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Associations between preterm birth, low birthweight, and postpartum health in a predominantly Hispanic WIC population

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Abstract

Objective—To describe the postpartum health of predominantly Hispanic WIC participants and identify how health characteristics differ between mothers who delivered preterm or low birthweight infants and those who did not.

Design—Cross-sectional survey among postpartum WIC mothers.

Setting—Los Angeles and Orange Counties, California.

Participants—WIC participants within 1 year of delivery (n = 1,420).

Main Outcome Measures—Postpartum health behaviors, health characteristics, and birth spacing intentions and behaviors.

Analysis—The frequencies of health characteristics were estimated using analyses with sample weights. Differences were assessed with chi-square and Fisher's exact tests with a Bonferroni correction for pairs of tests.

Results—Many women exhibited postpartum risk factors for future adverse health events, including overweight or obesity (62.3%), depressive symptoms (27.5%), and no folic acid supplementation (65.5 %). Most characteristics did not differ significantly ($P > 0.025$) between

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mothers of preterm infants and full-term infants or between mothers of low birthweight and normal birthweight infants.

Conclusions and Implications—Despite few differences between postpartum characteristics of mothers who delivered preterm or low birthweight infants and those who did not, a high percentage of mothers had risk factors that need to be addressed. Current postpartum educational activities of WIC programs should be evaluated and shared.

Keywords

postpartum period; postnatal care; premature birth; low birth weight

Introduction

The behaviors and health of a woman after she gives birth affect the long-term health of herself, her infant, and her future children.¹⁻⁴ The time after delivery may best be conceptualized as the interconception period, a term which emphasizes that a woman's pregnancies fall along the continuum of her life course. Interconception care has received increasing attention lately, as improvements in prenatal care have not decreased low birthweight or prematurity in infants, or obesity and diabetes in mothers and children.³⁻⁷ On the contrary, these health conditions are now more common than they were in 1990.⁵⁻⁷ Low-income women in particular are at elevated risk of preterm delivery and low birthweight, which puts them at increased risk of these birth outcomes in future pregnancies.^{4,8-11} Low-income mothers are also less likely to receive adequate preconception and interconception care.⁸

Regarded in the framework of the social ecological model,¹² interconception health is embedded in a social environment, with multiple levels influencing women's health-related behaviors. The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) has the potential to influence low-income women at multiple levels—from regular interpersonal interactions to effecting national policy changes. These features put WIC in an ideal position to educate, monitor, support, and refer low-income women during the interconception period.

To inform WIC's efforts, however, more information is needed on the postpartum health of its participants. The current understanding of women's health behaviors and characteristics during the interconception period is fragmented and incomplete.^{4,8,10,11} Although the importance of interconception health is well-established for women with adverse birth outcomes, little is known about how these mothers may differ from other mothers during the postpartum period.^{4,8} Additionally, WIC and other health educators in many parts of the U.S. are increasingly serving women of Hispanic origin; yet, research on interconception health and birth outcomes in Hispanic women has been limited.^{10,13,14} More evidence is needed to gain a comprehensive understanding of women's health behaviors and characteristics after delivery, particularly among low-income, Hispanic women who have delivered preterm or low birthweight infants.

The objectives of this study are to (1) describe the postpartum health behaviors and characteristics of predominantly Hispanic WIC participants in Southern California and (2) compare these characteristics between women who gave birth to preterm or low birthweight infants and those who did not. This study focused on postpartum characteristics known or suspected to be risk factors for preterm delivery and/or low birthweight, which were hypothesized to be more prevalent in women with preterm or low birthweight infants.^{4,10,11,15}

Methods

Study Population and Sampling Design

The study population consisted of postpartum mothers participating in WIC in Southern California. Two samples of women were collected. The first was a random, cross-sectional sample of postpartum WIC mothers in Los Angeles and Orange Counties. The second was a random, augment sample of postpartum WIC mothers in these counties who, according to WIC records, gave birth to preterm infants. Participants in the 2 samples were compared and duplicates removed.

Contact by telephone was attempted for 4,309 women, including 2,974 women for the cross-sectional sample and 1,335 for the augment sample. Up to 16 attempts were made to reach and interview participants. Of the women contacted, 225 were ineligible for the study because they did not speak English or Spanish, were currently pregnant, or did not give birth within the past year. A total of 1,493 eligible subjects completed the interview, including 1,026 women in the cross-sectional sample and 467 women in the augment sample. Of those who completed the interview, 73 were excluded from analyses because they had multiple births within the past year, and preterm delivery and low birthweight are more common and have different etiologies when there are multiple births. A total of 1,420 participants were included in the final analyses.

