

Gestational diabetes – an obstetric, neonatal and postnatal challenge

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Abstract

In recent decades, the demographics of pregnant women have changed, with an increase of women giving birth at an older age and which, associated with the increase of obesity, has led to a rise in the prevalence of gestational diabetes mellitus (GDM). This has become a global concern and, from a public health perspective, it has huge implications for the mother and the baby. This longitudinal and transversal retrospective study was conducted at the Department of Obstetrics and Gynecology of the "Regina Maria" Hospital – Private Health Network, Bucharest, and included 200 pregnant women who gave birth between 1 July 2021 and 30 June 2022. The patients selected were grouped into two major categories: the study group (100 pregnant women with gestational diabetes), and the control group (100 pregnant women without gestational diabetes). The total number of births in this period was 3807 (out of which 404 patients had gestational diabetes, representing 10.61%). The women were selected based on the following criteria: the glucose tolerance test with 75 g of modified glucose, with clinical exploration (age, Body Mass Index [BMI], hereditary antecedents, associated pathology, type of pregnancy), paraclinical and ultrasound. We included in our study patients of different ages and with different BMI. Women who gave birth to twins or more, with pre-pregnancy diabetes or with unavailable or incomplete case data were excluded from the study. The data used were collected from the patients' observation documents, birth and operation records, and from the Medis medical information system. Microsoft Excel was used to analyze the data. The aim of the study is to show that having a normal BMI lowers the risks of gestational diabetes, and that patients with obesity have a higher risk of gestational diabetes. We want to demonstrate that there are direct correlations between clinical and paraclinical changes and maternal and fetal complications for pregnant women with gestational diabetes, and that having a good glycemic control is of great importance for the amelioration of pregnancy complications and perinatal conditions.

Keywords: gestational diabetes, obesity, pregnancy, Body Mass Index

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Rezumat

În ultimele decenii, demografia femeilor însărcinate s-a schimbat, observând o creștere a ratei femeilor care nasc la o vârstă mai înaintată și care, asociată cu creșterea incidenței obezității, a condus la creșterea prevalenței diabetului gestațional, devenind o preocupare la nivel global și, din perspectiva sănătății publice, având implicații importante pentru mamă și copil. Acest studiu retrospectiv longitudinal și transversal a fost realizat la Secția de obstetrică și ginecologie a Spitalului „Regina Maria” – Rețea Privată de Sănătate, București, și include 200 de gravide care au născut în perioada 1 iulie 2021 – 30 iunie 2022. Pacientele selectate au fost grupate în două categorii: lotul de studiu (100 de gravide cu diabet gestațional) și grupul de control (100 de gravide fără diabet gestațional). Numărul total de nașteri în această perioadă a fost de 3807 (dintre care 404 paciente au dezvoltat diabet gestațional, reprezentând 10,61%). Femeile au fost selectate pe baza următoarelor criterii: testul de toleranță la glucoză cu 75 g de glucoză modificată, cu explorare clinică (vârstă, indice de masă corporală [IMC], antecedente ereditare, patologii asociată, tip de sarcină), paraclinică și ecografică. Pacientele cu sarcini gemelare sau multiple, cu diabet înainte de sarcină sau cu date de caz indisponibile și incomplete au fost excluse din studiu. Datele utilizate au fost culese din documentele de observare ale pacientelor, fișele de naștere și operație și din sistemul de informații medicale Medis. Am inclus în studiul nostru paciente de diferite vârste și cu diferiți indici de masă corporală. Analiza datelor s-a realizat cu programul Microsoft Excel. Scopul studiului este de a arăta că, având un indice de masă corporală normal, riscul de diabet gestațional scade, iar pacientele cu obezitate au un risc mai mare de diabet gestațional. Dorim să demonstrăm că există corelații directe între modificările clinice și paraclinice și complicațiile materne și fetale pentru gravidele cu diabet gestațional, precum și faptul că a avea un bun control glicemic este de mare importanță pentru ameliorarea complicațiilor sarcinii și a afecțiunilor perinatale.

Cuvinte-cheie: diabet gestațional, obezitate, sarcină, indice de masă corporală

Introduction

In recent decades, the demographics of pregnant women have changed, with an increase of women giving birth at an older age and which, associated with the increase of

obesity, has led to a rise in the prevalence of gestational diabetes mellitus (GDM)⁽¹⁾.

The incidence of gestational diabetes is on the rise due to the sedentary lifestyle, the increase in the prevalence of

obesity in women of childbearing age, the increase in the incidence of diabetes in the general population, as well as due to the advanced maternal age. In the 9th Edition of the Diabetes Atlas⁽²⁾, published in 2019, the estimated global prevalence of GDM is 12.8%.

