HHS Public Access

Author manuscript

AJOG Glob Rep. Author manuscript; available in PMC 2022 September 02.

Published in final edited form as:

AJOG Glob Rep. 2022 August ; 2(3): . doi:10.1016/j.xagr.2022.100070.

Polycystic ovary syndrome and postpartum depression among Hispanics and non-Hispanics: a population-based study

Adriele D. Fugal, MSPH,

Joseph B. Stanford, MD, MSPH,

Erica B. Johnstone, MD, MHS,

Kebba Kah, MPH,

Karen C. Schliep, PhD, MSPH

Department of Family and Preventive Medicine, The University of Utah, Salt Lake City, UT (Fugal, Stanford, Kah, Schliep); Division of Reproductive Endocrinology and Infertility, Department of Obstetrics and Gynecology, The University of Utah, Salt Lake City, UT (Johnstone)

Abstract

BACKGROUND: Women with polycystic ovary syndrome experience increased health complications during and after pregnancy, including a higher prevalence of postpartum depression. Although previous research has found that Hispanic women with polycystic ovary syndrome experience heightened hyperandrogenism and metabolic effects compared with non-Hispanic women, it is unknown whether they experience other polycystic ovary syndrome–related comorbidities, such as postpartum depression, to a greater degree than their non-Hispanic counterparts.

OBJECTIVE: This study aimed to determine the associations among a self-reported prepregnancy diagnosis of polycystic ovary syndrome, polycystic ovary syndrome symptoms (irregular menstruation, hirsutism, and acne), and postpartum depression among a national sample of at-risk women and evaluated the potential effect modification by Hispanic ethnicity.

STUDY DESIGN: The study population included 52,267 postpartum (2–6 months) women who completed the US Pregnancy Risk Assessment Monitoring System Phase 8 questionnaire (2016–2018). Data from US states that captured self-reported polycystic ovary syndrome symptoms in the 3 months before pregnancy (n=17 states) were used. Moreover, we performed a subanalysis restricted to data from the Utah Pregnancy Risk Assessment Monitoring System Phase 8 questionnaire (2016–2019; n=5814), as it was the only state that considered self-reported polycystic ovary syndrome symptoms during this period. Postpartum depressed mood and

Corresponding author. karen.schliep@gmail.com.

The authors report no conflict of interest.

A summary of the findings was presented as a poster presentation at The University of Utah Health's "Abortion to Gen Z: Equity and Inclusion in Sex, Gender, and Women's Health Symposium" virtual conference, Salt Lake City, UT, May 12, 2022.

This report does not represent the official views of the Utah Department of Health (UDOH), Centers for Disease Control and Prevention (CDC), or NIH. Data were provided by the Utah Pregnancy Risk Assessment Monitoring System, a project of the UDOH, the Office of Vital Records and Health Statistics of the UDOH, and the CDC of the US Department of Health and Human Services.

anhedonia, the postpartum depression outcome measurements, were assessed via the following questions, respectively: (1) “Since your new baby was born, how often have you felt down, depressed, or hopeless?” and (2) “Since your new baby was born, how often have you had little interest or little pleasure in doing things you usually enjoyed?” In addition, postpartum depressed mood and anhedonia were assessed separately and as a combined variable. Here, weighted adjusted prevalence ratios and 95% confidence intervals were used to assess the association between polycystic ovary syndrome and postpartum depressed mood and anhedonia among Hispanic women and non-Hispanic women while taking into account preconception sociodemographics, lifestyle, and health history confounding factors.

RESULTS: The national study population was composed of 16.8% of Hispanic ethnicity, with 11.4% Hispanic women and 17.1% non-Hispanic women reporting prepregnancy polycystic ovary syndrome symptoms. The study found no association between women reporting prepregnancy polycystic ovary syndrome vs women without polycystic ovary syndrome and the prevalence of postpartum depressed mood and/or anhedonia. Moreover, the results were null when we stratified by Hispanic ethnicity. The Utah study population was composed of 15.5% of women of Hispanic ethnicity, with 5.8% of Hispanic women and 7.4% of non-Hispanic women reporting prepregnancy polycystic ovary syndrome. Symptom-based polycystic ovary syndrome (having irregular menstruation with hirsutism or irregular menstruation with acne), compared with having regular menstruation in the Utah sample, was associated with a 1.54 higher adjusted prevalence ratio (95% confidence interval, 1.14–2.09) for postpartum depressed mood and anhedonia. Stratified analyses by ethnicity indicated a 2- to 5-fold higher prevalence of postpartum depression with symptom-based polycystic ovary syndrome for Hispanic women and a 1.5-fold higher prevalence for non-Hispanic women.

CONCLUSION: In this US population-based study, a self-reported prepregnancy diagnosis of polycystic ovary syndrome was not associated with postpartum depression. However, self-reported polycystic ovary syndrome symptoms, including irregular menstruation and acne and/or hirsutism, were associated with a higher probability of postpartum depression, most prominently for Hispanic women. Our findings suggested that capturing polycystic ovary syndrome symptoms among at-risk women may be important for identifying associations with postpartum depression and potentially other comorbidities.

Keywords

depression; Hispanic women; polycystic ovary syndrome; postpartum depression; pregnancy; Pregnancy Risk Assessment Monitoring System

Introduction

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder among women of reproductive age, affecting 8% to 13% of all women worldwide and 15% to 20% of women seeking pregnancy.[1–4] In the United States alone, it is estimated that PCOS affects approximately 5 million women of reproductive age, resulting in almost $4 billion yearly in direct medical costs.[5]

Much of the existing literature on PCOS has focused primarily on reproductive effects. An estimated 70% to 80% of women with PCOS have treatable infertility.[6] Even after successful conception, women with PCOS experience higher pregnancy complications, including miscarriage, preterm birth, gestational diabetes mellitus, preeclampsia, and other hypertensive disorders than the general population.[7] Outside of pregnancy, women with PCOS vs women without PCOS are known to be more likely to suffer from depression (27.3% vs 18.8%) and anxiety (50% vs 39.2%)[8]; and a history of depression is one of the most substantial risk factors for postpartum depression (PPD) in various international communities.[9–11]

Although prepregnancy depression predicting PPD is well established, limited research has assessed the relationship between PCOS and PPD among certain demographic groups known to experience greater severity of PCOS symptoms.[12] Hispanic women, in particular, are a population in need of further investigation, as previous research has found that Hispanic women with PCOS have the most severe phenotype for both hyperandrogenism and metabolic effects.[12,13] This results in Hispanic women not only experiencing a higher prevalence of hirsutism and acne but also having a higher tendency to be more insulin resistant,[12–14] a higher proportion of abnormal fasting insulin and glucose levels, and a higher prevalence of metabolic syndrome than non-Hispanic Whites and non-Hispanic Blacks with PCOS.[12,13]

We sought to address the current research gap by (1) evaluating the associations among a self-reported prepregnancy diagnosis of PCOS, PCOS symptoms (irregular menstruation, hirsutism, and acne), and PPD among a national sample of at-risk women and (2) evaluating potential effect modification by Hispanic ethnicity.