The survey questionnaire was administered using a computer-assisted telephone interviewing (CATI) system and took approximately 20 minutes to complete. All interviews were completed between July 30 and August 17, 2010. This research was approved by the E and I Institutional Review Board and verbal consent was obtained from each respondent.

Study Questionnaire and Variables

The research team developed the survey questionnaire through careful review of validated questionnaires related to interconception health topics. Self-reported survey data from this study's WIC population had been validated in a previous study.¹⁶ The study questionnaire was developed in English, translated into Spanish and then programmed onto a CATI system. All interviewers received data collection training, conducted mock interviews, and attended a briefing session on the study. Debriefings and retraining sessions were also held for interviewers during the data collection period to ensure consistent procedures. Prior to the full-scale data collection, the survey instrument was pre-tested in both English and Spanish among a small convenience sample of postpartum WIC mothers. Project leaders monitored each pre-test interview and the English and Spanish questionnaires and survey

administration were revised accordingly. The final survey was piloted among 10 English-speaking and 10 Spanish-speaking women, whose data are included in this study.

The questionnaire included items on maternal prepregnancy characteristics, including date of birth, race/ethnicity, education, country of birth, health insurance status, weight, height, and gravidity. Detailed questions were also asked about birth outcomes and maternal postpartum health characteristics and behaviors, such as changes in maternal weight, infant birthweight, maternal alcohol use postpartum, and medical conditions, among others. Postpartum metrics were reported as of time of survey. For example, a woman's postpartum weight is the weight she reported as current at the time of the survey.

Several variables used in analyses were derived from survey question responses. Body mass index (BMI) values were calculated from self-reported maternal heights and weights for the month before pregnancy, the end of pregnancy, and at the time of the survey. Due to the small number of underweight women ($n = 24$ postpartum), BMI values were categorized into normal weight or underweight ($<25 \text{ kg/m}^2$), overweight ($25\text{--}29.9 \text{ kg/m}^2$), and obese ($\geq 30 \text{ kg/m}^2$). Gestational weight gain was calculated as the difference between weight at the end of pregnancy and in the month before pregnancy. Gestational weight gain was then categorized based on the Institute of Medicine recommended ranges for each prepregnancy BMI category.¹⁷

Preterm birth was defined as <37 wk gestation, using mothers' self-report of birth more than three weeks before the due date. Low birthweight was defined as $<2,500$ g at birth, using mothers' self-report of birthweight in pounds and ounces. All birthweights $\geq 2,500$ g were grouped together due to the low prevalence of high birthweight ($n = 69$).

Postpartum diabetes and high blood pressure were assessed by self-report. Postpartum depression was assessed by 2 questions adapted from the validated Patient Health Questionnaire-2.¹⁸ Subjects were asked if, for a period of 2 weeks or longer since delivery, (1) they ever felt sad, empty, or depressed for most of the day and/or (2) they lost interest in most things they usually enjoyed doing. Participants were grouped into any or no depressive symptoms postpartum. Postpartum stress was assessed based on the Holmes and Rahe Stress Scale¹⁹ by asking if 12 different stressful life events occurred since delivery, such as if "someone close to you died" or "you got separated or divorced from your partner." After preliminary analyses showed no dose-response relationships with number of stressful events, subjects were grouped for analyses into any or no stressful life events postpartum.

Postpartum maternal alcohol drinking and household smoking were also assessed by self-report. Household smoking was defined as the mother or anyone else in the household smoking cigarettes. Ever breastfeeding was defined as ever giving breast milk to the infant. Duration of breastfeeding was categorized as 0-1 months or more than 1 month.

With regard to contraception, women indicated whether they used a permanent method (vasectomy or "tubes tied"), always used another method, used a method but knew that the method failed at least once, used a method but not every time, or did not use contraception. These responses were grouped into permanent or always using contraception, sometimes using or unreliable method, and not using contraception.

Refusals to respond to a question, which were rare, and “I don't know” responses were treated as missing.

Statistical Analysis

The prevalences of prepregnancy, birth, and postpartum characteristics in the study population were estimated using sampling weights to adjust for the preterm augment sample. The weights realigned the distribution of the sample with the true population proportions of full-term and preterm births. Because the prevalence of preterm birth is known to vary by race/ethnicity in this population, a weighting parameter associated with maternal race/ethnicity was also applied. As a check, analyses were conducted without weights using only the main cross-sectional random sample. Differences in results between weighted and unweighted analyses were negligible; hence weighted results are presented.