In 2008, the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) Study recruited a large multinational cohort and brought clarifications on the risks of adverse outcomes associated with hyperglycemia. The findings of the study showed that maternal hyperglycemia independently increased the risk of preterm delivery, caesarean section delivery, infants born large for gestational age, admission to a neonatal intensive care unit, neonatal hypoglycemia and of hyperbilirubinemia⁽³⁾.

This has become a global concern and from a public health perspective, because it has huge implications for the mother and her baby – it increases the risk of perinatal complications and, at the same time, predicts late, chronic metabolic complications, and sometimes its effects are felt during several generations⁽⁴⁾. Among the specific risks of diabetes during pregnancy, we list: spontaneous abortion, preeclampsia, fetal death, macrosomia, fetal anomalies, neonatal hypoglycemia, intrauterine growth retardation, respiratory distress syndrome, complications of natural birth with shoulder dystocia, clavicle fractures, and perineal lacerations⁽⁵⁻⁷⁾.

The aim of the study is to show that having a normal Body Mass Index (BMI) lowers the risks of gestational diabetes, and that patients with obesity have a higher risk of gestational diabetes. We want to demonstrate that there are direct correlations between clinical and paraclinical changes and maternal and fetal complications for pregnant women with gestational diabetes, and having a good glycemic control is of great importance for the amelioration of pregnancy complications and perinatal conditions.

Materials and method

This longitudinal and transversal retrospective study was conducted at the Department of Obstetrics and Gynecology of the “Regina Maria” Hospital – Private Health Network, Bucharest, and included 200 pregnant women who gave birth between 1 July 2021 and 30 June 2022. As shown in Figure 1, the total number of births in this period was 3807 (out of which 404 patients had gestational diabetes, representing 10.61%). This rate is comparable to the average rate of women with diabetes that give birth worldwide⁽⁸⁾.

Our sample (200 pregnant women) was divided into two major categories: *the study group* (100 pregnant women with gestational diabetes), and *the control group* (100 pregnant women without gestational diabetes).

The pregnant women were selected based on the following criteria: the glucose tolerance test with 75 g of modified glucose, with clinical exploration (age, BMI, hereditary antecedents, associated pathology, type of pregnancy, blood pressure monitoring, pulse, state of health), paraclinical (blood analysis, blood sugar and glucose tolerance test, biophysical score, cardiotocography) and ultrasound (fetal morphologies, growth curve monitoring, with serial

measurements of the biparietal diameter, cranial and abdominal circumference, femur length, e.g., Doppler on uterine arteries, umbilical arteries and middle cerebral artery with the measurement of resistance and pulsatility indices) of the group of pregnant women.

The data used were collected from the patients' observation documents, birth and operation records and from the Medis medical information system. We included in our study patients of different ages and with different BMI. Women who gave birth to twins or more, with pre-pregnancy diabetes and with unavailable or incomplete case data were excluded from the study. Microsoft Excel was used to analyze the data. All pregnant women performed oral glucose tolerance test (OGTT) with 75 g of glucose in weeks 24-28 of gestation. The test consisted in performing OGTT in the morning after overnight fast of ≥8 hours, with 75 g OGTT with plasma glucose (PG) measurement fasting, 1-hour and 2-hour. Patients who had at least one modified value from the ones below have been considered in the GDM group: fasting serum glucose of 92 mg/dl (5.1 mmol/l), 1-hour serum glucose of 180 mg/dl (10 mmol/l), 2-hour serum glucose of 153 mg/dl (8.5 mmol/l)⁽⁹⁾.

There are different opinions regarding the testing procedures: ADA guidelines recommend selective screening of high-risk women for GDM, whereas ACOG guidelines and NICE guidelines recommend universal screening (for all women). All women had biochemical tests and ultrasound examination in the first, second and third trimesters of pregnancy.

Patients diagnosed with gestational diabetes initially received routine care, and those who could not achieve glycemic control with diet alone were advised to take insulin by diabetologists.

The glycemic control has a great importance in treating patients with GDM and in preventing pregnancy-related complications. However, research on the correlation between glycemic control and pregnancy outcomes, maternal health and newborn health is limited⁽¹⁰⁾.

Results

We included in our analysis patients within different age categories, and we noticed that most women gave birth between 31 and 40 years old (71.5%). If we consider only patients from the study group (patients with diabetes), 79% of the women are included in this age category. The number of births drastically decreased after the age of 41, for both groups.

