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Research letter

Monitoring gestational diabetes mellitus patients with the telemedicine application MyDiabby decreases the rate of foetal macrosomia

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Tight blood glucose in gestational diabetes mellitus (GDM) is associated with improved maternal and neonatal outcomes [1]. For about a decade, telemedicine interventions using smartphone applications have been available [2]. Electronic interactions between physicians and GDM patients seem to improve patients' glycaemic control, their compliance and decrease insulin requirements [2]. Few studies have suggested a potential decrease in obstetrical maternal-foetal adverse events using electronic devises in patients with GDM [3,4]. Consequently, we investigated whether the use of MyDiabby application (app) [5], in a large cohort of GDM patients, affects the occurrence of foetal macrosomia and/or maternal-foetal adverse events, compared to a control group of GDM patients with classic medical care.

We retrospectively studied a single-centre cohort including 365 GDM patients, referred to the Endocrine Unit of St Antoine hospital, Assistance-Publique Hôpitaux de Paris (APHP) by the Obstetrics and Gynaecology department from Trousseau Hospital, APHP. All patients had GDM diagnosed on a fasting glucose level ≥ 5.1 mmol/l, or a 1-hour plasma glucose ≥ 10.0 mmol/l following a 75 g oral glucose load, or a 2-hour plasma glucose ≥ 8.5 mmol/l following a 75 g oral glucose load [6]. For all patients, the targets of fasting and postprandial sugar levels were between 3.6–5.2 mmol/l and 4.4–6.6 mmoL/l, respectively.

The control group (n = 161) was followed from January 2018 to January 2019 with usual monitoring, including one to three face-to-face consultations. The patients measured their capillary glycaemia levels six times per day, before and 2 h after each meal. Physicians checked the results at each visit. The second group of GDM patients (n = 158), using the app, was followed from January 2019 to March 2020 within the same centre. They had one to three face-to-face consultations. Their glycaemia levels were automatically entered in the app and downloaded by physicians. Patients had feedback telemedicine consultations, twice a week, during the entire pregnancy.

The primary outcome was the new-born's birth weight and the percentage of "large for gestational age" (LGA) infants, defined by a birth weight above the 90th percentile, reflecting macrosomia. The secondary outcomes were the percentage of patients receiving insulin, the gestational age at introduction of insulin, the gestational age at delivery, the mode of delivery, as well as maternal and neonatal adverse events. The study was authorised and registered by the APHP (number 20,210,802,163,836).

Student's t-tests were used to compare continuous variables; chi-square tests were used for categorical variables and a logistic regression for multivariate analysis. Data are presented as mean ± standard deviation (SD).

As shown in Table I, initial clinical characteristics of patients were similar between the two groups. During the pregnancy, weight gain, percentage of patients treated by insulin, timing of insulin treatment and mode of delivery were not statistically different. The terms of childbirth were identical in the two groups. LGA and foetal macrosomia were correlated with the maternal body mass index (BMI) prior to conception (P = 0.0016), 1 h blood glucose during oral glucose tolerance test (OGTT) diagnosis (P = 0.026), maternal weight at the last obstetric consultation (P < 0.0001), and maternal weight gain (P = 0.036).

Interestingly, the mean birth weight of new-borns in the app group was significantly lower than in the control group (3275 g ± 638 vs 3430 g ± 499, P = 0.0185). Furthermore, the percentage of LGA infants was significantly lower in the app group than in the control group (10.8% vs 18.9%, P = 0.022). Of note, insulin therapy did not affect the number of LGA infants in either group (P = 0.44). Multivariate analysis adjusted on BMI, Hb_{A1c} and fasting glucose level at diagnosis confirmed the statistically significant differences regarding the percentage of LGA, between the two groups. Finally, when the maternal BMI prior to conception was over 25 kg/m^2, foetal macrosomia was decreased (odds ratio 0.49 [CI 95% 0.25 −0.97], P = 0.04) in the group using the app. In the latter group, the mean levels of fasting and postprandial glycaemia during follow-up

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Table I
Patients' characteristics, their obstetrical outcome and new-borns' characteristics.

