OBSTETRICS

Association of lipid levels during gestation with preeclampsia and gestational diabetes mellitus: a population-based study

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OBJECTIVE: The study evaluates lipids profile changes during gestation in pregnancies with and without preeclampsia and/or gestational diabetes.

STUDY DESIGN: Lipid profiles were assessed between year prior and after pregnancy in 9911 women without cardiovascular comorbidities.

RESULTS: Lipid levels during gestation varied substantially with a nadir following conception and a peak at delivery. Compared to preconception levels total cholesterol levels increased from 164.4 mg/dL to 238.6 mg/dL and triglycerides (TGs) from 92.6 mg/dL to 238.4 mg/dL. The composite endpoint (gestational diabetes mellitus or preeclampsia) occurred in 1209 women (12.2%). Its prevalence increased with levels of TG—from 7.2% in the group with low TGs (<25th percentile adjusted for the gestational month) to 19.8% in the group with high TGs (>75th percentile), but was not associated with high-density lipoprotein levels. In multivariate analysis higher TGs levels, but not low high-density lipoprotein, were associated with the primary endpoint.

CONCLUSION: Lipid levels change substantially during gestation. Abnormal levels of TGs are associated with pregnancy complications.

Key words: adverse outcomes, gestation, lipids

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A number of diseases affecting the cardiovascular system emerge during pregnancy. Gestational diabetes mellitus is a risk factor for the development of type 2 diabetes and gestational hypertension is associated with an elevated risk for developing subsequent systemic hypertension.[1-3] Gestational diabetes and hypertension can contribute to maternal and fetal risk of developing peri- and postpartum complications.[4,5]

The third component of the metabolic syndrome associated with insulin resistance, ie, dyslipidemia, is a well known cardiovascular risk factor. However, lipid physiology and pathophysiology during pregnancy has not been studied extensively in large population-based cohorts. Values for total cholesterol (TC), low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides (TGs) during pregnancy and their changes with gestational age are not well described. Similarly, the association between pregnancy outcomes and abnormal levels of lipids prior to conception and during the gestation has not been studied substantially.

This population-based study was aimed to provide a description of lipids profile by gestational age during pregnancy. We sought to test the hypothesis that elevated TG levels and low levels of HDL assessed during gestation are associated with pregnancy complications such as preeclampsia and gestational diabetes mellitus.

MATERIALS AND METHODS

Study population

In the current study, we used a database with data on all deliveries between January 2000 and February 2006 in the Soroka University Medical Center. The study population was limited to women who during the study period had 1 of the lipids tests performed (analyzed in the single laboratory) in a time frame between 12 months prior to singleton pregnancy and 12 months following the delivery (Figure 1). The database included information on maternal comorbidities, perinatal assessment, maternal and fetal complications. Fasting glucose levels during gestation were assessed as well. Women with ischemic heart disease, stroke, peripheral vascular disease, diabetes mellitus diagnosed prior to conception, dyslipidemia, or hypertension were excluded from the study population.

Lipids levels measurement

We used a cross-sectional approach, ie, each subject (woman-lipids test) was included only once into the analysis. The time of performing lipidogram was related to the nearest estimated conception date (assigned value "0"), and calculated as (Date of lipidogram – [delivery date-gestational age]) in months. In women who delivered after 40 weeks and the test was done after delivery, the time of the test was assigned to the 10th month. If a subject had more than 1 pregnancy dur-

