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Brief Research Report

Implications of a new guideline on treating gestational diabetes in Denmark

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ABSTRACT

INTRODUCTION. In late 2023, the Danish national guideline on treatment of gestational diabetes mellitus (GDM) introduced tighter glucose control to prevent foetal and maternal complications. The change was expected to lead to an increased use of insulin therapy in GDM treatment. This study aimed to evaluate insulin usage and obstetric outcomes when adhering to the new guideline.

METHODS. This retrospective cohort study evaluated women diagnosed with GDM (n = 67) from May to October 2024 at Gødstrup Hospital, compared with women diagnosed with GDM (n = 46) in a three-month period in 2023 before implementation of the new guideline. Data on maternal age, pre-pregnancy BMI, ethnicity, education, oral glucose tolerance test 2-h values, insulin treatment, induction of labour and foetal characteristics were collected.

RESULTS. The number of women treated with insulin increased from 26% (2023) to 58% (2024), $p < 0.01$, but the maximum insulin dose did not change (0.42 IU/kg/day). Birthweight and birthweight z-scores were comparable. In 2024, induction of labour was more prevalent (63% versus 39%, $p < 0.01$) without a corresponding rise in obstetric and perinatal complications.

CONCLUSIONS. Implementation of the new GDM guideline increased the number of women requiring insulin treatment but did not affect the maximum dose of insulin per kg. The increase in insulin treatment led to a higher labour induction rate, increasing the workload for the obstetric department. Our data showed no decrease in birthweight or the incidence of large-for-gestational-age offspring.

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In 2023, the Danish Endocrine Society, the Danish Society of Obstetrics and Gynaecology, the Danish Society of General Medicine and the Danish Society of Biochemistry agreed on an updated treatment guideline for gestational diabetes mellitus (GDM) [1]. The primary change in this guideline was a tightening of glucose control during pregnancy. The new recommendations for blood glucose (BG) levels were 4.0-5.5 mmol/l before meals and 4.0-7.0 mmol/l 1.5 h following the initiation of a meal, replacing the previous target of 4.0-6.0 mmol/l pre-prandially and 4.0-8.0 mmol/l post-prandially. The new treatment goals were based on several randomised controlled trials showing beneficial outcomes for pregnancy complications, e.g. preeclampsia, preterm birth, macrosomia [2-4] and a reduction in long-term disease risk for both mother and child [5, 6]. Some feared that the new guideline would lead to a surge in women needing insulin therapy, whereas others advocated that women would adopt an “eat-to-target” behaviour to maintain their BG values within the recommended range.

This study report aims to evaluate use of insulin and obstetric outcomes when adhering to the new guideline.

Methods

Gødstrup Hospital provides healthcare services to approximately 3,000 pregnant women annually. The Danish GDM rate is currently 6% [7], and both national and international rates are increasing [8, 9]. At Gødstrup Hospital, care for women with GDM is provided by a multidisciplinary team including obstetricians, endocrinologists, midwives, nurses, sonographs and dieticians. We provide care for women treated with and without insulin, referring women with a daily insulin dose ≥ 50 IU to Aarhus University Hospital. We implemented the new guideline on 1 April 2024. To evaluate its effect and consequences, we collected data on women diagnosed with GDM from May 2024 to October 2024, and, for comparison, women diagnosed with GDM from May, June and August 2023. In total, we retrieved data on 116 women, excluding three women due to stillbirth, multiple pregnancies or failure to reach delivery at the time of data collection (end of March 2025). Data were retrieved manually from electronic medical records. We retrieved data on pre-pregnancy BMI, maternal age, ethnicity, educational level, parity, previous GDM status, gestational age (GA) at oral glucose tolerance test (OGTT), 2-h OGTT value, insulin treatment including maximum dose (IU/day/kg), GA at initiation of insulin treatment, GA at birth, birthweight, birthweight z-score [10], large-for-gestational-age offspring (LGA) (birthweight z-score > 2 SD), small-for-gestational-age offspring (SGA) (birthweight z-score < 2 SD) [11], induction of labour, mode of delivery and neonatal and maternal complications. Women requiring insulin were treated with insulin aspart/insulin aspart protamin, administered via injections 2-3 times daily, with dose adjustments every 7-10 days. Data are presented as mean values with 95% CI for continuous variables, ensuring normal distribution by assessing quantile-quantile plots. Student's t-test or the χ^2 test was used to compare cohorts. The REDCap electronic data capture tool hosted at Region Midtjylland was used for data collection and management [12, 13]. The statistical analyses were performed using Stata 18 (StataCorp, College Station, TX).