Materials and Methods

Study participants and questionnaire

National Pregnancy Risk Assessment Monitoring System.—We used data from the US national Pregnancy Risk Assessment Monitoring System (PRAMS) Phase 8 questionnaire (2016–2018). PRAMS is conducted by the Center for Disease Control and Prevention in conjunction with state health departments. A detailed description of the PRAMS surveillance system methodology and protocols can be found elsewhere.[15,16] In brief, the PRAMS sample is stratified so that subpopulations of particular public health interests can be oversampled.[15,16] Stratification variables vary by state and may include Medicaid status, birthweight, maternal race and ethnicity, geographic area, and smoking status. Each participating site draws a stratified random sample of 100 to 250 new mothers (2–6 months after delivery) every month from a frame of eligible birth certificates. New mothers are contacted via mailed questionnaire (available in English and Spanish) multiple times and telephone follow-up. An informed consent document is included within each survey packet. Consent is implied if the survey is completed.[15,16] Of note, 17 participating states (AK, CT, DE, HI, MD, ME, MI, MO, NJ, NY, OK, PA, UT, WI, WV, and Puerto Rico) included questions on the prepregnancy diagnosis of PCOS and postpartum depressive mood and anhedonia. A total of 52,267 women, reflecting an estimated population of 2,586,406

women, completed the PRAMS questionnaires 2016–2018 and were included in the current study.

Utah Pregnancy Risk Assessment Monitoring System.—We performed a subanalysis on the Utah PRAMS data as Utah is the only PRAMS-participating state in 2016–2019, among those noted that also included self-reported PCOS symptoms. A total of 5814 women, reflecting an estimated population of 188,770 women, completed the Utah PRAMS Phase 8 from 2016 to 2019 and were included in the current study.

Exposure: polycystic ovary syndrome

National Pregnancy Risk Assessment Monitoring System.—For the national survey, the assessment of self-reported prepregnancy PCOS was based on responses to the following question: “During the 3 months before you got pregnant with your new baby, did you have any of the following health conditions?,” including “PCOS” with “yes” or “no” response options.

Utah Pregnancy Risk Assessment Monitoring System.—In addition to the same PCOS question asked in all states, the Utah survey included the following questions: (1) “Have you ever been told that you have polycystic ovarian syndrome or PCOS by a doctor, nurse, or other healthcare workers?” with “yes,” “no,” or “I do not know” response options (clinically diagnosed PCOS), (2) “Have you ever experienced any of the following health problems?”—with the following choices—“irregular periods (menstruation)”; “skin condition that causes pimples (acne)”; “increased hair growth on the face, chest, or other parts of the body (hirsutism)”; and “being overweight or obese” with “yes” or “no” response options (symptom-based PCOS). In our analysis, PCOS symptomology was primarily defined as having at least 2 symptoms: irregular periods and hirsutism or irregular periods and acne. A secondary analysis defined PCOS symptomology as having all 3 symptoms: irregular periods, acne, and hirsutism.[17,18] The reference group was women with regular menstruation.

Outcomes: postpartum depressed mood and anhedonia

PPD was defined as having answered “always” or “often” to either of the following 2 questions that captured PPD or a postpartum depressed mood and anhedonia: (1) “Since your new baby was born, how often have you felt down, depressed, or hopeless?” and (2) “Since your new baby was born, how often have you had little interest or little pleasure in doing things you usually enjoyed?” PPD variables were created for those who had both postpartum depressed mood and anhedonia and either postpartum depressed mood or anhedonia.

Covariates

Variables obtained from the linked birth certificates included maternal age, race and ethnicity, education, and marital status. Maternal age included 7 categories (≤17, 18–19, 20–24, 25–29, 30–34, 35–39, and ≥40 years). Maternal education included 5 categories (0–8, 9–11, 12, 13–15, and ≥16 years). Race was dichotomized to White or non-White, ethnicity to Hispanic or non-Hispanic, and marital status to ever married (yes or no).

Variables obtained from the PRAMS questionnaire included prepregnancy body mass index (BMI), depression, high blood pressure, type 1 or 2 diabetes mellitus, and smoking or drinking alcohol. Women were asked their current height and weight right before pregnancy, which was converted to BMI (kg/m^2) and assessed continuously and categorically (underweight, <18.5; normal, 18.5–24.9; overweight, 25.0–29.9; obese, ≥30.0). In addition, women were asked in the 3 months before getting pregnant whether they had any of the following health conditions (yes or no): depression, high blood pressure, or type 1 or 2 diabetes mellitus. Moreover, women were asked whether they had smoked or drank alcohol in the past 2 years (yes or no).

Statistical analysis

Descriptive analyses were used to explore the characteristics of the study population by prepregnancy PCOS status. Moreover, we also compared prepregnancy PCOS vs clinically diagnosed PCOS vs symptom-based PCOS reporting via percent agreement and kappa statistics for the Utah sample. Relationships among PCOS, postpartum depressed mood, and anhedonia were assessed using robust Poisson distribution models to generate prevalence ratios (PRs) and 95% confidence intervals (CIs).

We reported unadjusted and adjusted models. Key confounders were selected on the basis of previous knowledge as documented in the literature.[9,19,20] They included age, race, Hispanic ethnicity, maternal education, prepregnancy BMI, depression before pregnancy, high blood pressure, drinking and smoking status in the last 2 years, and type 1 or 2 diabetes mellitus. The effect modification by Hispanic ethnicity was tested using interaction terms within Poisson models (with Wald chi-square test for significance), with stratified results presented. SAS software (version 9.4; SAS Institute, Cary, NC) and Stata (StataCorp, College Station, TX) were used for the analyses.

Ethics approval

The University of Utah Institutional Review Board classified this research as nonhuman subject research.

