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Original Research Article

Maternal obesity and obstetric outcomes in a tertiary referral center

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ABSTRACT

Background and aim: Obese women are at an increased risk of various adverse pregnancy outcomes. The aim of our study was to evaluate the impact of obesity on maternal and neonatal outcomes in a tertiary referral center and to compare obstetric outcomes by the level of maternal obesity.

Materials and methods: A cohort study included 3247 women with singleton gestations who gave birth at the Department of Obstetrics and Gynecology, Lithuanian University of Health Sciences, in 2010. Pregnancy complications and neonatal outcomes were identified using the hospital Birth Registry database in normal weight (body mass index [BMI] 18.5–24.9 kg/m², n = 3107) and prepregnancy obese (BMI ≥30 kg/m², n = 140) women. Pregnancy outcomes were compared according to the level of obesity (BMI 30–34.9 kg/m², n = 94 and BMI ≥35 kg/m², n = 46). **Results:** Obese women were significantly more likely to have gestational hypertension (OR = 8.59; 95% CI, 5.23–14.14; P < 0.0001), preeclampsia (OR = 2.06; 95% CI, 1.14–3.73; P < 0.0001), gestational diabetes (OR = 5.56; 95% CI, 3.66–8.49; P < 0.0001), dystocia (OR = 2.14; 95% CI, 1.36–3.38; P < 0.0001), induced labor (OR = 2.64; 95% CI, 1.83–3.80; P < 0.0001), failed induction of labor (OR = 18.06; 95% CI, 8.85–36.84; P < 0.0001), cesarean delivery (OR = 1.76; 95% CI, 1.25–2.49; P = 0.001), large-for-gestational-age newborns (OR = 3.68; 95% CI, 2.51–5.39; P < 0.0001). Significantly increased risk of gestational diabetes, preeclampsia, dystocia and newborns with Apgar score ≤7 after 5 min was only observed in women with BMI ≥35 kg/m². **Conclusions:** Maternal obesity is significantly associated with an increased risk of gestational hypertension, preeclampsia, gestational diabetes, dystocia, labor induction, failed induction of labor, large-for-gestational-age newborns and cesarean delivery.

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1. Introduction

The prevalence of obesity in the general population and among women of childbearing age has increased dramatically during past 25 years [1,2]. More than one-third of women of reproductive age are overweight or obese in middle or high income countries [3–6]. Being overweight or obese increases maternal and neonatal morbidity and obese women have higher infertility rates and are at increased risk of various adverse pregnancy outcomes [1,2,5–8]. Moreover, the perinatal nutritional environment may have a direct impact on development of obesity later in the life [9].

Most of the studies that investigated the relation of obesity with adverse perinatal outcomes were done in Western countries [1–4]. Few data exist about new European Union member states. Obesity is a burden for any healthcare system that should not be underestimated. When resources are limited it is important to identify risk groups which may benefit most from target interventions. Analysis of adverse pregnancy outcomes in relation to obesity class allows a better understanding of the risks and thus interventions can be concentrated on the population that needs them most.

The objective of our study was to evaluate the impact of obesity on maternal and neonatal outcomes in the tertiary referral center and to compare pregnancy outcomes by the level of maternal obesity.

2. Materials and methods

A cohort study was conducted at the Department of Obstetrics and Gynecology of the Lithuanian University of Health Sciences, in Kaunas, Lithuania. The department is a tertiary referral center where mainly high-risk pregnant women receive perinatal services. Pregnancy was considered as high-risk for a variety of maternal and fetal reasons: preexisting maternal medical illness, history of complications and poor outcomes during previous pregnancies, various obstetrical complications during current pregnancy, etc. Women who delivered singleton newborns at 22–42 weeks of gestation between January 1 and December 31, 2010, were retrospectively identified ($n = 3371$) using the Birth Registry, a computerized database in which all deliveries at the department have been registered. Data are entered into the registry by the trained midwife assisting at the delivery. Maternal demographic characteristics, medical and obstetrical history and pregnancy outcomes were collected from Birth Registry database along with manual retrieval from medical charts and labor records using standartized data collection forms.