Trial registration: not relevant.

Results

Characteristics of the pregnant women with GDM are shown in **Table 1**. We compared data on 67 women diagnosed in 2024 with those of 46 women diagnosed in 2023. There were no differences in maternal age, parity or previous GDM status between the two groups. However, women diagnosed with GDM in 2024 had a higher BMI than those diagnosed in 2023 (30.2 kg/m^2 (28.3; 32.1) versus 27.4 kg/m^2 (25.7; 29.1), p = 0.041). The two groups had comparable 2-h OGTT values and OGTT timing. Significantly more women in 2024 needed insulin therapy to manage their BG levels (58% versus 26%, p < 0.05). Interestingly, we found no difference in the maximum daily insulin dose between the groups (0.42 IU/kg/day) or in the number of women needing ≥ 50 IU/day. **Table 2** displays obstetric and neonatal outcomes. In the 2024 cohort, 63% of labour were induced compared to 39% in 2023 (p < 0.05). The main reason for induction in 2023 was GDM without insulin (24%), whereas it was GDM with insulin in 2024 (38%). The number of acute caesareans tended to be higher in 2024 than in 2023 (13% versus 7%, p = 0.241), whereas planned caesareans were similar between groups. We found no difference in birthweight, birthweight z-scores, SGA/LGA, or neonatal complications between groups. When adjusting birth weight and birth weight z-scores for maternal BMI, this did not explain the difference in birth weight (6.4 g (95% CI: –6.0; 18.9 g); p = 0.310), whereas maternal BMI accounts for a minimal difference in birth weight z-scores (0.03 (95% CI: 0.01; 0.06); p = 0.019).

TABLE 1 Maternal characteristics.

	2023 (N_{23} = 46)	2024 (N_{24} = 67)	p value
Age at childbirth, mean (95% CI), yrs	31.1 (29.8; 32.4)	32.3 (31.2; 33.4)	0.172
BMI at beginning of pregnancy, mean (95% CI), kg/m²	27.4 (25.7; 29.1)	30.2 (28.3; 32.1)	0.041
Parity, n (%)			0.955
0	20 (43)	32 (48)	
1	18 (39)	24 (36)	
≥ 2	8 (18)	11 (16)	
GDM in previous pregnancy, n (%)	12 (46)	16 (46)	0.497
Insulin treatment in previous pregnancy, n (%)	1 (8)	3 (19)	0.436
Ethnicity, n (%)			0.286
Europe, North America, Australia	36 (78)	57 (85)	
Middle East	6 (13)	3 (5)	
Africa, Latin America and South America	0	2 (3)	
Asia	4 (9)	4 (6)	
Unknown	0	1 (1)	
Education, n (%)			< 0.05
Primary and lower secondary education	7 (15)	0	
Vocational education and training	9 (20)	0	
General upper secondary education	0	2 (3)	
Academy profession degree	10 (22)	4 (6)	
Professional bachelor's degree/ bachelor's degree	7 (15)	16 (24)	
Master's degree/PhD degree	5 (11)	5 (7)	
Unknown	8 (18)	40 (56)	
Healthcare education, n (%)	9 (20)	12 (18)	0.824
GA at OGTT[a], mean (95% CI), wks	28+5 (26+1; 31+1)	28+4 (26+6; 29+6)	0.778
OGTT[a], mean (95% CI), mmol/l, 2-h value	9.7 (9.2; 10.2)	9.9 (9.7; 10.1)	0.488
Fasting BG measured, n (%)	5 (11)	9 (14)	0.650

BG = blood glucose; GA = gestational age; GDM = gestational diabetes mellitus; OGTT = oral glucose tolerance test.
a) 4 OGTTs missing.

TABLE 2 Obstetric and perinatal outcomes.