Results

Descriptive characteristics

National Pregnancy Risk Assessment Monitoring System.—After removing 639 women (1.2%) who did not answer the question on prepregnancy PCOS, there were 51,628 women in our primary analyses representing an estimated population size of 2,553,730 women. Missing data for sociodemographic, health history, and lifestyle potential confounding factors were low (Table 1).

In the final weighted sample, 16.8% of women reported prepregnancy PCOS (11.4% for Hispanic women vs 17.1% non-Hispanic women). Women with prepregnancy PCOS vs women without prepregnancy PCOS were more likely to be older, have higher BMI, be White and non-Hispanic, obtain higher education, and be married (Table 1). Moreover,

women with PCOS had a higher prevalence of prepregnancy depression, high blood pressure, and type 1 or 2 diabetes mellitus than women without PCOS.

Regarding PPD in the national sample, 6.3% of women reported postpartum depressed mood, 10.0% of women reported anhedonia, 3.3% of women report postpartum depressed mood and anhedonia, and 13.0% of women reported postpartum depressed mood or anhedonia.

Utah Pregnancy Risk Assessment Monitoring System.—After the removal of 94 women who did not answer the question on prepregnancy PCOS, there were 5720 women included in the analysis representing 185,925 women. The prevalence of prepregnancy PCOS was 7.1% overall (6.7% for Hispanic women vs 8.2% for non-Hispanic women). When considering symptom-based PCOS, 24.4% of women had 2 symptoms (irregular periods and hirsutism or irregular periods and acne), and 6.7% of women had all 3 symptoms (irregular period, hirsutism, and acne). Hispanic women had a slightly higher prevalence of irregular menstruation and a lower prevalence of acne and hirsutism (Figure 1) than non-Hispanic women. PCOS symptomology between Hispanic women and non-Hispanic women for 2 (25.0% vs 22.6%) and 3 (7.0% vs 4.9%) symptoms were similar (Figure 2).

Regarding PPD in the Utah sample, 9.6% of women reported postpartum depressed mood, 10.4% of women reported anhedonia, 5.1% of women reported postpartum depressed mood and anhedonia, and 15.0% of women reported postpartum depressed mood or anhedonia.

Utah Pregnancy Risk Assessment Monitoring System: agreement between prepregnancy polycystic ovary syndrome, clinically diagnosed polycystic ovary syndrome, symptom-based polycystic ovary syndrome

Within the Utah sample, 60.6% and 27.6% of women with prepregnancy PCOS reported 2 or all 3 symptoms, respectively, compared with 4.6% and 2.1% of women without prepregnancy PCOS (Figure 3). The agreement was fair with κ=0.20 (95% CI, 0.17–0.22) for 2 symptoms and κ=0.24 (95% CI, 0.20–0.29) for all 3 symptoms. Within the Utah sample, 60.9% and 27.3% of women with clinically diagnosed PCOS reported 2 or all 3 symptoms, respectively, compared with 4.6% and 2.1% of women without clinically diagnosed PCOS (Figure 4). The agreement was fair with κ=0.22 (95% CI, 0.19–0.25) for 2 symptoms and κ=0.25 (95% CI, 0.21–0.30) for all 3 symptoms. The agreement between women reporting prepregnancy PCOS and clinically diagnosed PCOS was high, with 96% agreement (κ=0.73; 95% CI, 0.70–0.77).

National Pregnancy Risk Assessment Monitoring System: clinically diagnosed polycystic ovary syndrome and postpartum depression

In the unadjusted and adjusted models, we found no relationship between prepregnancy PCOS and postpartum depressed mood (adjusted PR [aPR], 0.84; 95% CI, 0.68–1.05), anhedonia (aPR, 0.91; 95% CI, 0.76–1.09), depressed mood and anhedonia (aPR, 0.82; 95% CI, 0.60–1.13) or depressed mood or anhedonia (aPR, 0.90; 95% CI, 0.77–1.05) (Table

2). We found no indication for effect modification by Hispanic ethnicity and prepregnancy PCOS for any PPD outcomes (all $P>.49$).

Utah Pregnancy Risk Assessment Monitoring System: clinically diagnosed polycystic ovary syndrome, symptoms of polycystic ovary syndrome, and postpartum depression

Unadjusted PRs and aPRs for prepregnancy PCOS were similarly null in the Utah PRAMS cohort compared with the national PRAMS cohort (Table 3). However, reporting having ever been told by a doctor, nurse, or healthcare worker of having PCOS was significantly associated with a higher adjusted prevalence for postpartum depressed mood (aPR, 2.06; 95% CI, 1.35–3.15), anhedonia (aPR, 1.40; 95% CI, 1.07–1.83), depressed mood and anhedonia (aPR, 1.54; 95% CI, 1.12–2.12), or depressed mood or anhedonia (aPR, 1.60; 95% CI, 1.16–2.22) (Table 3). Utah women reporting symptom-based PCOS (having irregular menstruation with hirsutism or irregular menstruation with acne), compared with those having regular menstruation, also had a higher prevalence of postpartum depressed mood (aPR, 1.27; 95% CI, 1.03–1.58) and depressed mood and anhedonia (aPR, 1.54; 95% CI, 1.14–2.09) (Table 4). The results were similar, but with wider CIs, for symptom-based PCOS defined as having all 3 symptoms (irregular menstruation, hirsutism, and acne) (Table 5). The effect modification by Hispanic ethnicity for the relationship between symptom-based PCOS and PPD was suggestive for all outcomes (all $P<.20$). We observed the most substantial effect modification for symptom-based PCOS, defined as having all 3 symptoms (Table 5), with Hispanic women having a 5-fold (95% CI, 1.41–17.42) higher adjusted prevalence of depressed mood and anhedonia compared with non-Hispanic women having a 1.4-fold (95% CI, 0.82–2.49) higher adjusted prevalence.

Comment

Principal findings

In this large US national sample, we found no relationship between self-reported prepregnancy PCOS and postpartum depressed mood and/or anhedonia when comparing Hispanic women with non-Hispanic women. In contrast, in a subanalysis within 1 state that asked additional questions on PCOS symptoms and ever being told of having PCOS by a healthcare worker, we found both to be associated with a 1.5- to 2-fold higher prevalence of PPD. Moreover, we observed that Hispanic women with PCOS symptoms are at higher risk of PPD than non-Hispanic women with PCOS symptoms. Finally, we found relatively poor agreement between women reporting a diagnosis of PCOS and women reporting PCOS symptoms.

