Published in final edited form as:

Arch Womens Ment Health. 2014 December ; 17(6): 587–592. doi:10.1007/s00737-014-0460-5.

What do we know about Gestational Diabetes Mellitus and Risk for Postpartum Depression among Ethnically Diverse Low-Income Women in the United States?

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INTRODUCTION

In the United States Gestational diabetes mellitus (GDM) rates are increasing, affecting an estimated 6-7% of pregnancies, with higher rates among Asian (8.14%) and Latina (7.02%) women, and women who are overweight or obese (Bardenheier et al., 2013). Recent GDM women (pGDM) are at increased risk for developing type 2 diabetes mellitus (DMT2) compared to normoglycemic women (Halkoaho et al., 2010a). As ethnic minority pGDM women comprise one of the highest risk groups for DMT2 progression, these groups are increasingly targeted for diabetes prevention interventions, that often require behavioral commitments to exercise, weight loss and healthy eating. For low-income ethnic minority women, particularly non-English speaking women, there may be important psychological and financial stressors that can interfere with adoption of diabetes prevention efforts in the absence of tailored support.

Given the increasing prevalence of GDM and DMT2, many practitioners are screening for diabetes earlier in pregnancy in order to develop effective management plans.¹ Earlier GDM screening raises questions about the impact of GDM, and of a GDM diagnosis, on mental health outcomes, primarily postpartum depression (PPD). About 10-12% of women are affected by

PPD, and while there is evidence of a bidirectional link between diabetes and depression, the link between GDM and the development of PPD is not well understood. Possible mechanisms to support an association include the effects of hyperglycemia and insulin on the thyroid and stress axis, and the psychological burden of managing a chronic disease during and after pregnancy (Kozhimannil, Pereira, & Harlow, 2009a). In light of the increasing rates of GDM among Asians and Latinas, and the uncertainty as to whether GDM places women at increased risk for PPD, we sought to summarize the current US literature on GDM and PPD, with a particular focus on studies with ethnic and minority populations and on demographic factors related to socioeconomic stressors.

METHODS

Search strategies for four databases were conducted in collaboration with a professional librarian (Figure 1). From 302 results there were 60 duplicates and 242 unique articles. Two independent reviewers (SB and MH) evaluated abstracts, excluding: editorials and case reports; studies of non-GDM diabetes and those with no temporality established regarding GDM and mental health symptoms, leaving 30 articles for full text-screening. Eighteen were excluded after full text review, and three additional studies were identified, resulting in 15 articles. Additional quality criteria were then applied for: (1) presence of both GDM and non-GDM groups; (2) at least 50 participants in each group; and (3) description of recruitment strategy/participation rate, resulting in 10 studies (Table 1). The three US studies that include details on ethnic groups are summarized in the Results. Additional non-US studies are included in Table 1, but are not discussed.

RESULTS

Two large population-based studies using administrative data in New Jersey (Kozhimannil, Pereira, & Harlow, 2009b) and data from the Pregnancy Risk Assessment Monitoring System (PRAMS) survey in New York City (Liu & Tronick, 2012) examined the association between GDM and PPD. Both include population-based samples with ethnicity-specific data. Kim et al conducted a prospective assessment of an ethnically diverse sample of women receiving care at a publicly funded hospital in San Francisco (Kim, Brawarsky, Jackson, Fuentes-Afflick, & Haas, 2005a).

