Association of pre-pregnancy BMI and gestational weight gain with fat mass distribution and accretion during pregnancy and early postpartum: a prospective study of Albertan women

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Abstract

Background: The prevalence rates of overweight and obesity among women of childbearing years have increased dramatically in the past four decades,and recent reports of high gestational weight gain (GWG) accompanied with women not returning to their pre-pregnancy weight may further exacerbate this problem. The Institute of Medicine's (IOM) recommendations for GWG and results from InterGrowth 21 have focused attention on appropriate GWG for optimal pregnancy outcomes and reducing the risks for chronic diseases in maternal and offspring's later life. While body weight is an important indicator of pregnancy outcomes, maternal fat mass is a stronger predictor of long-term maternal health.

Objective: To examine the patterns of fat mass gain in pregnancy and fat loss in the early postpartum period relative to women's pre-pregnancy body mass index (BMI) and by adherence to Institute of Medicine's gestational weight gain (GWG) recommendations.

Methods: This study is a part of the prospective longitudinal birth cohort, 'The Alberta Pregnancy Outcomes and Nutrition Study' (APrON) that recruited pregnant women from the cities of Edmonton and Calgary in Alberta. 1820 pregnant women were recruited and followed through their pregnancy and at 3 months postpartum. Body weight and skinfold thicknesses were measured during pregnancy and early postpartum in women. Body density was calculated from sum of skinfold thickness (biceps, triceps, subscapula and suprailiac), and total fat mass accretion during pregnancy was calculated using Van Raaij's equations and at postpartum using Siri's equation. Differences in total fat mass gain, fat mass loss and fat retention according to pre-pregnancy BMI categories and GWG categories were tested using two-way analysis of variance and post hoc comparisons.

Results: Most women (64%) had a normal pre-pregnancy BMI, and overall 49% women exceeded the GWG recommendations. Obese women gained significantly less total fat mass, had lower fat mass loss and had lower postpartum fat retention than normal-weight women ($p<0.05$). Women with excessive GWG gained higher total fat mass and had higher postpartum fat mass retention ($p<0.03$) than women who met the GWG recommendations. Total GWG was positively correlated with total fat gain ($r=0.61$, $p<0.01$) and total fat retention ($r=0.31$, $p<0.05$).

Conclusions: Excessive GWG is the significant risk factor for higher fat mass accretion during pregnancy and higher postpartum fat retention, irrespective of pre-pregnancy BMI.

Keywords: Pre-pregnancy BMI, Gestational weight gain, Fat mass gain, Albertan Women, Longitudinal Study