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Postpartum glucose tolerance in women with gestational diabetes using levonorgestrel intrauterine contraception☆

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Abstract

Objective: Postpartum contraception is critical in women with gestational diabetes mellitus (GDM). We evaluated the effect of the levonorgestrel intrauterine system (LNG-IUS) on glucose tolerance in postpartum women with GDM.
Study design: The study is a descriptive analysis of 12-month glucose tolerance in women with recent GDM who used the LNG-IUS, the copper IUD or postpartum sterilization.
Results: Twelve months postpartum, 3 of 13 LNG-IUS users (23.1%) and 1 of 6 nonhormonal contraceptive users (16.6%) had prediabetes. No woman developed overt diabetes.
Conclusions: This study is the first and only to measure the metabolic effects of the LNG-IUS women with GDM. Larger trials are necessary.
Implications: Use of levonorgestrel intrauterine contraception does not appear to negatively affect glucose tolerance in postpartum women with a history of gestational diabetes. Additional appropriately powered clinical studies are needed to confirm these results.

Keywords: Postpartum contraception; Intrauterine device; Gestational diabetes; Glucose tolerance; LARC

1. Introduction

Gestational diabetes mellitus (GDM) complicates 3%–7% of pregnancies in the United States and places affected women at risk of developing type 2 diabetes mellitus (DM) [1,2]. Women with DM may experience an unintended pregnancy or conceive with undiagnosed diabetes, increasing maternal morbidity, obstetric complications and risk of fetal malformations [3]. Effective contraception is critical for delaying pregnancy until euglycemia is achieved, and evidence suggests that contraception decreases the lifetime risk of type 2 DM by preventing a subsequent pregnancy [4]. Previous GDM predisposes a woman to development of overt DM, with an estimated risk of 35%–60% of type 2 DM within 10 years [2].

The literature lacks evidence-based recommendations on the best contraceptive methods for women with past GDM. No published trials have addressed intrauterine device (IUD) use in patients with GDM in a previous pregnancy. The metabolic effects of the levonorgestrel intrauterine system (LNG-IUS) in women with type 2 DM are unknown [5]. This study is the first to investigate the effect of the LNG-IUS on glucose metabolism in postpartum women with GDM.

2. Materials and methods

The primary objective was to describe glucose tolerance in the first 12 months postpartum in two groups of women with GDM in the last pregnancy: (a) those using a LNG-IUS and (b) those using either the copper IUD or tubal sterilization. The primary hypothesis was that glucose tolerance in the group of women using the LNG-IUS would be similar to that of copper IUD users or sterilized

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women. Secondary aims included assessments of lipid metabolism, body mass index (BMI), pregnancy rates, contraceptive satisfaction and adverse events. The study was approved by the Northwestern University Institutional Review Board.

Women with class A1 or A2 GDM, who planned to use the LNG-IUS or the copper IUD, or who requested sterilization, were enrolled. Women choosing sterilization underwent tubal ligation while hospitalized for delivery. After delivery, participants returned for 3 visits—6 weeks, 6 months, and 12 months postpartum.

During the 6-week visit, data were collected on sociodemographic, medical and obstetric variables. Fasting serum glucose, insulin, glycosylated hemoglobin and lipids were measured. A 2-h, 75-g oral glucose tolerance test (OGTT) was performed, along with physical examination and IUD placement.

At the 6-month visit, fasting glucose, insulin and lipid levels were measured. Weight, blood pressure, menstrual patterns and adverse events were recorded. Satisfaction with IUD or sterilization use was assessed using a 100-mm visual analog scale (VAS). These procedures were repeated at the 12-month visit. Participants also completed a 2-h OGTT, and glycosylated hemoglobin values were ascertained.

The primary outcome measure was glucose tolerance on 2-h OGTT testing at 12 months postpartum. Secondary outcome measures included fasting lipid and insulin levels at 6 weeks, 6 months and 12 months, and assessments of BMI, pregnancy rates, adverse events and contraceptive satisfaction.

SAS, Version 9.4, was used for data analysis.

Table 1
Baseline characteristics, participants who completed 12-month follow-up

	LNG group		NH group	
Variable	*N*	%	*N*	%
Age				
<30 years	5	38.5	2	33.3
≥30 years	8	61.5	4	66.7
Race/ethnicity				
White, non-Hispanic	7	53.8	1	16.7
Black, non-Hispanic	2	15.4	2	33.3
Hispanic	3	23.1	3	50.0
Other	1	7.7	0	0
Gravidity				
1	1	7.7	2	33.3
2	3	23.1	2	33.3
3	6	46.3	0	0
4 or more	3	23.1	2	33.3
Parity				
0	4	30.8	0	50.0
1	6	46.3	1	16.7
2	3	23.1	2	16.7
3	0	0	3	16.7
GDM class				
A1	13	100.0	4	66.7
A2	0	0	2	33.3
BMI				
<25 kg/m^2	3	23.1	0	0
≥25 kg/m^2	10	76.9	6	100.0
≥30 kg/m^2	4	30.8	5	83.3
Pregnancy OGTT values				
Fasting glucose ≥ 91	6	46.2	5	83.3
1-h glucose ≥ 180	6	46.2	2	33.3
2-h glucose ≥ 153	8	61.5	2	33.3
OGTT results, 6 weeks postpartum				
Normal	13	100.0	5	83.3
Impaired fasting glucose	0	0	1	16.7
Impaired glucose tolerance	0	0	0	0

3. Results

Forty-two women were enrolled. Ages ranged from 20 to 42 years, with a median age of 30 years. Racial and ethnic backgrounds were diverse. Two thirds were parous. Most women had class A1 GDM. Few women had chronic medical problems, although most were overweight (BMI = 25–29.9 kg/m^2) or obese (BMI ≥ 30 kg/m^2). Six weeks postpartum, five women (11.9%) exhibited prediabetes.

Twelve-month data are available for 19 participants. Their baseline characteristics are shown in Table 1. These variables describe characteristics related to the pregnancy or the 6-week postpartum visit. Thirteen women used the LNG-IUS and comprise the study group (LNG group). Four women used the copper IUD, and two were sterilized; these six women comprise the nonhormonal contraception group (NH group). Most women (63.2%) were multiparous. Most had GDM class A1. All deliveries occurred at or beyond 37 weeks' gestation.

Table 2 lists the BMI, laboratory values and VAS scores for the 20 participants who completed 6 months (n = 1) or 12 months (n = 19) of follow-up. No IUD expulsions or removals, insertion complications or pregnancies occurred.

Among the 19 women for whom 12-month data are available, 4 women exhibited prediabetes—1 of 6 controls (16.6%) and 3 of 13 in the LNG group (23.1%). One woman had impaired fasting glucose and was in the LNG group. Two women with impaired glucose tolerance were in the LNG group, and the third woman was in the NH group.

Pregnancy weight gain varied greatly amongst participants, ranging 0.9 kg–22.2 kg. Median BMI varied little over time. Total cholesterol and low-density lipoprotein (LDL) levels improved over the 12-month period. Triglyceride, high-density lipoprotein (HDL), insulin and glycosylated hemoglobin levels were mostly normal and showed little change over time. Contraceptive satisfaction was high, with the majority of VAS scores above 80 mm.

4. Discussion

Our study is the first to evaluate the metabolic effects of the LNG-IUS in women with recent GDM. GDM signifies a high-risk metabolic environment, resulting in subsequent