Kozhimannil et al conducted a retrospective review of Medicaid administrative data for 11,024 women delivering in New Jersey 2004 -2006. Inclusion required continuous enrollment in the state Medicaid program 6 months prior and 12 months after delivery. Diabetes was defined by an ICD-9 code diagnosis for DMT2 (250) or GDM (6480) or filling a diabetes-related prescription. PPD was defined by an ICD-9 code for depressive, dysthymic, or depressive adjustment disorders, or a documented antidepressant prescription. Overall, 13.7% of pGDM

¹Recently, the American College of Obstetrics and Gynecology (ACOG) and the US Preventive Services Task Force issued statements supporting screening asymptomatic pregnant women at 24 weeks for GDM with a 'B' recommendation, suggesting adequate evidence that benefits associated with earlier screening outweigh potential risks. According to ACOG, early pregnancy screening for undiagnosed DMT2 is also suggested in women with risk factors, including those with a prior history of GDM. If the result of early testing is negative, repeat screening for high-risk women is recommended at 24–28 weeks of gestation. The two- step approach to testing, commonly used in the United States, is based on first screening with the administration of 50 g of an oral glucose solution followed by a 1-hour venous glucose determination. Those individuals meeting or exceeding the screening threshold undergo a 100-g, 3-hour diagnostic oral glucose tolerance test (OGTT).

women had either PPD or depression during pregnancy. After adjusting for age, race, year of delivery, and preterm birth, compared with non-GDM women, GDM women who were taking insulin had nearly double the odds of depression (OR 1.96; 95%CI, 1.27-3.04). Similar odds were reported for GDM women not taking insulin (OR=1.72; 95%CI, 1.11-2.66). Analysis controlling for prenatal depression during pregnancy also showed similar findings for PPD (OR, 1.69; 95% CI, 1.27-2.23). Although this study did not report ethnicity-specific results, participants were primarily non-white, including African American (46%) and “Other” which included Latinas, Asians, and Native Americans (12.4-17.5%). The strict criteria for PPD and GDM diagnosis strengthens the results of this study regarding an increased risk of PPD among ethnically diverse GDM women. Of note, though, is the number of eligible Latinas decreased from 44% to 8% when the criteria for continuous Medicaid eligibility was applied.

Liu & Tronick examined PPD prevalence and risk factors for PPD among 3,372 women following linkage of population-based birth certificate data and PRAMS data for 2004-2007 (Liu & Tronick, 2012). PRAMS surveyed women two to four months after delivery to characterize self-reported GDM and postpartum depression (“yes” to “Since your new baby was born, has a doctor, nurse, or health care worker diagnosed you with depression?”). Results indicate that compared to White women, Asian and Hispanic women had significantly higher rates of PPD. In stratified analysis, sociodemographic and maternal stressors accounted for increased rates in PPD among Blacks and Hispanics compared to Whites, whereas API women were still 3.2 times more likely to report PPD. There was no association, however, between PPD and higher rates of GDM after controlling for sociodemographic variables. As discussed by the authors, one important limitation is that reported differences in PPD rates among ethnic groups may reflect differences in screening, diagnosis, or reporting bias in willingness to self-disclose PPD.

In the Women and Infants Starting Healthy (WISH) study women with GDM and pregnancy-induced hypertension (PIH) were evaluated postpartum (Kim, Brawarsky, Jackson, Fuentes-Afflick, & Haas, 2005b). Study measures included perceived health status changes from pre-pregnancy compared to postpartum measures for women with GDM (n = 64), PIH (n = 148), and those without a prenatal health condition (n = 1233). Health status measures included the Short Form-36 scales for physical function, vitality, and self-rated health and the Center for Epidemiologic Studies-Depression scale. Approximately two-thirds of the study population was non-white, with Latinas, African Americans and Asians comprising the largest groups. Women with GDM and those without a prenatal health condition reported similar rates of postpartum depressive symptoms, which were high overall (14.1%, and 13.5% respectively). A high proportion of GDM women reported having poor health status postpartum (18.7%), which was significantly greater ($p<0.05$) than women without a prenatal health condition (10.0%). This study has a small sample but suggests postpartum depressive symptoms are common in this population.