Our findings suggested that women at higher risk of health problems, as per the PRAMS targeted sampling scheme, may experience consensus-based[15] symptoms for PCOS, including menstrual irregularity and hyperandrogenism, but never receive a formal diagnosis of PCOS. In addition, women with PCOS symptoms, notably Hispanic women with PCOS symptoms, may be at increased risk of PPD even after accounting for several prepregnancy sociodemographic, lifestyle, and health history factors. Future population-based research wishing to assess comorbidities associated with PCOS should consider expanding PCOS classification beyond a clinical diagnosis to include symptom reporting by participants.[20]

Clinical implications

Previous systematic reviews and meta-analyses have well documented that women with PCOS are 3 times more likely to experience depression and anxiety than women without PCOS.[21,22] Hypothesized explanations for the increased depression risk among women with PCOS are multifactorial. They include hormonal (eg, increased circulating testosterone),[23] chemical (eg, lowered serotonin),[24] and metabolic (eg, insulin resistance)[25] imbalances in addition to clinical manifestations of the disease (eg, infertility, obesity, hirsutism, or acne).[26–29]

Although Hispanic women with PCOS are genetically more predisposed to develop insulin resistance than non-Hispanic Whites with PCOS,[14,30] social determinants of health that lead to health disparities in access to care may also contribute to the disparity. Recent data showed that 19% of Hispanic women do not have health insurance, compared with 8% of non-Hispanic Whites.[31] Moreover, Hispanic women face barriers to primary care access,[14] including language barriers, immigration status,[32] and transportation barriers to healthcare.[33] Medical systems should be aware of the implications of diagnosing and treating individuals from different races and ethnicities, as diseases manifest in different populations in different ways and severity because of genetic makeup and social, environmental, and economic factors.[34]

As there is no single biomarker for PCOS and no test to definitively diagnose PCOS, underdiagnosed PCOS among women with limited access to care, as our study suggests, is problematic as it impacts appropriate and timely interventions that can mitigate associated metabolic and cardiovascular disease risks.[17] Previous research has reported that among a large international sample, it takes an average of 2 years and 3 different healthcare professionals before making a correct diagnosis of PCOS.[35] Underrepresented minorities, especially in countries that lack universal healthcare, are likely to experience even longer delays in diagnosis and appropriate treatment. Additional research on diagnosis delay among underrepresented minorities and how capturing menstrual cycle information and PCOS symptoms by health workers can shorten the delay and lead to improved health outcomes is needed before targeted interventions are implemented.[36]

Research implications

Although this study was conducted using US data, the results were still relevant to women outside the United States, as they may serve to increase discussions between women and their healthcare providers about the importance of menstrual health concerning overall health.[37]

Results from this study may also help researchers in other countries investigate risk differences in the relationship between PCOS and PPD among specific populations. For example, in a recent study, White women with PCOS had higher anxiety odds than Black women with PCOS but no difference in adjusted odds of depression.[38] Similar research evaluating differences by Hispanic ethnicity and other race and ethnicity groups is warranted for tailored surveillance, screening, and treatments.

Strengths and limitations

The strengths of our study included the assessment of the relationship between clinical and symptom-based PCOS and PPD among Hispanic and non-Hispanic women. Another strength included the large representative sample of women from across the United States, purposively sampled to include women at greatest risk of pregnancy-related health problems,[15,16] increasing generalizability.

Our study has important limitations in the context of its strengths. Because of being a cross-sectional study, the data were vulnerable to recall bias. Compared with women without PPD, women with PPD may systematically differ in how they remember events or omit details in their answers. Another major limitation was that we could not infer causality between PPD and PCOS because of the cross-sectional nature of the data. Lastly, this study was limited in self-reporting data for PCOS symptoms (irregular menstruation, hirsutism, and inflammatory acne). Therefore, we created our indications for PCOS that should be validated against gold standard diagnoses. A clinical diagnosis of PCOS poses its limitation because of the lack of a biomarker and evolving diagnostic criteria.[17] To diagnose women with PCOS, clinicians rely on 3 criteria, including the National Institutes of Health (NIH), Rotterdam 2003, and Androgen Excess-PCOS Society. The lack of a gold standard for the diagnosis of PCOS is problematic. Different criteria can lead to different disease prevalence, such as 9% for the NIH criteria and 18% for the Rotterdam consensus.[39] Finally, we only looked at PCOS symptoms for 1 US state. Our results showed fewer PCOS symptoms for Hispanic women than non-Hispanic women, which contradicts the findings of a previous study.[12] Whether this contradiction is owing to Hispanic women in Utah being nongeneralizable to Hispanic women in other states or simply owing to different assessment manners between studies is unclear and warrants further research.

Conclusion

In this US population-based study, a self-reported prepregnancy diagnosis of PCOS was not associated with PPD. However, self-reported PCOS symptoms, including irregular menstruation and acne and/or hirsutism, were associated with a higher probability of PPD, especially among Hispanic women. Our findings suggested that determining PCOS symptoms among at-risk women may be important for identifying associations with PPD and potentially other comorbidities.

ACKNOWLEDGMENTS

We thank the Centers for Disease Control and Prevention Pregnancy Risk Assessment Monitoring System Working Group for their assistance and support of our project.

K.C.S. was, in part, supported by the National Institutes of Health (NIH) National Institute on Aging (grant number K01AGA58781).

REFERENCES

1. Witchel SF, Teede HJ, Peña AS, Curtailing PCOS. Pediatr Res 2020;87:353–61. [PubMed: 31627209]
2. Sadeeqa S, Mustafa T, Latif S. Polycystic ovarian syndrome-related depression in adolescent girls: a review. J Pharm Bioallied Sci 2018;10:55–9. [PubMed: 29962792]