	2023 (N_{23} = 46)	2024 (N_{24} = 67)	p value
Insulin treatment, n (%)	12 (26)	39 (58)	0.001
GA at start of insulin treatment[a], mean (95% CI), wks	33+0 (29+6; 36+0)	32+0 (30+4; 33+4)	0.549
Insulin dose			
Max, mean (95% CI), IU/day	36 (25; 46)	35 (32; 38)	0.817
Max, mean (95% CI), IU/kg/day	0.42 (0.26; 0.58)	0.42 (0.39; 0.46)	0.959
> 50 IU/day, n (%)	3 (25)	4 (10)	0.194
Birthweight			
Birthweight, mean (95% CI), g	3529 (3368; 3690)	3591 (3494; 3689)	0.485
Birthweight z-scores, mean (95% CI)	0.200 (-0,169; 0.568)	0.262 (0.026; 0.498)	0.766
SGA, n (%)	0	0	-
LGA, n (%)	3 (7)	2 (3)	0.379
Induction of labour, n (%)	18 (39)	42 (63)	0.014
Reason for induction, n (%)			
Fetus estimate > 4,000 g	5 (11)	8 (12)	0.861
GDM without insulin	11 (24)	8 (12)	0.095
GDM with insulin	6 (13)	25 (38)	< 0.01
Polyhydramnios	1 (2)	2 (3)	0.792
Hypertension/PE	1 (2)	5 (8)	0.405
Other	1 (2)	4 (6)	0.218
Mode of delivery, n (%)			
Vaginal	38 (83)	52 (78)	0.517
Planned caesarean	5 (11)	6 (9)	0.736
Acute caesarean	3 (7)	9 (13)	0.241
Complications, n (%)			-
None	41 (89)	56 (84)	0.405
Dystocia of the shoulder	0	0	-
Haemorrhage > 1,000 ml	4 (9)	9 (13)	0.438
Grade 3-4 tear [14]	1 (2)	0	0.225
Unknown	0	2 (3)	0.405

GA = gestational age in weeks; GDM = gestational diabetes mellitus; LGA = large-for-gestational-age offspring; PE = pre-eclampsia;
SGA = small-for-gestational-age offspring.
a) Total of 12 + 39 women were treated with insulin.

Conclusions

In this brief study report, we present our experience implementing an updated Danish guideline for the treatment of GDM. A higher proportion of women required insulin therapy to achieve BG targets. However, the average maximum insulin dose IU/kg/day did not increase. The study was adequately powered to detect the observed difference in the proportion of women requiring insulin treatment. However, it was not powered to detect small differences in the maximum insulin dose. Therefore, the absence of significant differences in

these outcomes should be interpreted with caution. Compared to 2023, more labours were induced in 2024 (63% versus 39%). The higher rate of insulin therapy in 2024 was the main indication for labour induction (38% in 2024 versus 13% in 2023). According to guidelines, labour induction in women treated with insulin must be conducted in-hospital rather than at home. Furthermore, induction is recommended at GA 40+0 for women treated with insulin, compared to GA 41+0 for those not requiring insulin [15]. This difference in timing likely contributed to the observed trend towards earlier deliveries in 2024 (mean GA 38+4 versus 40+3, $p = 0.203$). The observed doubling of acute cesarean sections in 2024 did not reach statistical significance, likely due to limited power. With cesarean rates of 13% versus 7% (Cohen's $h \approx 0.21$) and sample sizes of 67 and 46, post hoc power was approximately 24%. Thus, this potential increase should be interpreted cautiously, and larger studies are needed to confirm differences in mode of delivery. Overall, our findings match data from Crowther et al [2]. Due to the limited sample size, we did not expect to find differences in birthweight, birthweight z-scores or complication rates. Although women diagnosed with GDM in 2024 had a higher pre-pregnancy BMI, adjusting for this variable revealed no clinical relevant differences between the groups regarding birthweight or birthweight z-scores. Interestingly, we found a remarkably low number of LGA overall compared to findings in previously described populations [16, 17], making it more unlikely to show a difference in LGA between the 2023 and 2024 cohorts. Unfortunately, data on gestational weight gain, an outcome valuable to our findings on birthweight, birthweight z-scores and SGA/LGA, were not systematically reported in the medical charts. To detect differences in neo- and perinatal outcomes, larger studies are needed. Nonetheless, this brief research report provides valuable and helpful insights into the implications of the updated Danish GDM national guideline, not only in terms of clinical treatment, but also in relation to organisational structure and healthcare delivery.

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