DISCUSSION

The findings of the Kozhimannil study suggest a strong association between GDM and PPD among ethnically diverse low income women, while the other studies provide support for high rates of PPD among all groups of women included in the studies. Taken together, these findings

suggest potentially greater risks for PPD among low income ethnically diverse women that warrants more careful study. For women with GDM, lifestyle changes and interventions that focus on a healthy diet, weight loss or maintaining a healthy weight, regular physical activity, and breastfeeding – are especially important as they have been shown to prevent or delay the onset of DMT2 (Halkoaho et al., 2010b). However, as suggested by the findings in this review, it is critical to take into account the high prevalence of PPD symptoms in such tailoring, as PPD can not only result in reduced adherence to dietary guidelines and decreased physical activity for the mother, (Vernon, Young-Hyman, & Looney, 2010), they can also can affect a mother's relationship with her newborn, which can lead to long-term sequelae for the child, including impaired cognitive development and poor emotional adjustment (Al-Shahrani, Al-Sunaidi, Al-Amri, Al-Maswary, & Al-Gelban, 2011a). Because the perinatal period has been identified as a “window of opportunity” for initiating lifestyle changes, integration of PPD screening and counseling for GDM women should be supported, as should tailoring supportive services to diverse populations. Such efforts can both reduce the burden of PPD and enable women to become active in prevention efforts to reduce the incidence of T2DM.

Acknowledgments

This project was supported by National Institute On Minority Health And Health Disparities (NIMHD) of the National Institutes of Health under Award Number P60MD006902

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Figure 1. Summary of Search Strategy and Article Selection Methods

* The search and literature review was conducted between December 2012 and March 2013.

Table 1

Study Country Year	Study Design	Sample Size	Criteria for GDM Diagnosis	Mental Health Assessment	Results
<i>STUDIES FROM THE UNITED STATES</i>					
Kim United States 2005	Cohort study of women with GDM and Pregnancy-induced Hypertension (PIH), San Francisco Bay Area	N=1,445 (GDM, n=64; PIH, n=148; neither condition, n=1,233)	Glucose intolerance first recognized in pregnancy, excluding DM1 and DM2.	SF-36 CES-D > 10 First assessment at 12-20 weeks gestational age (asked about health status during month prior to conception). Last assessment at 8-12 weeks Post-partum.	Women with GDM reported similar rates of postpartum depressive symptoms when compared to women with pregnancies unaffected by GDM (14.1% and 13.5% respectively).
Kozhimannil United States 2009	Retrospective study using Medicaid administrative data, New Jersey	N=11,024 (with diabetes, n=657; GDM, n=346; pre-pregnancy DM, n=311; non-GDM, n=10,367)	Claims data with ICD-9 diagnostic code (DM=250 or GDM=6480) or prescription filled for diabetes medication 6 months prior to or 1 year following delivery.	Claims data with ICD-9 diagnostic code for depression or a prescription filled for antidepressant medication 6 months prior to or 1 year following delivery.	Adjusted OR indicated that women with GDM had greater odds of depression compared to those without GDM: • GDM with insulin: (OR 1.96, 95% CI 1.27-3.04) • GDM women not taking insulin: (OR 1.72, 95% CI 1.11-2.66)
Liu United States 2012	PRAMS cohort study examining disparities in diagnosis of PPD, New York city	N=3732	Self-reported "yes" to "high blood sugar (diabetes) that started during this pregnancy"	Self-reported "yes" to "Since your new baby was born, has a doctor, nurse, or health care worker diagnosed you with depression?" Participants contacted between 2 and 4 months postpartum by mail or by phone.	In stratified analysis, socio-demographic and maternal stressors accounted for increased rates in PPD among Blacks and Hispanics compared to Whites, whereas Asian/Pacific Islander women were still 3.2 times more likely to report PPD. There was no association, however, between PPD and higher rates of GDM after controlling for socio-demographic variables.
<i>STUDIES FROM OUTSIDE THE UNITED STATES</i>					
Al-Shahrani Saudi Arabia 2011	Prospective study of postpartum women with and without GDM, Saudi Arabia	N=113 (GDM, n=56; non-GDM, n=57)	Positive 50-g OGTT followed by 75-g OGTT	EPDS > 12 Assessed during first week postpartum	Prevalence of PPD was 41% among GDM women and 37% among non-GDM women (not a statistically significant difference).
Besser Israel 2007	Prospective cohort of women evaluated in third trimester of pregnancy and postpartum, Israel	N=209 (GDM, n=100; non-GDM, n=109)	Normal fasting values and two abnormal GTT (50-g oral glucose load) (at 1 and 3 hours).	CES-D >16 DEQ, a 66-item scale that reports levels of DEQ factors (Self-Criticism and Dependency), evaluating patterns	Prevalence of PPD was 47% among high-risk pregnancies, and 40% among low-risk pregnancies (not a statistically significant difference).