3. March WA, Moore VM, Willson KJ, Phillips DI, Norman RJ, Davies MJ. The prevalence of polycystic ovary syndrome in a community sample assessed under contrasting diagnostic criteria. Hum Reprod 2010;25:544–51. [PubMed: 19910321]
4. Bozdag G, Mumusoglu S, Zengin D, Karabulut E, Yildiz BO. The prevalence and phenotypic features of polycystic ovary syndrome: a systematic review and meta-analysis. Hum Reprod 2016;31:2841–55. [PubMed: 27664216]
5. Ndefo UA, Eaton A, Green MR. Polycystic ovary syndrome: a review of treatment options with a focus on pharmacological approaches. P T 2013;38:336–55. [PubMed: 23946629]
6. Melo AS, Ferriani RA, Navarro PA. Treatment of infertility in women with polycystic ovary syndrome: approach to clinical practice. Clinics (Sao Paulo) 2015;70:765–9. [PubMed: 26602525]
7. Martini AE, Healy MW. Polycystic ovarian syndrome: impact on adult and fetal health. Clin Obstet Gynecol 2021;64:26–32. [PubMed: 33337742]
8. Damone AL, Joham AE, Loxton D, Earnest A, Teede HJ, Moran LJ. Depression, anxiety and perceived stress in women with and without PCOS: a community-based study. Psychol Med 2019;49:1510–20. [PubMed: 30131078]
9. Muchanga SMJ, Yasumitsu-Lovell K, Eitoku M, et al. Preconception gynecological risk factors of postpartum depression among Japanese women: the Japan Environment and Children's Study (JECS). J Affect Disord 2017;217:34–41. [PubMed: 28365479]
10. Davey HL, Tough SC, Adair CE, Benzies KM. Risk factors for sub-clinical and major postpartum depression among a community cohort of Canadian women. Matern Child Health J 2011;15:866–75. [PubMed: 18256913]
11. Johnstone SJ, Boyce PM, Hickey AR, Morris-Yatees AD, Harris MG. Obstetric risk factors for postnatal depression in urban and rural community samples. Aust N Z J Psychiatry 2001;35:69–74. [PubMed: 11270460]
12. Engmann L, Jin S, Sun F, et al. Racial and ethnic differences in the polycystic ovary syndrome metabolic phenotype. Am J Obstet Gynecol 2017;216:493. e1–13. [PubMed: 28104402]
13. Zhao Y, Qiao J. Ethnic differences in the phenotypic expression of polycystic ovary syndrome. Steroids 2013;78:755–60. [PubMed: 23624030]
14. Kazemi M, Kim JY, Wan C, et al. Comprehensive evaluation of disparities in cardiometabolic and reproductive risk between Hispanic and White women with polycystic ovary syndrome in the United States: a systematic review and meta-analysis. Am J Obstet Gynecol 2022;226:187–204. e15. [PubMed: 34384776]
15. Shulman HB, D'Angelo DV, Harrison L, Smith RA, Warner L. The Pregnancy Risk Assessment Monitoring System (PRAMS): overview of design and methodology. Am J Public Health 2018;108:1305–13. [PubMed: 30138070]
16. Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion. Pregnancy Risk Assessment Monitoring System (PRAMS) Methodology. Available at: https://www.cdc.gov/prams/methodology.htm. Accessed July 20, 2022.
17. Goodman NF, Cobin RH, Futterweit W, et al. American Association of clinical endocrinologists, American college of endocrinology, and androgen excess and PCOS society disease state clinical review: guide to the best practices in the evaluation and treatment of polycystic ovary syndrome–PART 1. Endocr Pract 2015;21:1291–300. [PubMed: 26509855]
18. Koric A, Singh B, Vanderslice JA, et al. Polycystic ovary syndrome and postpartum depression symptoms: a population-based cohort study. Am J Obstet Gynecol 2021;224:591. e1–12. [PubMed: 33412131]
19. Greenwood EA, Yaffe K, Wellons MF, Cedars MI, Huddleston HG. Depression over the lifespan in a population-based cohort of women with polycystic ovary syndrome: longitudinal analysis. J Clin Endocrinol Metab 2019;104:2809–19. [PubMed: 30985868]
20. Pearson RM, Evans J, Kounali D, et al. Maternal depression during pregnancy and the postnatal period: risks and possible mechanisms for offspring depression at age 18 years. JAMA Psychiatry 2013;70:1312–9. [PubMed: 24108418]
21. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics 1977;33:159–74. [PubMed: 843571]

22. Lujan ME, Chizen DR, Pierson RA. Diagnostic criteria for polycystic ovary syndrome: pitfalls and controversies. J Obstet Gynaecol Can 2008;30:671–9. [PubMed: 18786289]
23. Blay SL, Aguiar JV, Passos IC. Polycystic ovary syndrome and mental disorders: a systematic review and exploratory meta-analysis. Neuropsychiatr Dis Treat 2016;12:2895–903. [PubMed: 27877043]
24. Brutocao C, Zaiem F, Alsawas M, Morrow AS, Murad MH, Javed A. Psychiatric disorders in women with polycystic ovary syndrome: a systematic review and meta-analysis. Endocrine 2018;62:318–25. [PubMed: 30066285]
25. Annagür BB, Tazegül A, Uguz F, Kerimoglu ÖS, Tekinarslan E, Celik Ç. Biological correlates of major depression and generalized anxiety disorder in women with polycystic ovary syndrome. J Psychosom Res 2013;74:244–7. [PubMed: 23438716]
26. Shi X, Zhang L, Fu S, Li N. Co-involvement of psychological and neurological abnormalities in infertility with polycystic ovarian syndrome. Arch Gynecol Obstet 2011;284:773–8. [PubMed: 21688169]
27. Greenwood EA, Pasch LA, Cedars MI, et al. Insulin resistance is associated with depression risk in polycystic ovary syndrome. Fertil Steril 2018;110:27–34. [PubMed: 29908775]
28. Hadjiconstantinou M, Mani H, Patel N, et al. Understanding and supporting women with polycystic ovary syndrome: a qualitative study in an ethnically diverse UK sample. Endocr Connect 2017;6:323–30. [PubMed: 28515051]
29. Ethirajulu A, Alkasabera A, Onyali CB, et al. Insulin resistance, hyperandrogenism, and its associated symptoms are the precipitating factors for depression in women with polycystic ovarian syndrome. Cureus 2021;13:e18013. [PubMed: 34667688]
30. Kauffman RP, Baker VM, Dimarino P, Gimpel T, Castracane VD. Polycystic ovarian syndrome and insulin resistance in white and Mexican American women: a comparison of two distinct populations. Am J Obstet Gynecol 2002;187:1362–9. [PubMed: 12439532]
31. Artiga S, Orgera K, Damico A. Changes in health coverage by race and ethnicity Since the ACA, 2010–2018. Available at: https://files.kff.org/attachment/Issue-Brief-Changes-in-Health-Coverage-by-Race-and-Ethnicity-since-the-ACA-2010-2018.pdf. Accessed July 20, 2022.
32. Escarce JJ, Kapur K. Access to and quality of health care. In: Tienda M, Mitchell F, eds. National Research Council (US) Panel on Hispanics in the United States, Washington, DC: National Academies Press (US); 2006.
33. Wolfe MK, McDonald NC, Holmes GM. Transportation barriers to health care in the United States: findings from the national health interview survey, 1997–2017. Am J Public Health 2020;110:815–22. [PubMed: 32298170]
34. Borrell LN, Elhawary JR, Fuentes-Afflick E, et al. Race and genetic ancestry in medicine - a time for reckoning with racism. N Engl J Med 2021;384:474–80. [PubMed: 33406325]
35. Gibson-Helm M, Teede H, Dunaif A, Dokras A. Delayed diagnosis and a lack of information associated with dissatisfaction in women with polycystic ovary syndrome. J Clin Endocrinol Metab 2017;102:604–12. [PubMed: 27906550]
36. Babbar K, Martin J, Ruiz J, Parray AA, Sommer M. Menstrual health is a public health and human rights issue. Lancet Public Health 2022;7:e10–1. [PubMed: 34717798]
37. Critchley HOD, Babayev E, Bulun SE, et al. Menstruation: science and society. Am J Obstet Gynecol 2020;223:624–64. [PubMed: 32707266]
38. Alur-Gupta S, Lee I, Chemerinski A, et al. Racial differences in anxiety, depression, and quality of life in women with polycystic ovary syndrome. F S Rep 2021;2:230–7. [PubMed: 34278359]
39. Bani Mohammad M, Majdi Seghinsara A. Polycystic ovary syndrome (PCOS), diagnostic criteria, and AMH. Asian Pac J Cancer Prev 2017;18:17–21. [PubMed: 28240001]