Variable	MyDiabby app population (n = 158)	Control population (n = 161)	P
Patients' characteristics			
Age in years, mean (± SD)	34.09 (4.97)	33.75 (5.59)	0.57
Number of previous pregnancies, mean (± SD)	1.97 (1.76)	2.24 (1.75)	0.16
Number of previous deliveries, mean (± SD)	1.01 (1.07)	1.30 (1.14)	0.11
Weight before pregnancy in kg, mean (± SD)	73.54 (15.96)	76.76 (17.33)	0.09
Body mass index in kg/m^2, mean (± SD)	27.03 (5.61)	28.19 (6.11)	0.08
Hb_{A1c}, mean (± SD)	5.32 (0.46)	5.23 (0.48)	0.097
Weight gain in kg, mean (± SD)	9.43 (6.52)	9.60 (6.25)	0.81
Insulin therapy during pregnancy (%)	46.84	44.10	0.62
Rapid acting insulin therapy only (%)	8.33	6.25	0.568
Long acting insulin therapy only (%)	23.6	18.75	0.371
Rapid and long acting insulin therapy (%)	19.44	23.61	0.194
Gestational age at introduction of insulin in wa, mean (± SD)	27.51 (6.17)	28 (6.25)	0.64
Patients' obstetrical outcome			
Pre-eclampsia (%)	2.5	3.1	0.25
Gestational age at delivery in wa, mean (± SD)	38.46 (2.15)	38.79 (1.89)	0.16
Caesarian section (%)	34.2	28.6	0.47
Postpartum haemorrhage (%)	11.4	6.2	0.11
New-borns' characteristics			
APGAR score at 5 mn of life, mean (± SD)	9.83 (0.70)	9.87 (0.61)	0.61
Birth weight in g, mean (± SD)	3274.5 (637.6)	3430.1 (498.9)	0.0185 *
Weight > 90th percentile (%)	10.8	18.9	0.022 *

kg = kilograms; g= grams; wa= weeks of amenorrhoea (* = $P < 0.05$ statistically significant).

were in the targets at 4.79 ± 0.39 and 5.94 ± 0.48 mmol/l, respectively.

To our knowledge, our study is the first to investigate the impact of MyDiabby app on foetal macrosomia, in a large population of patients with GDM. Although our study is retrospective, it was conducted in a single centre and includes a large number of patients, as well as a control population. Since MyDiabby app is widely used in France, Belgium, Switzerland and Luxembourg [5], evaluating its impact seems important. The decreased rate of macrosomia observed in our study could be related to a better glycaemic control when using the app.

In the literature, a meta-analysis by Xie et al. showed that the cumulative Z-value of macrosomia incidence was not sufficient to conclude and they suggested that further research should be performed [7]. In a randomised controlled trial including 120 GDM patients using a telemedicine application, Miremberg et al. [3] found a decrease in new-born birthweight; the difference however was not significant. Wei Yew et al. tested the Habits-GDM app in a randomised study including 370 patients showing a better composite neonatal outcome. However, this outcome evaluating neonatal complications was not prespecified in the study.

In conclusion, our study suggests that MyDiabby application decreases the rate of foetal macrosomia, particularly in overweight GDM patients and therefore may improve foetal outcomes.

References

[1] International Association of Diabetes and Pregnancy Study Groups Consensus Panel, Metzger BE, Gabbe SG, Persson B, et al. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care 2010;33:676–82. doi: 10.2337/dc09-1848.

[2] Ming WK, Mackillop LH, Farmer AJ, LoerupL Bartlett K, Levy JC, et al. Telemedicine technologies for diabetes in pregnancy: a systematic review and meta-analysis. J Med Internet Res 2016;18:e290 http://doi.org/10.2196/jmir.6556.

[3] Miremberg H, Ben-Ari T, Betzer T, Raphaeli H. The impact of a daily smartphone-based feedback system among women with gestational diabetes on compliance, glycemic control, satisfaction, and pregnancy outcome: a randomized controlled trial. Am J Obstet Gynecol 2018;218:453 .e1-7. doi: 10.1016/j.ajog.2018.01.044.

[4] Yew TW, Chi C, Chan SY, van Dam RM, Whitton C, Lim CS, et al. A randomized controlled trial to evaluate the effects of a smartphone application–based lifestyle coaching program on gestational weight gain, glycemic control, and maternal and neonatal outcomes in women with gestational diabetes mellitus: the SMART-GDM Study. Diabetes Care 2021;42:456–63 dc201216. doi: 10.2337/dc20-1216.

[5] https://www.mydiabby.com/

[6] World Health Organization. Diagnostic criteria and classification of hyperglycaemia first detected in pregnancy. World Health Organization; 2013 https://apps.who.int/iris/handle/10665/85975.

[7] Xie W, Dai P, Qin Y, Wu M, Yang B, Yu X. Effectiveness of telemedicine for pregnant women with gestational diabetes mellitus: an updated meta-analysis of 32 randomized controlled trials with trial sequential analysis. BMC Pregnancy Childbirth 2020;20:198. doi: 10.1186/s12884-020-02892-1.

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