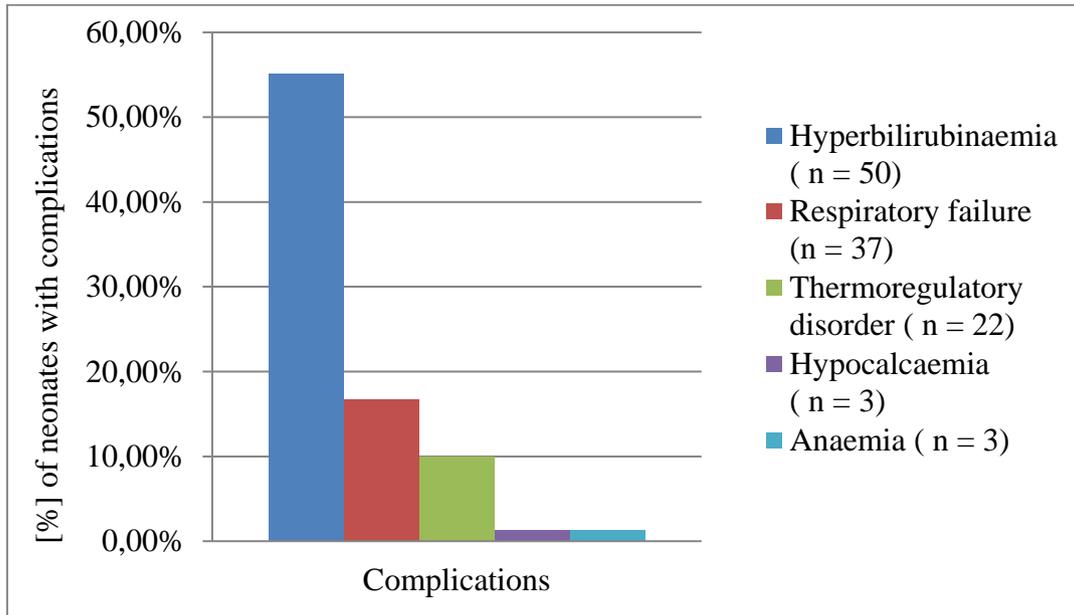


Figure 5. Complications in the early adaptation period.

Very interesting result is the fact that 10,81% of children were diagnosed with non-critical congenital heart disease. They are neonates from the high risk group, so all of them had cardiological consultation. Some of these congenital heart diseases have been diagnosed prenatally. There weren't any critical heart diseases – there were for example ASD and VSD diseases.

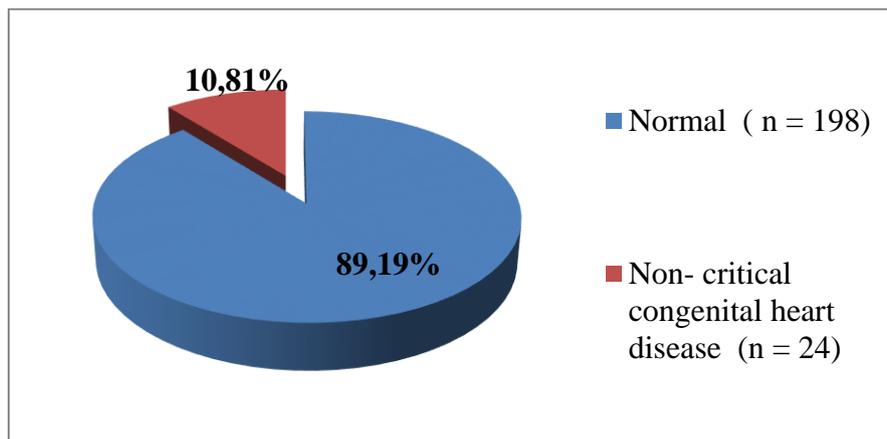


Figure 6. Non-critical congenital heart disease.

Ultrasound examinations conducted during the newborns' hospitalization revealed pathologies in 61 cases. The most common abnormality was intraventricular, non-traumatic haemorrhage of different degrees of severity (PIVH), which occurred in 47 neonates (21.17%).

### 3. CONCLUSIONS

Complications in the early adaptation period occur often in diabetic mothers' neonates, in particular: carbohydrate disorders, pathological jaundice and PIVH features in additional examinations. 10,81% of neonates have been diagnosed with non-critical heart disease. In the available literature we can find exactly the same percentage. However, it concerns other diabetes than gestational. According to our study, this percentage is the same for all types of diabetes. Due to the higher risk of numerous complications in the early adaptation period, diabetic mothers' children should be given special care, prolonged adequately to the neonate's health condition.

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