AJOG Global Reports at a Glance

Why was this study conducted?

It is unclear whether polycystic ovary syndrome (PCOS) is associated with postpartum depression (PPD) in a population-based sample of at-risk women and whether Hispanic women with PCOS are at increased risk of PPD.

Key findings

This study found no association between self-reported prepregnancy diagnosis of PCOS and PPD. However, self-report of ≥2 symptoms, including irregular menstruation and hirsutism and/or acne, was associated with a 30% to 50% increased prevalence of PPD compared with self-report of regular menstruation. Hispanic women with all 3 PCOS symptoms were 5 times more likely to report PPD than non-Hispanic women.

What does this add to what is known?

Determining PCOS symptoms among at-risk women, including Hispanic women, may be important for identifying associations with PPD and potentially other comorbidities.

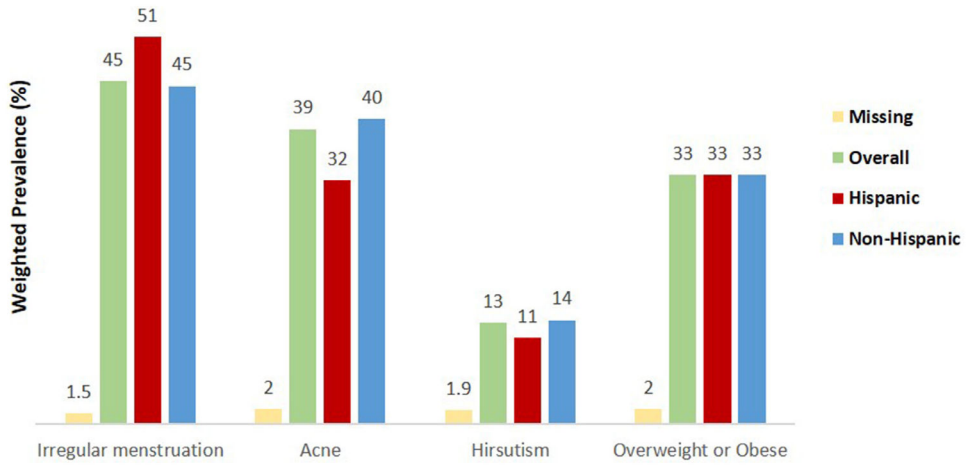

FIGURE 1.
Polycystic ovary syndrome symptoms by ethnicity: UT-PRAMS (2016–2019)

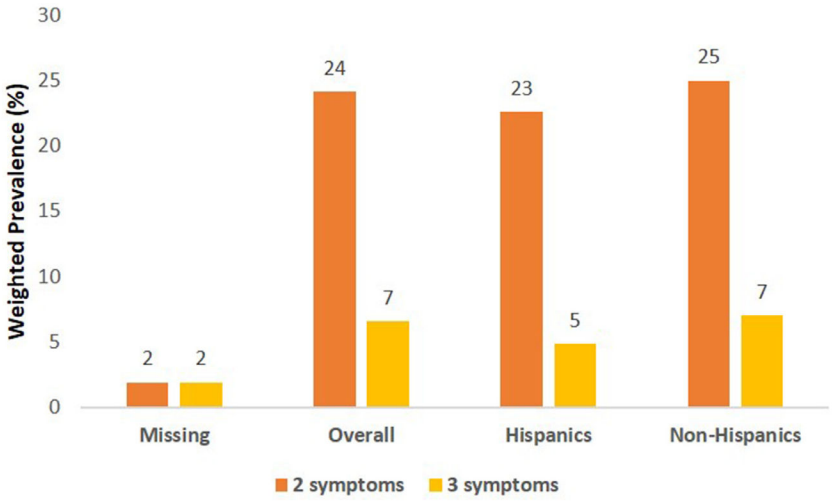

FIGURE 2.
Polycystic ovary syndrome symptoms by symptomology: UT-PRAMS (2016–2019)

