HbA1c and maternal-fetal outcomes in gestational diabetes

Rita Bettencourt-Silva [1,2], Pedro Souteiro [1,2], Daniela Magalhães [1,2], Sandra Belo [1,2,3], Ana Oliveira [1], Davide Carvalho [1,2], Joana Queirós [1,3], Diabetes and Pregnancy Study Group of the Portuguese Society of Diabetology [3]

[1] *Department of Endocrinology, Diabetes and Metabolism, Centro Hospitalar São João, E.P.E., Porto, Portugal*

[2] *Faculty of Medicine, University of Porto, Porto, Portugal*

[3] *Diabetes and Pregnancy Study Group of the Portuguese Society of Diabetology, Portugal*

Introduction

- **Self-monitoring of blood glucose** is the standard method for assessing the glycaemic profile in women with gestational diabetes mellitus (GDM).
- The goal is to **normalize blood glucose**.
- The glycated haemoglobin (HbA1c) level can be used as a complementary parameter.
- **This study aims to evaluate the maternal-fetal outcomes in GDM according to HbA1c in the 3rd trimester of pregnancy.**

Methods

Participants selection process

- Retrospective cohort study
- Portuguese pregnant women with GDM who delivered in 2013 and 2014
- Data were obtained from the analysis of the National Registry of GDM coordinated by the Diabetes and Pregnancy Study Group of the Portuguese Society of Diabetology
- The GDM diagnosis was established according to the International Association of Diabetes Pregnancy Study Groups' (IADPSG) criteria

Statistical analysis (SPSS Statistics 20.0)

- Frequencies, percentages, mean, standard deviation (SD)
- Kolmogorov-Smirnov test
- Independent sample t-test, Chi-square test
- Simple and multiple linear regression

Analysed data

- Demographic and biometric parameters
- Obstetric history, gestational age, gestational weight gain
- GDM treatment (diet, antidiabetic agents, insulin)
- HbA1c in the 3rd trimester of pregnancy
- ***Obstetric complications:*** pregnancy-induced hypertension, pre-eclampsia, hydramnios, preterm labour, caesarean section
- ***Fetal and neonatal outcomes:*** gestational age at delivery, birth weight, Fenton curves (small, appropriate and large for gestational age – SGA, AGA, LGA, respectively), APGAR score, morbidities (neonatal hypoglycaemia, hyperbilirubinemia and respiratory distress syndrome), admission to the Intensive Care Unit, congenital anomalies and fetal/neonatal death

Results

5271 Portuguese women with gestational diabetes

3546 had HbA1c level registered in 3rd trimester

505 (14.2%) pregnant women with HbA1c ≥5.7%

Women with HbA1c ≥5.7% had similar mean age (33.5 *vs.* 33.1, p=0.113), a higher mean body mass index (29.6 *vs.* 26.8, p<0.001) and a higher mean gestational weight gain (10.6 *vs.* 9.4, p<0.001) comparing with women with HbA1c < 5.7%.

Table 1: Maternal and fetal outcomes according to the HbA1c level in the 3rd trimester of pregnancy

OUTCOMES	HbA1c ≥ 5.7% n (%)	HbA1c < 5.7% n (%)	*p* value	*Odds Ratio (95% confidence interval)*
OBSTETRIC COMPLICATIONS				
Pregnancy-induced hypertension	37 (7.5)	143 (4.8)	**0.013**	**1.604** (1.103-2.333)
Pre-eclampsia	19 (3.8)	59 (2.0)	**0.010**	**1.978** (1.169-3.347)
Hidramnios	30 (6.1)	91 (3.0)	**0.001**	**2.055** (1.344-3.140)
Preterm labour	41 (8.4)	195 (6.7)	0.177	---
Labour induction	41 (35)	262 (42.3)	0.142	---
Caesarean section	214 (43.8)	1004 (34.2)	**<0.001**	**1.497** (1.233-1.819)
Urgent caesarean section	97 (48.7)	436 (47.1)	0.680	
FETAL/NEONATAL OUTCOMES				
Fetal death	6 (1.2)	10 (0.3)	**0.018**	**3.634** (1.315-10.043)
Birthweight (Fenton curves)				
SGA	42 (8.9)	392 (14.2)	**0.002**	**0.594** (0.425-0.830)
AGA	383 (81.5)	2301 (83.2)	0.365	---
LGA	45 (9.6)	73 (2.6)	**<0.001**	**3.906** (2.657-5.742)
Hypoglycaemia	14 (3.0)	105 (3.8)	0.419	
Hyperbilirubinemia	58 (12.6)	282 (10.2)	0.126	
Respiratory distress syndrome	14 (3.0)	53 (1.9)	0.120	
Intensive neonatal care	24 (5.2)	139 (5.1)	0.891	
Birth injury	8 (1.9)	20 (0.8)	0.058	
Congenital anomalies	8 (2.1)	52 (2.9)	0.396	
Neonatal death	0 (0)	7 (0.7)	0.292	

↑ 1.6-fold pregnancy-induced hypertension

↑ 2-fold pre-eclampsia and hidramnios

↑ 1.5-fold caesarean section

↑ 3.6-fold fetal death

↓ 0.4-fold SGA
↑ 4-fold LGA

Conclusion

- Women with HbA1c ≥ 5.7% in the 3rd trimester of pregnancy had more maternal complications, caesarean section rate, fetal death and LGA newborn.
- HbA1c < 5.7% is compatible with normal blood glucose levels in nonpregnant patients, but these levels should be achieved without hypoglycaemia. However, due to increased red blood cell turnover, HbA1c is lower and changes are faster in pregnancy than in nonpregnant women.
- Our results confirm the utility of HbA1c as a parameter for glycemic control evaluation in DGM, after self-monitoring of blood glucose.

References: *1.* American Diabetes Association. Management of diabetes in pregnancy. Sec. 13. In Standards of Medical Care in Diabetes 2017. Diabetes Care 2017; 40(Suppl.1):S114–S119. *2.* Barquiel B, et al. HbA1c and Gestational Weight Gain Are Factors that Influence Neonatal Outcome in Mothers with Gestational Diabetes. *J Womens Health* 2016 Jun;25 (6):579-85. *3.* International Association of Diabetes and Pregnancy Study Groups Recommendations on the Diagnosis and Classification of Hyperglycemia in Pregnancy. *Diabetes Care* Vol 33 (3)Mar 2010. *4.* The HAPO Study Cooperative Research Group. Hyperglycemia and Adverse Pregnancy Outcome. N Engl J Med 2008;358:1991-2002.