For 52% of the women, this was the first time when they gave birth, while 28% were at the second birth, and 3.5% at the third birth or more. Also, 16.5% of the women had a previous miscarriage or abortion.

In the study group particularly, 51% of diabetic patients gave birth for the first time, 29% for the second time (and almost half of them, 13 out of 29 patients, had diabetes in their first pregnancy) and 4% had three or more births; 16% of them had a previous miscarriage or abortion.

Of the total number of 200 patients, 138 (69%) had under normal or normal BMI at the beginning of the pregnancy (initial BMI), and in 62 patients (31%) their prenatal

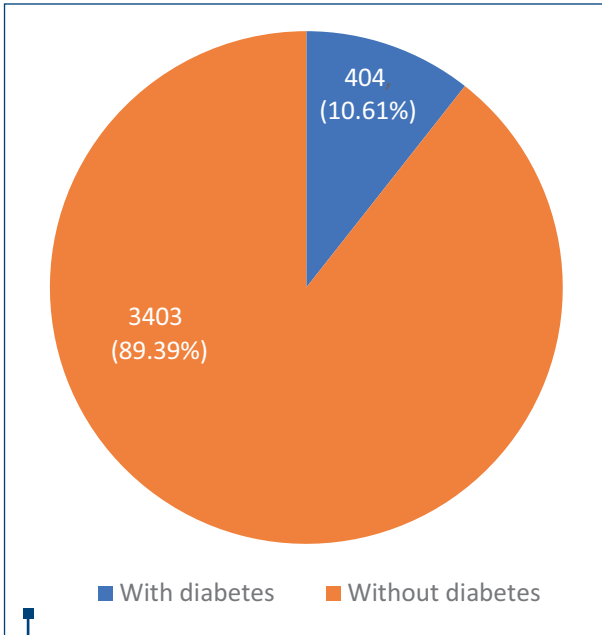


Figure 1. Patients with and without diabetes who gave birth between 1 July 2021 and 30 June 2022

BMI exceeded the normal range – 41 patients were overweight (20.5%) and 21 patients were obese (10.5%).

Comparing the initial and the final BMI (during the pregnancy) for the two groups together (the study group and the control group), we noticed that:

- During the pregnancy, only 42 patients **kept the initial underweight and normal BMI** (representing 21%); from this group, the number of patients without diabetes was 28 versus 14 patients with diabetes; this means that having a normal BMI at the beginning and during the pregnancy lowered by 200% the risks of GDM.
- Patients who were overweight and had obesity as **initial BMI** had a higher rate of gestational diabetes (53 patients with diabetes versus nine patients without diabetes).
- Patients with obesity (at different stages) as **final BMI** (no matter the initial BMI) have a 77.20% risk to develop gestational diabetes (44 patients out of 57).

If we consider only the study group (patients with diabetes), 53 patients had the initial BMI in the overweight and obesity category. The number of patients with initial under normal and normal BMI was 47, but during the pregnancy, only 14 patients kept their BMI in the normal range, while the others moved to overweight (27 patients) and obesity (seven patients) categories.

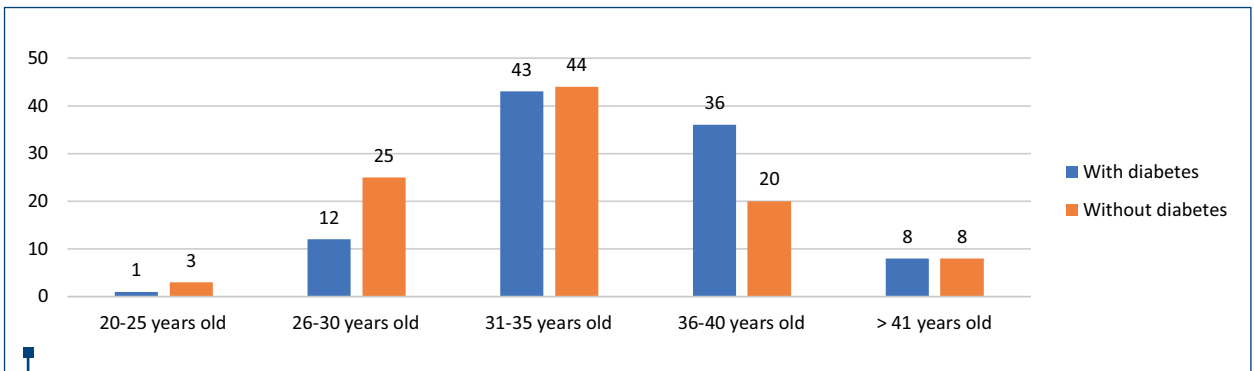


Figure 2. Age distribution

Table 1 Births history

Births history	With diabetes	Without diabetes	Grand Total
First birth	51	53	104
Second birth, without gestational diabetes background	16	27	43
Second birth, with gestational diabetes background	13		13
Third birth or more	4	3	7
Miscarriage	13	10	23
Abortion	3	7	10
Grand Total	100	100	200

