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The Relationship Between Diet, Activity, and Other Factors, and Postpartum Weight Change by Race

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Objective: To identify the impact of dietary intake and activity level on postpartum weight change.

Methods: White (n = 121) and black (n = 224) women, 7–12 months postpartum, participating in the Special Supplementation Feeding Program for Women, Infants, and Children were assessed for dietary intake, activity level, body weight, and other maternal characteristics.

Results: For both black and white women, the most important variables in predicting postpartum weight loss were pre-pregnancy weight, gestational weight gain, parity, and prenatal exercise. After these factors were controlled, race predicted that black women retained 6.4 lb more than white women. These results may be due to the finding that black women reported significantly higher mean energy intake (2039 versus 1552 kcal, P < .001), higher percent fat in diet (41 versus 38%, P < .001), and significantly lower amounts of prenatal and postpartum activity.

Conclusion: Higher energy intake and lower activity levels in black postpartum mothers compared with white mothers may contribute to the significantly higher rates of obesity found in black mothers. This study suggests the need for intervention strategies in the prenatal and postpartum periods to help those at risk of retaining weight gained during pregnancy. (Obstet Gynecol 1995;86:834–8)

Obesity, a pervasive and persistent public health problem in the United States, is more common among women than men.1 Across subgroups within the population, not all women are equally affected; 49% of black adult women compared with 32% of white adult women are defined as overweight.1 In addition, rates for hypertension, stroke and coronary heart disease, and non-insulin-dependent diabetes for black women are reported to be 1.5–2.5 times the rates found in white women.2,3

A commonly held notion is that weight gain associated with pregnancy contributes to the increased rates of obesity in women. However, the literature is contradictory.4–7 Parker and Abrams8 concluded from the 1988 National Maternal and Infant Health Survey data, a nationally representative sample of women, that black mothers had about twice the risk of being at least 20 lb heavier postpartum compared with white mothers. The same data set was examined9 for weight change in mothers who had prenatal weight gains within the Institute of Medicine’s 1990 weight gain guidelines for pregnant women. The results indicated that postpartum weight increased as prenatal weight gain increased and that black women retained more weight than white women with comparable weight gain. The relationship between pregnancy and adiposity changes in young black and white women was examined in a longitudinal study.10 Results indicated that there is an association between first pregnancy and increased adiposity for both black and white women, with black women having greater adverse changes in adiposity than white women at each level of parity.

Weight changes associated with pregnancy may contribute to the differing rates of obesity between black and white women.8–10 Few studies have considered the effects of diet or activity on postpartum weight, a potentially important oversight, because diet, physical activity, and heredity are considered to be the three most important factors in the determination of body weight.11 In addition, diet and physical activity level are modifiable factors and are the basis for weight-control efforts.

The purpose of this study was to 1) examine dietary intake and physical activity in a group of postpartum
women, and 2) explore variables potentially related to weight changes associated with pregnancy and determine whether these factors differ by maternal race. This study extends previous research by the inclusion of diet and activity factors that may be related to weight change.

Materials and Methods

Postpartum women attending Special Supplemental Food Program for Women, Infants, and Children (WIC) nutrition education classes for their 7–12-month-old infants were the subjects for this study. Data were collected at a WIC clinic over a period of 4 months so that the population would include all eligible postpartum WIC participants at the clinic. Four hundred five consecutive women attending the classes were invited and agreed to participate in the study.

For data analysis, subjects were excluded if they were younger than 18 years old, were pregnant with a subsequent pregnancy, had a neonate who weighed less than 5.5 lb, or reported their race as other than black or white; 48 women were excluded by these criteria. In addition, 11 women were excluded because they failed to complete the entire survey. During multiple linear regression analysis, one subject was excluded because her reported weight change from before to after pregnancy was more than 100 lb and the data point was an outlier. The final model was also run with the outlier, resulting in no change in significance. The final data set consisted of 345 white (n = 121) and black (n = 224) postpartum women.

The survey instrument was a paper and pencil, self-administered questionnaire. Information regarding usual dietary intake was assessed using the optically scannable version of the food frequency questionnaire developed and used by the National Cancer Institute. This food frequency questionnaire is used for epidemiologic and clinical use to provide information about an individual's usual dietary intake. Although all diet recall methods are subject to questions of validity, the food frequency questionnaire has been validated in a range of population groups, including those similar to the subjects in this study.

Participants were instructed to complete the food history according to how they have eaten since the delivery of their infant. We used the software HHHQ-DIETSYS (version 3.0; National Cancer Institute, Bethesda, MD) to analyze the scanned data. Total energy intake and percentage of fat in the diet were used as independent variables.

Information about usual physical activity level both during and after pregnancy was collected using a questionnaire adapted from an instrument used previously to collect activity data from women. For each activity reported, the number of times per week (frequency), the length of time engaged in the activity (duration), and an exertion rating (intensity) were multiplied together, and all activities were summed to produce an activity score that was used as an independent variable.

The instrument included questions about the infant’s age and birth weight, mother’s return to work, breast- and formula feeding, mother’s pre-pregnancy weight, mother's weight at delivery, parity, smoking behavior, and the use of oral contraceptives. The instrument was pretested in a group of women attending a similar WIC clinic. The entire questionnaire took 30–35 minutes to complete and was administered as part of the WIC-required nutrition class, which usually lasted 45–60 minutes. Consequently, the assessment did not impose an additional burden on the study group. After administration and collection of the survey instrument, subjects were measured for height and weight. Weight was measured without shoes or extraneous clothing (eg, sweaters or jackets) using a standard clinical scale that was zero balanced before each assessment period.

