International Journal of Gynecology and Obstetrics xxx (2009) xxx–xxx

Contents lists available at ScienceDirect

International Journal of Gynecology and Obstetrics

journal homepage: www.elsevier.com/locate/ijgo

BRIEF COMMUNICATION

Maternal mid-pregnancy serum triglyceride levels and neonatal birth weight

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ARTICLE INFO

Article history:
Received 18 January 2009
Received in revised form 1 February 2009
Accepted 3 March 2009

Keywords:
Mid-pregnancy
Neonatal birth weight
Triglycerides

Although disturbances in maternal glucose metabolism and resultant fetal hyperinsulinemia are known to significantly impact fetal overgrowth, it has been suggested that other fuels such as lipids and amino acids may be the determinants of fetal growth in nondiabetics [1]. Maternal serum lipid levels increase in mid to late pregnancy [2]; and in women with gestational diabetes, elevated triglycerides were significantly associated with birth weight corrected for gestational age [3]. Although the role of maternal hyperlipidemia in fetal growth is not known, maternal fasting serum triglyceride levels at 24 to 32 weeks of pregnancy were shown to be significantly and positively associated with neonatal weight at term, independent of maternal prepregnancy obesity, weight gain during pregnancy, or mid-pregnancy plasma glucose levels (either fasting or postprandial) in Japanese [4,5] and white women [6].

The aim of the present study was to determine the relationship between maternal mid-pregnancy serum lipid levels and neonatal birth weight in our region. Fasting levels of serum triglycerides and total cholesterol were evaluated in 108 consenting consecutive women who attended for prenatal care with a singleton pregnancy between 24 to 34 weeks and who had abnormal results on the glucose challenge test (plasma glucose > 140 mg/dL) and normal results from the oral 100 g 3-hour glucose tolerance test. Women with antiphospholipid antibody syndrome, hypertension, or thyroid disorder were excluded.

Considering the smaller build and modest nutritional status of the women in our region, a neonatal birth weight of 3.5 kg calculated as more than one standard deviation of the mean (2.95 ± 0.49 kg) was taken to indicate a heavy baby.

The relationship between mid-pregnancy triglyceride and total cholesterol values and neonatal birth weight was determined according to fasting glucose, body mass index (BMI, calculated as weight in kilograms divided by height in meters squared) and pregnancy weight gain—with 95 mg/dL, 25, and 10 kg as the cut-off values, respectively.

The mean gestational age at the time of recruitment and lipid estimation was 27 weeks. The mean maternal age was 27.6 ± 4.8 years and mean BMI was 23.7 ± 8.7 (for 71 women). There were 45 women who had their prenatal visits from the first trimester and the mean weight gain during pregnancy in these women was 9.9 ± 1.9 kg. The mean values were 216.8 ± 55.1 mg/dL for fasting triglyceride and 223.2 ± 45.9 mg/dL for cholesterol.

The mean neonatal birth weight was 2.9 ± 0.49 kg (range, 1.8–4.4 kg). There was no difference in mean neonatal birth weight between the women with fasting glucose levels less than 95 mg/dL compared with those 95 mg/dL or greater; the same was true for women with cholesterol levels less than 248.5 mg/dL compared with those 248.5 mg/dL or greater. Women with a BMI of 25 or greater, weight gain during pregnancy of over 10 kg, and fasting triglyceride values of 248.5 mg/dL or greater (≥75th percentile of the mean) had neonates weighing significantly greater than their respective

Table 1
Maternal characteristics and neonatal birth weight[a].

Maternal characteristics	No. of women (n = 108)	Neonatal birth weight, kg	*P* value[c]
BMI[b]			
<25	78	2.90 ± 0.43	0.04
≥25	30	3.07 ± 0.55	
Weight gain in pregnancy, kg			
<10	29	2.98 ± 0.54	0.04
≥10	16	3.19 ± 0.58	
Fasting glucose, mg/dL			
<95	70	2.90 ± 0.46	0.233
≥95	38	3.02 ± 0.49	
Fasting cholesterol, mg/dL			
<248.5	79	2.94 ± 0.48	0.89
≥248.5	29	2.93 ± 0.49	
Fasting triglycerides, mg/dL			
<241	81	2.89 ± 0.43	0.04
≥241	27	3.10 ± 0.54	

[a] Values are given as mean ± SD unless otherwise indicated.
[b] BMI, body mass index calculated as weight in kilograms divided by height in meters squared.
[c] Using the t test.

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0020-7292/$ – see front matter
doi:10.1016/j.ijgo.2009.03.004

Table 2
Predictability of heavier neonatal birth weight[a].

Group	Maternal variable	Neonatal birth weight		Relative Risk (95% Confidence Interval)
		<3.5 kg	≥3.5 kg	
All (n = 108)	Fasting triglycerides <241 mg/dL	69	12	2.0 (0.9–4.2)
	Fasting triglycerides ≥241 mg/dL	19	8	
BMI<25, weight gain up to 10 kg, glucose<95 mg/dL (n = 14)	Fasting triglycerides <241 mg/dL	6	2	2.6 (0.78–8.4)
	Fasting triglycerides ≥241 mg/dL	2	4	
	BMI<25	15	3	4.6 (1.7–9.8)
	BMI≥25	2	7	
Fasting triglycerides≥241 mg/dL (n = 85)	Fasting glucose <95 mg/dL	18	2	7.1 (2.0–21.9)
	Fasting glucose ≥95 mg/dL	2	5	
	BMI<25, Fasting glucose<95 mg/dL	21	1	9.7 (1.7–62.6)
	BMI≥25, Fasting glucose≥95 mg/dL	5	4	

Abbreviation: BMI, body mass index calculated as weight in kilograms divided by height in meters squared.
[a] Values are given as number of women unless otherwise indicated.

comparative groups ($P = 0.04$; Table 1). Two neonates weighed more than 4 kg, both born to mothers with mid-pregnancy fasting hypertriglyceridemia ($P = 0.01$). The relative risk of having heavier babies weighing 3.5 kg or greater was 2 (95% CI, 0.9–4.2) for women with hypertriglyceridemia and 2.6 (95% CI, 0.78–8.4) when controlled for fasting glucose, BMI, and pregnancy weight gain. When studied together, the combination of hypertriglyceridemia, fasting hyperglycemia, and higher BMI was a significant predictor of heavier neonates (Table 2).

It is important to note that the higher relative risk for heavier babies in women with hypertriglyceridemia persisted even when the variables such as greater BMI, greater pregnancy weight gain, and hyperglycemia were accounted for. With a combination of greater BMI and fasting hyperglycemia, women with hypertriglyceridemia had a much higher relative risk for heavier babies (RR 9.7; 95% CI, 1.7–62.6).

These observations are in accordance with earlier reports [3–6] and suggest that there is an association between higher mid-pregnancy triglyceride levels and heavier neonates in women in this part of South West India. Maternal mid-pregnancy triglyceride may be considered an independent predictor of neonatal birth weight. Lipid levels throughout pregnancy and their association need to be studied in women of different ethnicities and in different regions.

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Please cite this article as: Kushtagi P, Arvapally S, Maternal mid-pregnancy serum triglyceride levels and neonatal birth weight, Int J Gynecol Obstet (2009), doi:10.1016/j.ijgo.2009.03.004