Table 2 BMI variation before and during pregnancy

Initial BMI	Final BMI	With diabetes	Without diabetes	Grand Total
Underweight	Normal weight	3	5	8
Normal weight	Normal weight	11	23	34
Normal weight	Overweight	26	58	84
Normal weight	Obesity (stage 1)	7	5	12
Overweight	Overweight	16	1	17
Overweight	Obesity (stage 1)	16	6	22
Overweight	Obesity (stage 2)	2	0	2
Obesity (stage 1)	Obesity (stage 1)	3	0	3
Obesity (stage 1)	Obesity (stage 2)	11	2	13
Obesity (stage 1)	Obesity (stage 3)	1	0	1
Obesity (stage 2)	Obesity (stage 2)	1	0	1
Obesity (stage 2)	Obesity (stage 3)	2	0	2
Obesity (stage 3)	Obesity (stage 3)	1	0	1
Grand Total		100	100	200

In the control group, we had nine patients with BMI in the overweight and obesity category. Ninety-one patients had initial underweight and normal BMI and, during the pregnancy, 27 patients remained in the normal BMI category, 58 patients moved to overweight BMI, and five patients moved to obesity stage 1 category.

Considering all the above facts, we can draw the conclusion that there is a strong correlation between the variation of BMI (before and during the pregnancy) and the incidence of gestational diabetes. Our results indicate that the higher the initial BMI, the greater the risk of gestational diabetes. This is also highlighted in other research studies on this subject⁽¹¹⁾. Ninety percent of the patients with diabetes controlled their blood sugar levels with diet and took no medications, whereas 10% of the patients controlled it with insulin treatment.

We also considered the associated pathologies of our patients. Mild anemia is considered normal during pregnancy and, in our study, it was noticed a higher percentage for patients with diabetes (48%) compared to those without diabetes (39%). The same situation was for edema: 22% of the diabetes patients had edema, compared to 18% of patients without diabetes who had edema.

Regarding smoking habit, the percentages were comparable between the two categories: 56% smokers for

patients with diabetes versus 58% smokers for non-diabetes patients.

Moreover, we noticed that the presence of the diabetes familial risk factor in the first-degree relatives (mother/father) represents an important contribution to assessing the gestational diabetes risk: 76% (19 patients out of 25) of the patients who had their mother or father with diabetes developed gestational diabetes. If we extend this

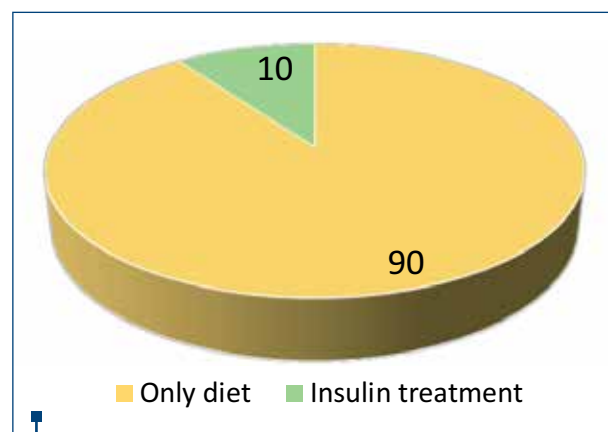


Figure 3. Diabetes regime

Table 3 Other pathologies

		With diabetes	Without diabetes	Grand Total
Anemia	Without anemia	52	61	113
	With anemia	48	39	87
Thyroid pathology	Without thyroid pathology	84	79	163
	With thyroid pathology	16	21	37
Smokers	No smoking	56	58	114
	Smoking	44	42	86
Edema	Without edema	78	82	160
	With edema	22	18	40

Table 4 Diabetes antecedents

Diabetes antecedents	With diabetes	Without diabetes	Grand Total
No diabetes history	74	93	167
The mother has diabetes	9	2	11
The father has diabetes	10	4	14
Another relative with diabetes	7	1	8
Grand Total	100	100	200