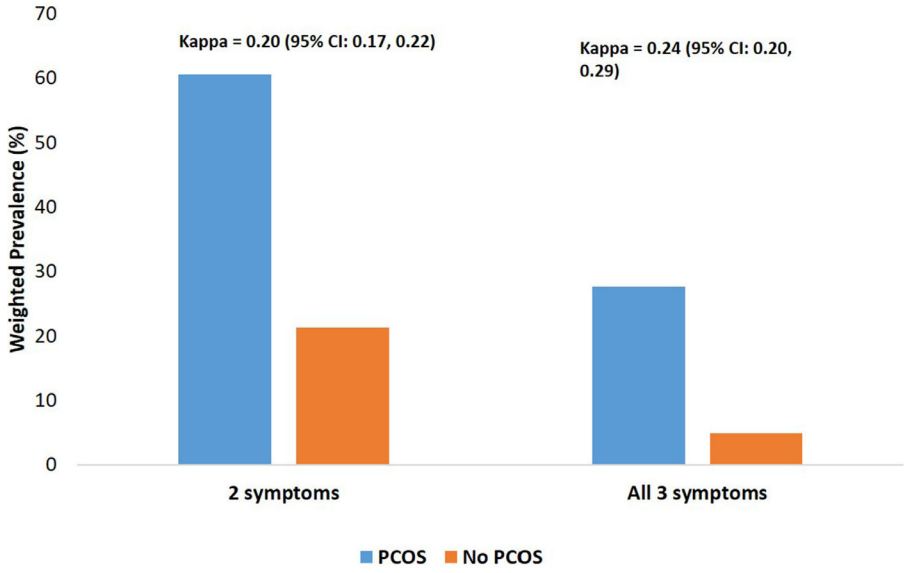

FIGURE 3.

Agreement between PCOS diagnosis (3 months before pregnancy) and symptoms: UT-PRAMS (2016–2019)

PCOS, polycystic ovary syndrome.

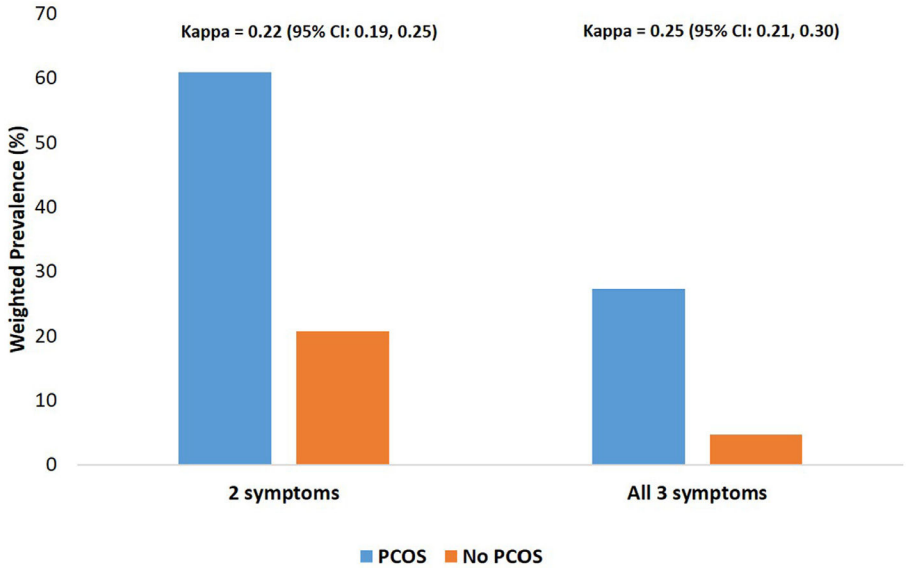

FIGURE 4.

Agreement between PCOS diagnosis (ever told by a healthcare worker) and symptoms: UT-PRAMS (2016–2019)

PCOS, polycystic ovary syndrome.

TABLE 1

Characteristics of women by prepregnancy polycystic ovary syndrome status (51,628 women representing an estimated population size of 2,553,730 women) from the National Pregnancy Risk Assessment Monitoring System 2016–2018

		PCOS	
Characteristics	**Total N=51,628**	**Yes n=3280 (6.3)**	**No n=48,348 (93.7)**
Maternal age group (y)			
<17	1.1	0.4	1.1
18–19	2.9	1.8	3.0
20–24	17.7	11.2	18.1
25–29	29.3	30.1	29.2
30–34	30.1	34.5	29.8
35–39	15.4	17.7	15.2
≥40	3.5	4.3	3.4
Prepregnancy BMI (kg/m^2), mean±SE	26.60±0.04	28.70±0.18	26.50±0.04
Prepregnancy BMI category (kg/m^2)			
<18	3.3	1.9	3.4
18–24	44.2	35.0	44.8
25–29	26.4	25.6	26.5
≥30	26.1	37.6	25.3
Hispanic ethnicity	16.8	11.4	17.1
Race			
White	70.3	77.3	69.8
Black	15.9	10.4	16.2
Other	13.8	12.2	14.0
Education level (y)			
0–8	3.1	0.8	3.3
9–11	8.7	4.4	9.0
12	24.1	18.8	24.5
13–15	26.5	30.0	26.2

		PCOS	
Characteristics	**Total N=51,628**	**Yes n=3280 (6.3)**	**No n=48,348 (93.7)**
≥16	37.9	46.2	37.0
Married (%)	62.1	74.0	61.3
Depression before pregnancy	13.4	40.0	11.7
High blood pressure before pregnancy	5.5	36.0	3.4
Type 1 or 2 diabetes mellitus before pregnancy	3.6	34.6	1.5
Prenatal depression	12.2	13.7	12.1
Prenatal anxiety	18.4	22.4	18.1
Postpartum depressed mood	6.3	6.9	6.3
Postpartum anhedonia	10.0	9.9	10.0
Postpartum depressed mood and anhedonia	3.3	3.7	3.3
Postpartum depressed mood or anhedonia	13.0	13.3	13.0
Mother consumed alcohol in the past2 y	65.8	71.8	65.4
Mother smoked in the past 2 y	19.9	20.5	19.8

Data are presented as weighted percentages, unless otherwise specified. Missing frequencies for characteristics among women who are not missing PCOS (N=51,628): age=0 (0%); BMI=1193 (2.6%); Hispanic ethnicity=244 (0.5%); race=0 (0%); education=430 (0.6%); married=51 (0.6%); depression before pregnancy=110 (0.2%); high blood pressure before pregnancy=94 (0.2%); prenatal depression=911 (1.8%); prenatal anxiety=36,945 (36,452 [79.8%] women from state that did not ask about prenatal anxiety and 222 [0.3%] women from state that did ask but participant left blank); postpartum depressed mood=1375 (2.3%); postpartum anhedonia=1369 (2.4%); postpartum depressed mood and anhedonia=1669 (2.9%); postpartum depressed mood or anhedonia=1581 (2.8%); consumed alcoholic drinks in the last 2 years=852 (1.5%); smoked cigarettes in the last 2 years=733 (1.3%); type 1 or 2 diabetes mellitus=209 (0.5%); and gestational diabetes mellitus=747 (1.5%).