Chi-square and Fisher exact tests were used to assess differences in variables between women who delivered preterm and those who delivered full-term, and between women who delivered low birthweight infants and those who delivered normal or high birthweight infants. Prematurity and low birthweight were analyzed separately to assess differences in these distinct conditions. Subjects without data on preterm birth were excluded from analyses of preterm vs. full-term birth ($n = 7$) and subjects without data on birthweight were excluded from analyses of low birthweight vs. normal or high birthweight ($n = 16$). A Bonferroni correction for pairs of tests was used in statistical comparisons. Therefore, differences were considered statistically significant at $P < 0.025$. All analyses were conducted using SAS (version 9.3; SAS Institute Inc, Cary, NC, 2011).

Results

The survey cooperation rate (ratio of those interviewed to those contacted) was 87.8% for the cross-sectional sample and 85.1% for the preterm augment sample. The response rate (ratio of those interviewed to all contacted eligible women) was 42.8% for the cross-sectional sample and 44.3% for the augment sample. The length of time from birth to survey completion ranged from 61 to 348 days, with a mean of 208 days. Among all participants, 18.6% completed the survey before four months postpartum, 43.6% completed it between 4 and 8 months postpartum, and 37.8% completed it between 8 and 12 months postpartum.

Prepregnancy Maternal Characteristics and Birth Outcomes

Most subjects included in the study were Hispanic (83.4%), born outside of the U.S. (60.1%), and had a high school education or less (68.7%). The median age was 28 years old, and most women were multiparous (71.1%), had no healthcare coverage before pregnancy (51.3%), and were overweight or obese prepregnancy (52.1%). One quarter of women met the Institute of Medicine recommendations²⁴ for gestational weight gain. At birth, 35.2% of all infants were delivered by cesarean, 14.6% were preterm, and 5.6% were low birthweight. Additionally, 56.3% of preterm infants were low birthweight, and 72.4% of low birthweight infants were preterm. That is, these distinct conditions most often, but not always, occurred together.

In comparative analyses, a higher proportion of mothers of preterm infants were in older age groups than mothers of full-term infants ($P<0.001$)(Table 1). Mothers of low birthweight infants were significantly more likely to be primigravida than mothers of normal birthweight infants ($P<0.001$). Both preterm infants and low birthweight infants were significantly more likely to be delivered by cesarean ($P<0.001$). Gestational weight gain differed significantly between mothers of preterm and full-term infants ($P=0.01$) and between mothers of low birthweight and normal weight infants ($P<0.001$). Mothers of preterm or low birthweight infants were more likely to gain less than the recommended amount of weight for a full-term pregnancy.

Postpartum Maternal Health Characteristics

At the time of the postpartum survey, 30.3% of women were overweight and an additional 32% were obese. Most women were covered by health insurance (62%) and had received a postpartum health check-up (88.9%). Over one-quarter (27.5%) of women experienced at least one postpartum depressive symptom and over one-third (39.7%) experienced at least one stressful life event. Few had high blood pressure (1.1%) or diabetes (0.3%). No postpartum health characteristics differed significantly by preterm birth or birthweight ($P>0.025$)(Table 2).

Postpartum Maternal Health Behaviors

Overall, 14.7% of women reported drinking alcohol postpartum and 5.4% reported smoking in the household. More than half (65.5%) reported never taking multivitamins or folic acid supplements postpartum. Over 90% of women initiated breastfeeding, but only one-third (32.5%) breastfed longer than 1 month. There were no significant differences in comparative analyses ($P>0.025$)(Table 2).

Birth Spacing

Almost all (98.6%) women in the study did not plan to become pregnant within 3 months following the survey. Nearly one-third (29%) of women, however, were never or only sometimes using contraception postpartum, or using a method that had failed in the past. Among the women using contraception, 47.1% were very confident in the effectiveness of their birth control method. Confidence in birth control method was significantly higher in mothers of preterm infants than in mothers of full-term infants ($P=0.01$)(Table 2). There were no other significant differences in pregnancy planning or birth control use ($P>0.025$).

Discussion

Women in this predominantly Hispanic WIC population were found to have multiple postpartum risk factors for future preterm or low birthweight deliveries. These factors included several postpartum health behaviors and conditions that, following the social ecological model, can be targeted by WIC to improve the outcomes of future pregnancies as well as the health of mother and child. In contrast to the study's hypotheses, there were few differences between mothers of preterm infants and low birthweight infants and those of full-term infants and normal birthweight infants. However, the risk factors among mothers

of preterm and low birthweight infants are especially concerning due to their increased risk of having another preterm and/or low birthweight infant.