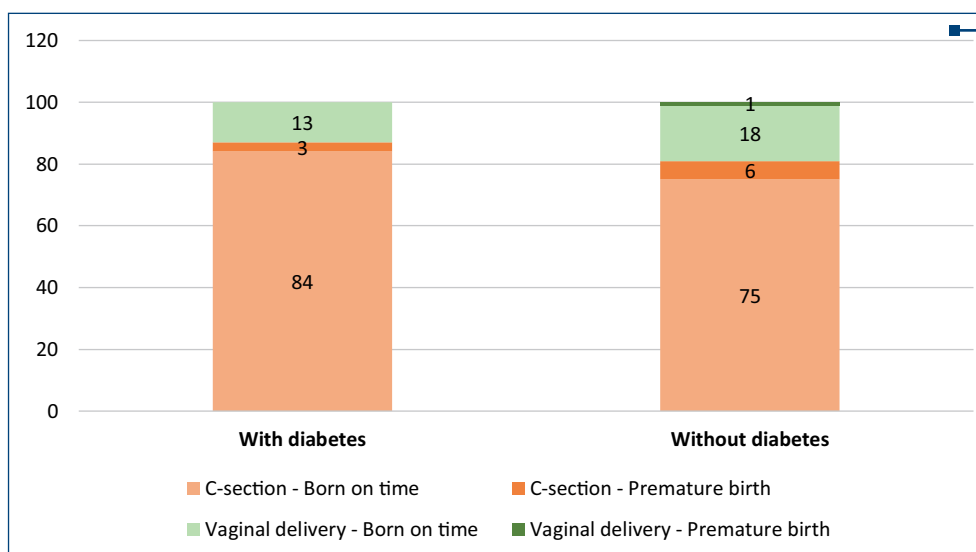


Figure 4. Delivery type

analysis to all relatives with diabetes (of any degree), the percentage increases to 79% (26 patients out of 33).

Increasing rates of worldwide caesarean section (C-section) operations can be also observed in our analysis.

Many women prefer this method over the vaginal birth (due to personal and medical reasons), and this is reflected in our study: 87% of the women with diabetes had C-section; 97% of the babies were delivered on time, and 3%

Table 5 Amniotic fluids

Amniotic fluid	With diabetes	Without diabetes	Grand Total
Normal	79	93	172
Oligohydramnios	10	5	15
Polyhydramnios	11	2	13
Grand Total	100	100	200

were born premature. For the patients without diabetes, the numbers were slightly different: 81% of the women had C-section; 93% of the babies were delivered on time, while 7% were born premature.

The ultrasound examination provided us details about the amniotic fluid: 86% (79 patients with diabetes and 93 patients without diabetes) had normal amniotic fluid, 7% (11 patients with diabetes and two patients without diabetes) of the cases had polyhydramnios and 8% (10 patients with diabetes and five patients without diabetes) had oligohydramnios.

Discussion

Preconception counseling for women should include information about the benefits of a healthy diet, exercise and behavioral changes. A 5-10% weight loss before getting pregnant has shown improvement in metabolic disorders associated with obesity⁽¹²⁾.

A better understanding of the mechanisms that can lead to the onset of gestational diabetes should allow a better monitoring of risk factors, the administration of treatment during pregnancy, as well as more rational approaches to the prevention of diabetes during and after pregnancy. If it's done during the routine clinical care in the early stages of the pregnancy, it represents a great opportunity to prevent the dysregulation of glucose metabolism (stages in which early intervention can substantially reduce the risk of post-pregnancy diabetes)⁽¹³⁾.

We acknowledge that our study has some limitations. Among these, we mention: the sample size (200 pregnant women out of 3807), the limited timeline considered (one year), and the fact that we considered only patients from one medical center. Larger scale prospective studies are recommended to confirm these findings.

Conclusions

This study demonstrates that there are correlations between clinical and paraclinical changes and maternal and fetal complications for pregnant women with gestational diabetes. Good glycemic control is of great importance for the amelioration of pregnancy complications and perinatal conditions. The findings of this study contribute to a more comprehensive understanding of the effects of GDM and highlight the importance of preconception counseling for women with BMI > 25. Pre-pregnancy care for diabetic women should be performed by a multidisciplinary care

team (obstetrician, endocrinologist, nutritionist) and should include evaluations for vascular complications, cardiovascular status, assessment of glycemic control and, last but not least, promoting a healthy lifestyle that might involve behavioral changes (exercise regularly, be physically active, healthy diet, get enough sleep, quit smoking etc.).

Postpartum retesting is a very important aspect that can prevent complications of diabetes, metabolic or cardiovascular diseases. For patients with gestational diabetes, the oral glucose tolerance test must be repeated 6-12 weeks postpartum and every two years after birth in order to identify women with persistent diabetes^(14,15). ■

Conflict of interests: The authors declare no conflict of interests.

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