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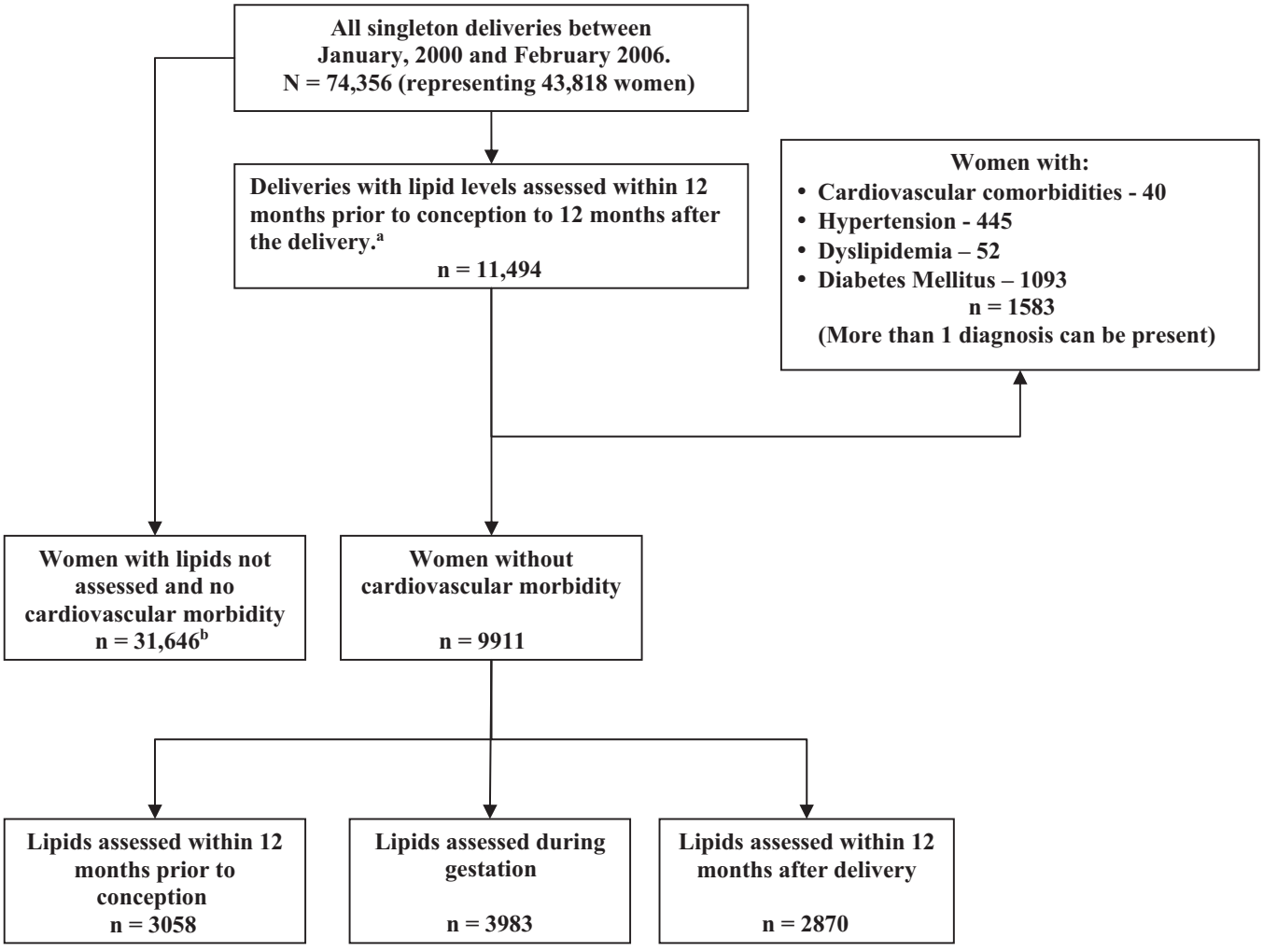
FIGURE 1
Flowchart of the study population



[a]In case a woman had >1 pregnancy during the defined period, and ≥1 lipidograms, a gestation with the conception closest to the lipidogram date was chosen; [b]Chosen at random from 52,815 deliveries during study period with no lipids analysis between 12 months prior to conception and 12 months following the delivery.

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ing the defined period, the pregnancy with the conception closest to the lipidogram date was chosen. If a woman had more than 1 lipidogram for the chosen pregnancy, only 1 test closest to delivery date was used for analysis. Women with preeclampsia or gestational diabetes mellitus (GDM) were excluded from definition of the lipids distribution for the respective gestational month.

Results for each individual test (TC, HDL, LDL, and TGs) during pregnancy were divided into 3 groups: "low level" (levels <25th percentile); "intermediate level" (between 25th and 75th percentiles); and "upper level" (levels >75th percentile) of the distribution for the respective gestational month.

Definitions

We considered the composite of preeclampsia and gestational diabetes mellitus to be the primary endpoint in the study. The outcome diagnoses were made by the treating physician according to standard definitions used in our institution. Preeclampsia was defined as blood pressure of 140/90 mmHg after 20 weeks' gestation and proteinuria of ≥0.1 g/L of protein in random specimen. GDM was diagnosed by universal screening.

Preterm delivery was defined as delivery prior 37 weeks of gestation, small for gestational age (SGA) as birthweight below 10th percentile for gestational age, and large for gestational age (LGA) weight above 90th percentile. Repeated spontaneous abortion was defined as 2 or more spontaneous abortions.

Data analysis

The data on continuous variables with normal distribution were presented as mean ± SD, and median with interquartile range (IQR) for not normally distributed variables. Categorical data were shown in counts and percentages. Dif-