The prevalence of preterm birth (14.6%) was higher in this study population than the national prevalence among all women (12.0%) and among Hispanics (11.8%) during the same year.²⁰ Low birthweight, however, was less prevalent (5.6%) than among all women (8.2%) and Hispanic women (7.0%) at the national level.²⁰ As expected, preterm birth and low birthweight most often occurred together. However, nearly half of preterm infants were not low birthweight and over one-quarter of low birthweight infants were not preterm. These discrepancies underscore the differences in these two conditions and the importance of analyzing the conditions independently to assess their risk factors, prevalences, and consequences.^{10,11}

Only one-quarter of the study population met national recommendations for gestational weight gain. Mothers who delivered preterm and/or low birthweight infants were more likely to have low gestational weight gain, which is a known risk factor for preterm birth and low birthweight.^{10,11} This finding may be partly attributable to the shorter gestational period of preterm (and usually low birthweight) infants compared to full-term infants.^{10,11,15} More generally, our data suggest high rates of excessive gestational weight gain. Thirty-five percent of mothers of preterm infants gained more weight than recommended for a full-term pregnancy. Overall, the proportion of women who were obese increased substantially from 23.9% before pregnancy to 32.0% at the time of the survey. As the average infant age at the time of the survey was about 7 months, it is likely many women retained excess pregnancy weight. The consequences of excessive weight gain are complex. Remaining overweight or obese until a woman's next pregnancy puts her at increased risk of a medically-indicated preterm delivery and other adverse birth outcomes.^{15,21,22} On the other hand, according to a recent study, infants born to obese women with excessive weight gain had a decreased likelihood of mortality.²³ Additional prospective studies are needed to fully understand the impact of excessive weight gain on maternal and child health.

Depressive symptoms and stressful life events postpartum were relatively common among women in this population. The prevalence of any postpartum depressive symptoms was 27.5%, compared to a national estimate of 15.7% in all women and 19.1% in Hispanic women.⁸ Postpartum depression can negatively affect maternal health, child development and fetal development during future pregnancies.^{4,8,24}

In terms of postpartum health behaviors, many women did not meet their family planning intentions or national recommendations for vitamin supplementation or breastfeeding duration.^{1,25,26} These behaviors are essential to maternal health, infant development, and prevention of adverse birth outcomes. Birth spacing is of particular importance in preventing future preterm birth, low birthweight, and stillbirth.^{10,11,15} Nearly 30% of women in this study were not regularly using contraception, and less than half of those who used contraception were very confident in its effectiveness.

The findings of this study may not be fully generalizable to the national WIC population, particularly due to ethnic differences; 83% of the study subjects were Hispanic, compared to

approximately 42% of all WIC participants nationwide.²⁶ The results are also limited by self-reported and retrospective data collection. The cross-sectional study design limited the ability to assess change over time. It was also not possible to reliably measure infant size for gestational age to assess this characteristic.

There are several strengths of this study, including its augment sample of preterm infants. This method provided an adequate sample size to assess differences between preterm and full-term infants, and between low and normal birthweight infants. The study population also enabled assessment of birth outcomes and postpartum health in low-income Hispanic women, who are an understudied and growing population.^{10,13,14} There were also minimal differences in cooperation and response rates between the cross-sectional sample and the augment sample.

Implications for Research and Practice

The findings from this study highlight the many areas of support and education needed by low-income mothers following the birth of a child. In particular, this study focused on the areas of need for the predominantly Hispanic population of women served by WIC in Southern California. As the postpartum period often becomes an interconception period, it is an important time period at which to intervene to help mothers and future infants achieve optimal health. These data suggest that a large number of WIC mothers with young infants do not have healthcare coverage. While provisions of the Affordable Care Act are expected to help address this issue, WIC may remain the primary point of contact for low-income postpartum women whose infants are served by the program. Health education from WIC that supports postpartum weight loss, folic acid intake, breastfeeding, and birth spacing may have the greatest potential to improve interconception health in large populations of low-income women. Although mothers who have previously given birth to a low birthweight or preterm infant are more likely to have subsequent poor birth outcomes, results from this research suggest that all mothers served by WIC could benefit from focused attention on postpartum health. Many WIC programs already engage in such educational activities with mothers. These efforts must be evaluated and shared to bolster support of dedicated funding for health education during the interconception period.