Height and prepregnancy weight was obtained from the prenatal records or was self-reported upon admission for delivery. Body mass index (BMI) was calculated from weight in kilograms divided by height in meters squared (kg/m^2). Prepregnancy obese women ($\text{BMI} \geq 30 \text{ kg}/\text{m}^2$, $n = 140$) and normal weight women ($\text{BMI} 18.5\text{--}24.9 \text{ kg}/\text{m}^2$, $n = 3107$) were included. Gestational weight gain (GWG) was ascertained according to self-reported data at the time of delivery or documented weight at last prenatal visit subtracted from prepregnancy weight.

Maternal characteristics including age, parity, marital status (married vs. unmarried, including single, divorced, widowed, and separated), educational level, GWG and pregnancy outcomes were compared between obese and normal weight women. Furthermore obese women were subcategorized into two groups ($\text{BMI} 30\text{--}34.9 \text{ kg}/\text{m}^2$, $n = 94$ and $\text{BMI} \geq 35 \text{ kg}/\text{m}^2$, $n = 46$) and pregnancy outcomes were compared between these and normal weight women. Maternal outcomes of interest included gestational hypertension, preeclampsia, gestational diabetes, induction and augmentation of labor, failed induction, dystocia and cesarean section rate. Neonatal outcomes of interest included gestational age at delivery, birthweight, preterm delivery, stillbirth and low Apgar score at 5 min.

Gestational age at delivery was based on early ultrasound and recorded day of last menstrual period. Low Apgar score was defined as a score ≤ 7 at 5 min after delivery. A stillbirth was defined as the death of a fetus at any time of pregnancy and delivery after 22 completed weeks of gestation. Large-for-gestational-age (LGA) newborn or fetal macrosomia was defined as birthweight above the 90th percentile adjusted for newborn gender and gestational age. Small for gestational age newborns were defined as those with a weight less than the 10th percentile at birth adjusted for newborn gender and gestational age. Newborns were weighted immediately upon delivery in the nursery.

Gestational hypertension was defined as a blood pressure elevation $\geq 140 \text{ mmHg}$ systolic or $\geq 90 \text{ mmHg}$ diastolic measured on two occasions 6 h apart in previously normotensive women after ≥ 20 weeks of gestation. Preeclampsia was diagnosed when woman developed gestational hypertension and proteinuria $\geq 300 \text{ mg}$ of protein in a 24-h urine specimen. A fasting glucose screening test was done at initial prenatal visit. An oral glucose tolerance test (OGTT) was done in all prepregnancy obese women. OGTT in women with normal BMI was carried out according to institutional policy if women had the following risk factors: age ≥ 35 years, familial history of diabetes, prior history of gestational diabetes (GDM), glucosuria, history of unexplained stillbirth, previously delivered LGA newborn. OGTT was conducted with a loading glucose dose of 75 g between 24th and 28th weeks of gestation. The diagnosis of GDM was made on the basis of a 2-h plasma glucose level of $\geq 7.8 \text{ mmol}$ per liter. Class A1 GDM was diagnosed when dietary modification was sufficient to control blood glucose level. Class A2 GDM was diagnosed when additional therapy with insulin was required. Failed induction of labor was diagnosed when physical and pharmacological methods did not generate regular uterine contractions and lead to vaginal delivery. Dystocia was defined as a failure to progress in labor either because of uterine dysfunction, pelvic contraction or disproportion between the head of the fetus and the birth canal.

2.1. Statistical analysis

Statistical analyses were performed using the SPSS (*Statistical Package for the Social Sciences*) version 17.0 (Chicago, IL, USA) for Windows. Descriptive statistics are presented as the arithmetic mean \pm standard deviation (SD). The Pearson Chi-squared test was used for analysis of categorical variables. The Fisher

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