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Short report

Peripheral adiposity in relation to offspring birth size in women with and without gestational diabetes: Preliminary data

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Abstract

Objective. – To document the relationship between maternal body composition parameters and offspring anthropometric measurements.

Methods. – A prospective sample of 48 pregnant women with either gestational diabetes (GDM, $n=21$) or normal glucose tolerance (NGT, $n=27$) was studied. Maternal weight, hip circumference and skinfold thicknesses were obtained at 32 weeks of gestation. Offspring length and weight, as well as cranial and thoracic perimeters were obtained at birth.

Results. – Reported maternal pregravid BMI correlated with offspring thoracic perimeter ($\rho=0.52$, $P<0.05$) and tended to correlate with birth weight ($\rho=0.41$, $P=0.07$). There were significant correlations between hip circumference and pregravid BMI, and with biceps, triceps, subscapular, thigh and total sum of skinfold thicknesses ($\rho=0.53$–0.75, all $P<0.01$). Hip circumference also correlated with offspring length (ρ=0.61), weight ($\rho=0.75$) and thoracic perimeter ($\rho=0.60$, all $P<0.05$). Maternal hip circumference was an independent and significant predictor of offspring weight, explaining 14.1% of the observed variance ($P<0.05$).

Conclusion. – In a sample of women with and without GDM, maternal hip circumference was strongly related to other body composition estimates and was also predictive of offspring size measurements at birth.

Keywords: Anthropometry; Gestational diabetes mellitus; Offspring; Birth size; Birth weight; Hip circumference; Predictive value

Résumé

Relations entre adiposité périphérique de femmes avec ou sans diabète gestationnel et taille de l'enfant à la naissance : données préliminaires.

Objectif. – Documenter les relations entre les mesures anthropométriques de la mère et celles de l'enfant.

Méthodes. – Une étude prospective de 48 femmes enceintes avec diabète gestationnel (DG, $n=21$) ou tolérance normale au glucose (TGN, $n=27$) a été réalisée. Le poids maternel, le tour de hanches et l'épaisseur des plis cutanés ont été mesurés à 32 semaines de grossesse, la taille, le poids et les périmètres crânien et thoracique de l'enfant à la naissance.

Résultats. – L'IMC pré-gravidique était en corrélation avec le périmètre thoracique de l'enfant ($\rho=0{,}52$, $P<0{,}05$) avec une tendance non significative pour une corrélation IMC pré-gravidique-poids de naissance ($\rho=0{,}41$, $P=0{,}07$). Des corrélations significatives ont été notées entre tour de hanches et IMC pré-gravidique, plis cutanés du biceps, triceps, du sous-scapulaire, de la cuisse et de la somme des plis (ρ compris entre 0,53 à 0,75, tous $P<0{,}01$). Le tour de hanches était en corrélation avec la taille ($\rho=0{,}61$), le poids ($\rho=0{,}75$) et le périmètre thoracique ($\rho=0{,}60$; tous $P<0{,}05$) de l'enfant. Le tour de hanches était un facteur prédictif indépendant et significatif du poids de l'enfant, expliquant 14,1 % de la variance ($P<0{,}05$).

Conclusions. – Dans un groupe de femmes avec ou sans diabète gestationnel, le tour de hanches de la mère était fortement relié à d'autres mesures de composition corporelle et pourrait avoir une valeur prédictive des mesures de l'enfant à la naissance.

Mots clés : Anthropométrie ; Diabète gestationnel ; Enfant ; Tour de hanches ; Poids de naissance ; Taille de naissance

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1. Introduction

Several studies have reported that maternal body mass index (BMI) and neonate birth weight are positively related [1]. However, to our knowledge, maternal anthropometry measurements and offspring characteristics have rarely been studied in women with either normal glucose tolerance (NGT) or gestational diabetes (GDM). Our objective was to examine the relationship between maternal body composition estimates and offspring anthropometric measurements, and to test the hypothesis that maternal anthropometry has a significant impact on offspring characteristics measured at birth.