Study Country Year	Study Design	Sample Size	Criteria for GDM Diagnosis	Mental Health Assessment	Results
Crowther Australia 2005	RCT of GDM treatment with nested assessment of maternal depression and anxiety outcomes, Australia	N=573 (intervention =278; control= 295)	Administered at 24-28 weeks of gestation	of experiences that constitute a predisposition to depressive symptoms. Participants completed CES-D and DEQ during third trimester and CES-D again at 8 weeks postpartum	Treatment of GDM improved health related QOL, including a decreased incidence of PPD.
Dalfr Italy 2011	Cohort of pregnant and postpartum women attending diabetes clinic assessed for quality of life measure, Italy	N=245 (T1DM, n=30; GDM, n=176; controls, n=39)	One or more risk factors for GDM on selective screening or a positive 50-g OGTT and a 75-g OGTT. Screenings were done between 24-34 weeks.	SF-36 SSTI >15 EPDS>12: Assessed 6 weeks after study entry and 3 months post-partum.	T1DM and GDM women had significantly higher levels of depressive symptoms compared to controls. GDM women had mean difference of 5.7 higher in CES-D than controls (-2.7, p,0.0001).
Daniells Australia 2003	Prospective longitudinal cohort of postpartum women with and without GDM, in Australia, between 2000 - 2001	N=100(GDM, n=50; nonGDM, n=50)	Fasting 75 g OGTT >=5.5 mmol/l and/or 2-hr OGTT >=8.0 mmol/l Women were diagnosed at the beginning of the third trimester.	MHI-5 >16 SSTI Likert Scale/~30wksGA, ~36wksGA, and 6wksPP	No difference was found in scores for anxiety between the two groups, but more GDM women had MHI-5 scores > 16 than nonGDM women (30% vs 12%, p=0.03) during pregnancy, but not postpartum.
Halkoaho Finland 2010	Retrospective cohort of GDM women and control group interviewed post-partum re HRQL, Finland	N=131 GDM, n=77; Control, n=54.	1 or 2 abnormal values on glucose tolerance tests. No mention at what age of pregnancy participants were diagnosed.	HRQL was measured by the 15D questionnaire elimination, usual activities, mental function, discomfort and symptoms, depression, distress, vitality and sexual activity. The mean time between delivery and inclusion was 66 months in the GDM group and 64 months in the controls.	No difference between groups even with modeling for risk factors.
Sjogren Sweden 1994	Retrospective case control study in Sweden of women with prior GDM and controls, Sweden	N=113 women with previous first time GDM and 226 matched controls.	Questionnaires mailed to women. GDM women were asked about reactions to the diagnosis and treatment of the diabetes.	Psychosocial conditions at time of pregnancy confirmation, health before and during the pregnancy, emotional experience of the pregnancy and childbirth and health of the mother and child. Some qs focused on specific	Women with GDM reported significantly lower scores than controls for wellbeing (p,0.05), psychic health (p,0.001), more worry (p,0.001) and less energy (p,0.001).

Study Country Year	Study Design	Sample Size	Criteria for GDM Diagnosis	Mental Health Assessment	Results
			No description of when women were diagnosed.	aspects such as depression. They were asked about reactions to the GDM dx and tx of the diabetes, "psychic health problems after delivery." The interval from delivery to the distribution of the questionnaire ranged between 0.8-3.2 years with a mean 1.8 years.	