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Table 1
Comparison of Prepregnancy, Pregnancy, and Birth Characteristics of Women in the Study Sample by Full-term/Preterm Birth (n = 1413) and Normal Birthweight^a/Low Birthweight Infants (n = 1404)

Variables	Full-term (n = 961) column % ^a	Preterm (n = 452) column % ^b	P ^c	Normal birthweight (n = 1056) column %	Low birthweight (n = 348) column %	P
Age (n = 1406)			<0.001			0.19
18–24 y	36.6	29.7		34.3	34.6	
25–29 y	26.8	23.2		26.7	22.4	
30–34 y	22	23.2		22.6	21.3	
35–39 y	14.6	23.9		16.4	21	
Race/ethnicity (n = 1391)			0.08			0.08
Hispanic	84.2	86.2		84.9	85	
White non-Hispanic	5	3.6		5.2	2.4	
Black non-Hispanic	5	6.8		5	7.1	
Other	5.8	3.4		4.8	5.6	
BMI prepregnancy (n = 1086)			0.56			0.25
Normal weight/underweight	48.7	45.2		46.9	49.6	
Overweight	28.1	29.8		28	30.3	
Obese	23.3	25		25	20.1	
Gravidity ^d (n = 1420)			0.19			0.001
0	30.5	28.5		27.3	37.6	
1–3	58.1	56.6		59.9	51.4	
4	11.5	14.8		12.8	10.9	
Cesarean delivery (n = 1420)	33.7	48.9	<0.001	36.1	46.8	<0.001
Preterm delivery (n = 1413)	-	-	-	18.7	72.4	<0.001
Low birthweight (n = 1404)	10.1	56.3	<0.001	-	-	-
Gestational weight gain ^e (n = 1086)			0.01			<0.001
Less than recommendation	33.2	42.4		31.2	50.7	
Recommended amount	26.3	22.5		26.7	20.8	
More than recommendation	40.6	35.1		42.2	28.5	

^a Includes all infants 2500 g at birth;

^b Indicates distribution of each variable within each subgroup;

^c Chi-square test used and results statistically significant at $P < 0.025$;

^d Gravidity does not include index pregnancy;

^e Institute of Medicine recommendations.¹⁵

Table 2
Comparison of Postpartum^a Maternal Health Characteristics and Health Behaviors of Women in the Study Sample by Full-term/Preterm Birth (n = 1413) and Normal Birthweight^b/Low Birthweight Infants (n = 1404)

Variables	Full-term (n = 961) column % ^c	Preterm (n = 452) column %	<i>P</i> ^d	Normal birthweight (n = 1056) column %	Low birthweight (n = 348) column %	<i>P</i>
Health Characteristics						
BMI postpartum (n = 1054)			0.28			0.42
Normal weight or underweight	38.8	35.8		36.7	40.7	
Overweight	30.3	28.5		29.9	29.9	
Obese	30.9	35.8		33.4	29.5	
Postpartum check-up for self (n = 1420)	89.7	91.2	0.39	89.5	93.1	0.047
Depressive symptoms postpartum (n = 1418)	26.3	30.2	0.13	27.2	28.8	0.56
Stressful life events postpartum (n = 1420)	39.1	44.3	0.07	40.0	42.5	0.40
High blood pressure postpartum (n = 1418)	1.4	1.3	0.97	1	2.3	0.08
Health Behaviors						
Maternal alcohol use postpartum (n = 1419)	14.8	10.9	0.045	14.6	10.1	0.03
Smoking in household postpartum (n = 1420)	4.9	7.5	0.047	5.3	7.2	0.19
Multivitamin and/or folic acid supplement use (n = 1412)			0.1			0.78
Everyday	21	20.4		21.1	20.5	
Less than everyday	12.3	16.4		13.2	14.7	
Never	66.8	63.2		65.7	64.7	
Ever breastfed (n = 1408)	90.1	87.1	0.08	88.9	89.9	0.63
Duration of any breastfeeding (n = 1406)			0.06			0.29
0-1 m	32.5	37.6		33.4	36.5	
>1 m	67.5	62.4		66.6	63.5	
Contraception usage (n = 1387)			0.06			0.16
Permanent or always using	70.9	72.4		71.4	72.3	
Sometimes using or failed method	9	5.5		8.7	5.6	
Not using	20.1	22.2		19.9	22.1	
Confidence in birth control method, if using (n = 906)			0.01 ^e			0.03 ^e

Variables	Full-term (n = 961) column % ^c	Preterm (n = 452) column %	<i>P</i> ^d	Normal birthweight (n = 1056) column %	Low birthweight (n = 348) column %	<i>P</i>
Very confident	47.6	55.6		47.7	57.1	
Somewhat confident	32.4	27.8		32.6	26.7	
Not too confident	17.4	11.6		16.8	11.5	
Not at all confident	2.6	5.1		3	4.6	

^a Postpartum variables reported at time of the survey;

^b Includes all infants > 2500 g at birth;

^c Indicates distribution of each variable within each subgroup;

^d Chi-square test used, unless otherwise indicated, and results statistically significant at $P < 0.025$;

^e Fisher's exact test used.