2. Materials and methods

This preliminary study included 48 pregnant women recruited from March 2008 to September 2009 at Le Centre Mère-Enfant, Centre Hospitalier Universitaire de Québec (CHUQ; Mother–Child Centre, university hospital of Quebec). Women were screened for GDM with a 75-g oral glucose tolerance test (OGTT) at less than 32 weeks of gestation. The analysis included 21 women diagnosed with GDM, according to Canadian Diabetes Association (CDA) guidelines [2], and a control group of 27 women with NGT. The GDM group was treated with either nutritional therapy alone ($n = 9$) or combined with insulin treatment ($n = 12$) when necessary, according to CDA guidelines. The study was approved by the Laval University Medical Center Ethics Review Board and all subjects provided written informed consent. The data collected from these participants have been used in previous publications [3–5].

Prepregnancy weight was obtained by questionnaire, and prepregnancy BMI was calculated from self-reported prepregnancy weight and measured height at the time of screening. Between weeks 31 and 34, hip circumference was measured at the widest point between the iliac crest and buttock by an investigator who also measured skinfold thickness at six different sites (biceps, triceps, medial calf, subscapular, suprailiac and midaxillary) [6]; the sum of the skinfolds was also calculated. Delivery data (weight, length, cranial and thoracic perimeters) were obtained within 1 h of delivery. Spearman correlation coefficients were computed to test correlations between anthropometric measurements and neonatal outcomes. Stepwise multivariate regression analysis was computed to identify the best predictor of infant birth weight and length in a model that included maternal age, hip circumference, prepregnancy BMI, BMI at 32 weeks of pregnancy and the sum of skinfold thicknesses. All statistical analyses were performed using JMP statistical software 7.0 (SAS Institute, Cary, NC, USA).

3. Results

More than 30% of our study sample reported a pregravid BMI less than 25 kg/m^2 and 19% had a BMI less than 30 kg/m^2, indicating overweight or obesity. In all women, significant correlations were observed between hip circumference and other body composition parameters (Table 1), and between hip

Table 1
Maternal and offspring characteristics, according to maternal glucose tolerance status.

Variables	All ($n = 48$)	NGT ($n = 27$)	GDM ($n = 21$)	P value
Baseline				
Prepregnancy BMI (kg/m^2)	26.3 ± 6.5	24.2 ± 4.3	28.9 ± 7.8	0.01
Maternal age (years)	30.6 ± 4.3	29.4 ± 3.8	32.0 ± 4.6	0.04
Parity	0.9 ± 0.9	0.7 ± 0.7	1.1 ± 1.0	NS
At 32 weeks of gestation				
Weight (kg)	81.1 ± 18.6	77.6 ± 13.9	85.6 ± 22.9	NS
BMI (kg/m^2)	30.4 ± 6.9	28.5 ± 4.4	32.9 ± 8.7	0.03
Hip circumference (cm)	111.5 ± 13.4	108.5 ± 8.7	114.6 ± 16.7	NS
Biceps (mm)	14.0 ± 7.4	12.8 ± 7.6	15.6 ± 6.9	NS
Triceps (mm)	25.9 ± 8.6	25.3 ± 8.5	26.7 ± 8.8	NS
Subscapular (mm)	26.5 ± 9.3	24.8 ± 8.3	28.7 ± 10.4	NS
Midaxillary (mm)	20.9 ± 7.2	19.8 ± 7.0	22.4 ± 7.5	NS
Suprailiac (mm)	30.6 ± 9.2	29.9 ± 8.5	31.4 ± 10.2	NS
Calf (mm)	24.5 ± 8.6	23.4 ± 8.0	26.0 ± 9.4	NS
Sum of skinfolds (mm)	142.4 ± 43.1	135.9 ± 40.9	150.8 ± 45.5	NS
Delivery				
Time (weeks of gestation)	39.2 ± 1.5	39.8 ± 0.9	38.4 ± 1.8	0.0008
Vaginal/C-section (n)	32/16	22/5	10/11	0.01
Offspring				
Male/female (n)	24/24	7/20	17/4	0.0001
Weight (g)[a]	3384 ± 595	3526 ± 516	3202 ± 650	NS
Length (cm)[a]	51.1 ± 2.8	51.7 ± 2.8	50.3 ± 2.7	NS
Abdominal perimeter (cm)[a]	33.4 ± 2.5	34.0 ± 2.0	32.5 ± 2.8	NS
Cranial perimeter (cm)[a]	34.1 ± 1.8	34.4 ± 1.3	33.6 ± 2.2	NS

NGT: normal glucose tolerance; GDM: gestational diabetes mellitus; BMI: body mass index; NS: not significant; C-section: caesarean section.
[a] Adjusted for gestational age.