ATLANTIC DIP: The Impact of Obesity on Pregnancy Outcome in Glucose-Tolerant Women

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OBJECTIVE — A prospective study of the impact of obesity on pregnancy outcome in glucose-tolerant women.

RESEARCH DESIGN AND METHODS — The Irish Atlantic Diabetes in Pregnancy network advocates universal screening for gestational diabetes. Women with normoglycemia and a recorded booking BMI were included. Maternal and infant outcomes correlated with booking BMI are reported.

RESULTS — A total of 2,329 women fulfilled the criteria. Caesarean deliveries increased in overweight (OW) (odds ratio 1.57 [95% CI 1.24–1.98]) and obese (OB) (2.65 [2.03–3.46]) women. Hypertensive disorders increased in OW (2.30 [1.55–3.40]) and OB (3.29 [2.14–5.05]) women. Reported miscarriages increased in OB (1.4 [1.11–1.77]) women. Mean birth weight was 3.46 kg in normal BMI (NBMI), 3.54 kg in OW, and 3.62 kg in OB women. Macrosomia occurred in 15.5, 21.4, and 27.8% of babies of NBMI, OW, and OB mothers, respectively (P < 0.01). Shoulder dystocia occur in 4% (>4 kg) compared with 0.2% (<4 kg) babies (P < 0.01). Congenital malformation risk increased for OB (2.47 [1.09–5.60]) women.

CONCLUSIONS — OW and OB glucose-tolerant women have greater adverse pregnancy outcomes.

Obesity is now a global pandemic (1) and increases the risk of gestational diabetes mellitus (GDM). Few studies (2,3) have examined the independent effects of obesity on pregnancy outcome in glucose-tolerant women.

RESEARCH DESIGN AND METHODS — The Atlantic Diabetes in Pregnancy Partnership (ATLANTIC DIP) (4), serving a population of 500,000 in five centers along the Irish Atlantic seaboard, advocates and provides universal screening for GDM using a 75-g oral glucose tolerance test (OGTT) at 24–28 weeks. Normoglycemia is defined as a fasting blood glucose <5.6 mmol/l and 2-h value <7.8 mmol/l (5). Maternal BMI (kg/m²) was calculated at the first obstetrical visit and defined as <25 kg/m² normal BMI (NBMI), overweight (OW) 25–29.9 kg/m², and obese (OB) ≥30 kg/m². Maternal outcomes included caesarean deliveries, antepartum (APH) and postpartum (PPH) hemorrhage, pregnancy-induced hypertension (PIH), and preeclampsia (PET). Fetal/infant outcomes included gestational weight at delivery, macrosomia, shoulder dystocia, major congenital malformations, miscarriage, stillbirth, neonatal death, and perinatal mortality. Statistical analyses were carried out using the Statistical Package for the Social Sciences version 15.0. Significance was achieved at P < 0.05.

RESULTS

Maternal outcomes
A total of 2,329 women, mean ± SD age 31.4 ± 5.4 years, 90% Caucasian with a recorded booking BMI and a normal OGTT, were included. Caesarean deliveries increased from 16.4 to 23.4 to 32.6% in NBMI, OW, and OB women, respectively (P < 0.01). The odds ratio (OR) of a caesarean delivery was 1.57 (95% CI 1.24–1.98, P < 0.01) for OW and 2.65 (2.03–3.46, P < 0.01) for OB women (Table 1). The risk of an emergency caesarean delivery increased from 10 to 12.4 to 16.1% in NBMI, OW, and OB women, respectively (P < 0.01). The trend was similar for elective caesarean delivery, increasing from 6.5 to 11 to 16.5% NBMI, OW, and OB women, respectively (P < 0.01). There was no correlation between increasing maternal age and increasing BMI.

PIH increased from 4.3 to 9 to 11.3% in NBMI, OW, and OB women, respectively (P < 0.01). PET risk doubled from 2.7 to 4.7% in NBMI, OW, and OB women, respectively (P < 0.01). The overall risk of hypertensive disorders increased from 5 to 9.7 to 12.7% in NBMI, OW, and OB women, respectively (P < 0.01). The OR of having a pregnancy complicated by hypertension was 2.30 (95% CI 1.55–3.40, P < 0.01) in OW and 3.29 (2.14–5.05, P < 0.01) in OB women (Table 1). There was no significant difference in the rates of APh or PPH between groups.

Fetal/infant outcomes
A total of 41.2% of OB women had a history of more than one miscarriage, compared with 34.7 and 32.5% in OW and NBMI women, respectively (P < 0.01). The OR of a history of miscarriage was 1.4 [1.11–1.77] in OB women, respectively (P < 0.01) mothers. Macrosomia occurred in 15.5, 21.4, and 27.8% of babies of NBMI, OW, and OB mothers, respectively (P < 0.01). Shoulder dystocia occur in 4% (>4 kg) compared with 0.2% (<4 kg) babies (P < 0.01). Congenital malformation risk increased for OB (2.47 [1.09–5.60]) women.
Macroemia is more common in OB women (11). In addition to birth injury, macroemia is linked to increased obesity and dysglycemia in adolescence (12). We found a strong association between obesity, macroemia, and shoulder dystocia. A meta-analysis by Stothard et al. (13) showed that obese women are at increased risk of congenital malformations. The authors recognized in their conclusion that some of these adverse outcomes may be due to undiagnosed hyperglycemia. We found a significantly higher rate of congenital malformations in OB women (OR 2.47) but had excluded diabetes.

Previous studies have tried to disentangle the effects of obesity and diabetes on pregnancy outcome. Jensen et al. (2) found an increased risk of adverse events in OW/OB glucose-tolerant Danish women. These women were selected on the basis of increased risk of GDM, thereby limiting the application of the findings to the general population. Our study was in an unselected population of obese women (11). In addition to birth injury, macroemia is linked to increased obesity and dysglycemia in adolescence (12). We are grateful to the staff and patients along the Atlantic seaboard, to collaborators at each center, and to the Health Research Board for funding.

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The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study (14). Obesity confers an increased lifetime risk for type 2 diabetes, and research has offered potential interventions to retard this (15). Identifying obese women and providing interventions is essential for long-term diabetes prevention. Obese women could be offered prepregnancy care with a focus on promoting NBMI prior to their next pregnancy. This would potentially reduce adverse maternal outcomes. Reducing BMI would also affect the offspring in the antenatal and postnatal periods. Further studies are needed to compare outcomes of obese women who undergo intensive prepregnancy care compared with those with no intervention.

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