BMI, body mass index; *PCOS*, polycystic ovary syndrome; *SE*, standard error.

TABLE 2

Unadjusted and adjusted prevalence ratios (95% confidence intervals) on the relationship between diagnosed polycystic ovary syndrome and postpartum depressed mood and anhedonia from the National Pregnancy Risk Assessment Monitoring System 2016–2018

Variable	Postpartum depressed mood and anhedonia	Postpartum depressed mood or anhedonia	Postpartum depressed mood	Postpartum anhedonia
Total	PR (95% CI)			
Unadjusted	1.10 (0.86–1.40)	1.02 (0.90–1.15)	1.11 (0.94–1.32)	0.99 (0.86–1.15)
Adjusted	0.82 (0.60–1.13)	0.90 (0.77–1.05)	0.84 (0.68–1.05)	0.91 (0.76–1.09)

Models were adjusted for age, race, Hispanic ethnicity, maternal education, prepregnancy depression, body mass index, high blood pressure, type 1 or 2 diabetes mellitus, marital status, and ever smoked or consumed alcohol in the past 2 years.

CI, confidence interval; *PR*, prevalence ratio.

TABLE 3

Unadjusted and adjusted prevalence ratios (95% confidence intervals) on the relationship between polycystic ovary syndrome (before 3 months and ever having been told by a healthcare worker) and postpartum depressed mood and anhedonia in the Utah Pregnancy Risk Assessment Monitoring System (2016–2019)

Variable	Postpartum depressed mood and anhedonia	Postpartum depressed mood or anhedonia	Postpartum depressed mood	Postpartum anhedonia
PCOS in 3 mo before getting pregnant (total)		PR (95% CI)		
Unadjusted	1.52 (0.97–2.41)	1.06 (0.80–1.40)	1.30 (0.93–1.81)	1.06 (0.74–1.51)
Adjusted	1.39 (0.74–2.64)	1.05 (0.73–1.51)	1.20 (0.78–1.86)	1.07 (0.67–1.72)
Ever having been told by a doctor, nurse, or other healthcare worker of having PCOS (total)				
Unadjusted	2.11 (1.44–3.10)	1.30 (1.01–1.67)	1.52 (1.13–2.05)	1.47 (1.10–1.99)
Adjusted	2.06 (1.35–3.15)	1.40 (1.07–1.83)	1.54 (1.12–2.12)	1.60 (1.16–2.22)

Models were adjusted for age, maternal education, prepregnancy body mass index, high blood pressure, type 1 or 2 diabetes mellitus, depression before pregnancy, and smoking and drinking status in the past 2 years. Of 5814 women, data are missing for the following: 97 for postpartum anhedonia, 113 for postpartum depressed mood, 129 for postpartum depressed mood and anhedonia, and 123 for postpartum depressed mood or anhedonia.

CI, confidence interval; *PCOS*, polycystic ovary syndrome; *PR*, prevalence ratio.

TABLE 4

Unadjusted and adjusted prevalence ratios (95% confidence intervals) on the relationship between PCOS and postpartum depressed mood and anhedonia for 2-symptom polycystic ovary syndrome from the Utah Pregnancy Risk Assessment Monitoring System 2016–2019.

Variable	Postpartum depressed mood and anhedonia	Postpartum depressed mood or anhedonia	Postpartum depressed mood	Postpartum anhedonia
Overall		PR (95% CI)		
Unadjusted	1.77 (1.32–2.36)	1.14 (0.95–1.36)	1.46 (1.18–1.80)	1.14 (0.92–1.40)
Adjusted	1.54 (1.14–2.09)	1.06 (0.89–1.27)	1.27 (1.03–1.58)	1.09 (0.88–1.36)
Hispanics				
Unadjusted	1.99 (0.85–4.65)	1.13 (0.72–2.77)	1.47 (0.79–2.76)	1.13 (0.66–1.92)
Adjusted	2.33 (1.06–5.37)	1.21 (0.77–1.90)	1.73 (0.97–3.09)	1.15 (0.66–2.03)
Non-Hispanics				
Unadjusted	1.73 (1.27–2.36)	1.14 (0.95–1.38)	1.45 (1.16–1.82)	1.14 (0.90–1.44)
Adjusted	1.50 (1.09–2.06)	1.06 (0.87–1.28)	1.25 (0.99–1.58)	1.09 (0.86–1.38)

Models were adjusted for age, race, Hispanic ethnicity, maternal education, prepregnancy depression, body mass index, high blood pressure, type 1 or 2 diabetes mellitus, marital status, and ever smoked or consumed alcohol in the past 2 years. The reference for no PCOS was report of regular menstruation.

CI, confidence interval; *PCOS*, polycystic ovary syndrome; *PR*, prevalence ratio.

TABLE 5

Unadjusted and adjusted prevalence ratios (95% confidence intervals) on the relationship between polycystic ovary syndrome and postpartum depressed mood and anhedonia for 3-symptom polycystic ovary syndrome from Utah Pregnancy Risk Assessment Monitoring System 2016–2019

Variable	Postpartum depressed mood and anhedonia	Postpartum depressed mood or anhedonia	Postpartum depressed mood	Postpartum anhedonia
Overall		PR (95% CI)		
Unadjusted	1.73 (1.07–2.78)	1.09 (0.81 −1.48)	1.11 (0.76–1.64)	1.38 (0.98–1.94)
Adjusted	1.62 (0.97–2.71)	1.08 (0.78–1.51)	1.04 (0.68–1.58)	1.42 (0.98–2.06)
Hispanics				
Unadjusted	3.54 (0.98–12.81)	1.86 (0.96–3.61)	1.66 (0.57–4.87)	2.53 (1.24–5.18)
Adjusted	4.96 (1.41–17.42)	2.39 (1.17–4.86)	2.30 (0.76–6.98)	3.31 (1.58–6.95)
Non-Hispanics				
Unadjusted	1.56 (0.94–2.61)	1.00 (0.71–1.40)	1.05 (0.69–1.59)	1.24 (0.84–1.82
Adjusted	1.43 (0.82–2.49)	0.95 (0.66–1.37)	0.95 (0.60–1.50)	1.22 (0.80–1.85)

Models were adjusted for age, race, Hispanic ethnicity, maternal education, prepregnancy depression, body mass index, high blood pressure, type 1 or 2 diabetes mellitus, marital status, and ever smoked or consumed alcohol in the past 2 years.

CI, confidence interval; *PR*, prevalence ratio.