Cigarette smoking and gestational diabetes mellitus in Hispanic woman

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ABSTRACT

Aims: Hispanic women are at increased risk of gestational diabetes mellitus (GDM) as compared to non-Hispanic white women. While smoking has been associated with increased risk of type 2 diabetes, studies of smoking and GDM are sparse and conflicting. Therefore, we evaluated the relationship between cigarette smoking and GDM in Hispanic women.

Methods: We conducted a pooled analysis of two Hispanic datasets based in Massachusetts: the UMass Medical Health Care dataset and the Proyecto Buena Salud dataset. A total of 3029 Hispanic prenatal care patients with singleton gestations were included. Cigarette smoking prior to and during pregnancy was collected via self-report. Diagnosis of GDM was abstracted from medical records and confirmed by study obstetricians.

Results: One-fifth of participants (20.4%) reported smoking prior to pregnancy, and 11.0% reported smoking in pregnancy. A total of 143 women (4.7%) were diagnosed with GDM. We did not observe an association between pre-pregnancy cigarette smoking and odds of GDM (multivariable OR = 0.77, 95% CI 0.47, 1.25). In contrast, smoking during pregnancy was associated with a 54% reduction in odds of GDM (OR = 0.46, 95% CI 0.22, 0.95). However, this association was no longer statistically significant after adjustment for age, parity, and study site (OR = 0.47, 95% CI 0.23, 1.00).

Conclusions: In this population of Hispanic pregnant women, we did not observe statistically significant associations between pre-pregnancy smoking and odds of GDM. A reduction in odds of GDM among those who smoked during pregnancy was no longer apparent after adjustment for important diabetes risk factors.

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1. Introduction

Gestational diabetes mellitus (GDM) is defined as glucose intolerance with onset or first recognition in pregnancy. GDM is one of the most common complications of pregnancy, affecting 3–5% of pregnancies [1]. GDM has been associated with significant immediate and long-term health risks for both mother and offspring; long-term associations include maternal type 2 diabetes mellitus risk and cardiovascular sequelae, and offspring risk of obesity, metabolic syndrome and diabetes across the life span [2–5]. GDM occurs more frequently in Hispanics as compared to non-Hispanic whites with rates 1.5–2 times higher depending upon the Hispanic subgroup studied [6,7].

With evidence of increasing GDM prevalence in the U.S. [1], efforts are needed to identify modifiable factors that could be targeted for GDM prevention. Cigarette smoking has been associated with an increased risk of type 2 diabetes mellitus [8–10] but studies examining smoking and risk of GDM are relatively sparse, conflicting, face methodologic limitations, and have been conducted predominantly in non-Hispanic white women [11].

As Hispanics are the largest minority group in the U.S., with the highest birth and immigration rates of any minority group [12], the objective of this study was to evaluate the relationship of smoking as a modifiable behavior, with GDM risk, among Hispanic prenatal care patients.

2. Materials and methods

2.1. Study design and population

We conducted a pooled analysis of data from two datasets in Massachusetts: (1) the University of Massachusetts Memorial Health Care (UMMHC) dataset in Central Massachusetts based upon data abstracted from a clinical care database at UMMHC and (2) Proyecto Buena Salud (PBS) a prospective cohort study based at Baystate Medical Center (BMC) in Western Massachusetts. The Institutional Review Boards of the University of Massachusetts Medical School, Baystate Medical Center, and the University of Massachusetts Amherst provided approval for this study.

For the UMMHC dataset, the UMMHC Department of Obstetrics and Gynecology's automated Labor & Delivery electronic medical records export database was used to assemble a study population. This database began collecting detailed information on the timing of cigarette smoking (e.g., pre-pregnancy and pregnancy smoking) in January 2007. Therefore, eligibility was restricted to 2071 Hispanic women delivering singleton gestations from January 1, 2007 to March 31, 2011 without pregestational diabetes mellitus. For the purposes of the current analysis we excluded 227 women missing data on cigarette use both prior to and during pregnancy. For women with more than one pregnancy during this time period, the first pregnancy in the database was selected. This resulted in a final sample size of 1844 women in the UMMHC dataset.

Details of PBS have been previously published [13]. The overall goal of PBS was to investigate the relationships among physical activity, psychosocial stress and risk of GDM in Hispanic women. Eligibility was restricted to women of Puerto Rican and Dominican heritage (Caribbean Islanders) enrolled between January 2006 and 2011. Exclusion criteria included: (1) current medications thought to adversely influence glucose tolerance (e.g., prednisone), (2) multiple gestation, (3) pregestational diabetes, hypertension, heart disease or chronic renal disease, and (4) <16 years and >40 years of age. From this sample of 1300 eligible participants, we exclude 115 women missing data on cigarette use both prior to and during pregnancy resulting in a final sample size of 1185 in the PBS dataset.

2.2. Assessment of cigarette smoking status

Cigarette smoking was the primary exposure of interest in these analyses. UMMHC patients were asked questions regarding cigarette use by the admitting nurse at the time of admission to the labor floor for delivery. Specifically, women were asked the frequency of cigarette use prior to pregnancy as well as during overall pregnancy. Patients answered by providing the number of cigarettes smoked per day.

PBS participants were asked questions regarding cigarette use by interviewers at the time of enrollment (mean 13.0 weeks gestation), in mid pregnancy (19–26 weeks gestation), and in late pregnancy (>26 weeks gestation) using questions designed by the Pregnancy Risk Assessment Monitoring System (PRAMS) [14]. Specifically, women were asked the frequency of cigarette use in the year prior to pregnancy, and the number of cigarettes smoked during the previous month at each pregnancy time period.

To enable pooling the datasets, we created a summary PBS pregnancy smoking variable to make it comparable to the UMMHC pregnancy smoking variable using the following procedure. If participants stated that they currently smoked at any of the 3 pregnancy interviews (early, mid, or late), they were coded as a smoker during pregnancy. Remaining participants that denied smoking at all of the 3 interviews were coded as a non-smoker during pregnancy. Among pregnancy smokers, smoking frequency was averaged across interviews.

In the pooled dataset, the pregnancy smoking variable was defined as: non-smoker (referent category), smoker (1–10, >10 cigarettes/day), former smoker, and missing. Non-smokers were defined as participants who did not smoke prior to and during pregnancy. Former smokers were defined as those who smoked prior to pregnancy but not during pregnancy. Subjects were classified as missing the pregnancy smoking variable if: (1) not a pregnancy smoker and missing data on pre-pregnancy smoking or (2) missing data on pregnancy smoking regardless of available information on pre-pregnancy smoking.

2.3. Assessment of gestational diabetes mellitus

The study sites for both UMMHC and PBS practice universal screening for GDM at 24–28 weeks gestation. The screening test consists of a non-fasting oral glucose challenge test in which venous blood is sampled 1 h after a 50-g oral glucose