The SAS software package (SAS Institute, Cary, NC) was used to perform all statistical analyses. Student t test for unpaired observations was used for comparisons of continuous variables between races. Other univariate analyses were done using analysis of variance. Pearson product-moment correlation coefficient was used to measure association. Chi-square test was used for comparisons of categorical variables.

For multivariate analysis, the dependent variable was weight change, defined as the measured current weight minus the mother’s self-reported pre-pregnancy weight. Multiple linear regression was used to develop the models relating weight change to energy intake, physical activity level, and other variables of interest. Models for the multivariate analysis were based on a priori hypotheses of important variables thought to affect weight change. Variables and possible interactions were entered into the model, and stepwise procedure with backward elimination was used to drop nonsignificant terms from the model. An alpha level of .05 was used to determine statistical significance.

Results

The mean ages for white and black subjects were 25.0 and 26.2 years, respectively. Although mean height did not differ, current weight (pounds) differed significantly (white 146.9 ± 36.5 lb and black 162.9 ± 44.3 lb, P < .001). Neither the birth weight of the neonate nor the age of the mother at first childbirth differed signifi-
Table 1. Demographic and Anthropometric Characteristics

<table>
<thead>
<tr>
<th></th>
<th>White women (n = 121)</th>
<th>Black women (n = 224)</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>25.0 ± 4.9</td>
<td>26.2 ± 6.0</td>
<td>.02</td>
</tr>
<tr>
<td>Height (in)</td>
<td>64.3 ± 2.5</td>
<td>64.4 ± 2.5</td>
<td>.64</td>
</tr>
<tr>
<td>Current weight (lb)</td>
<td>146.9 ± 36.5</td>
<td>162.6 ± 44.3</td>
<td>.001</td>
</tr>
<tr>
<td>Age at first childbirth (y)</td>
<td>21.9 ± 4.2</td>
<td>21.7 ± 4.6</td>
<td>.66</td>
</tr>
<tr>
<td>Education (y)</td>
<td>12.4 ± 1.7</td>
<td>12.9 ± 1.6</td>
<td>.007</td>
</tr>
<tr>
<td>Birth weight of neonate (lb)</td>
<td>7.3 ± 0.9</td>
<td>7.2 ± 1.0</td>
<td>.31</td>
</tr>
</tbody>
</table>

Data are presented as mean ± standard deviation.

* t test for racial difference.

Table 2. Maternal Demographic Characteristics

<table>
<thead>
<tr>
<th></th>
<th>White women (n = 121)</th>
<th>Black women (n = 224)</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return to work</td>
<td>64 (52.9%)</td>
<td>145 (64.7%)</td>
<td>.03</td>
</tr>
<tr>
<td>Breast feeding</td>
<td>53 (43.8%)</td>
<td>49 (21.9%)</td>
<td>.001</td>
</tr>
<tr>
<td>Smoking</td>
<td>39 (32.2%)</td>
<td>26 (11.6%)</td>
<td>.001</td>
</tr>
<tr>
<td>Dieting</td>
<td>37 (30.6%)</td>
<td>62 (27.7%)</td>
<td>.57</td>
</tr>
<tr>
<td>Married</td>
<td>86 (71%)</td>
<td>62 (27.7%)</td>
<td>.001</td>
</tr>
<tr>
<td>Primipara</td>
<td>60 (49.6%)</td>
<td>109 (48.7%)</td>
<td>.12</td>
</tr>
</tbody>
</table>

Return to work was mother reporting starting or re-entering work in the postpartum period. Breast-feeding includes all women who reported breast-feeding for longer than 1 week. Smoking includes those mothers who are currently smoking. Dieting behavior is taken from the question, “Do you consider yourself to be dieting now?” Marital status is at the time of the survey.

* Chi-square test for racial differences.

Table 3. Calories, Percentage of Fat, and Weight

<table>
<thead>
<tr>
<th></th>
<th>White women (n = 121)</th>
<th>Black women (n = 224)</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>1551.7 ± 626.1</td>
<td>2039.4 ± 947.3</td>
<td>.001</td>
</tr>
<tr>
<td>% fat in diet</td>
<td>37.5 ± 8.5</td>
<td>40.7 ± 5.9</td>
<td>.001</td>
</tr>
<tr>
<td>Prenatal activity score</td>
<td>673.4 ± 566</td>
<td>476.4 ± 544</td>
<td>.002</td>
</tr>
<tr>
<td>Postnatal activity score</td>
<td>735.0 ± 582</td>
<td>603.0 ± 589.3</td>
<td>.047</td>
</tr>
<tr>
<td>Pre-pregnancy weight (lb)</td>
<td>140.1 ± 33.5</td>
<td>149.3 ± 39.4</td>
<td>.02</td>
</tr>
<tr>
<td>Gestational weight gain (lb)</td>
<td>31.6 ± 12.9</td>
<td>31.1 ± 11.9</td>
<td>.72</td>
</tr>
<tr>
<td>Current weight (lb)</td>
<td>146.9 ± 36.5</td>
<td>162.6 ± 44.3</td>
<td>.001</td>
</tr>
</tbody>
</table>

Activity scores were derived by multiplying the reported activity by frequency, duration, and intensity and summing reported activities. Data are presented as mean ± standard deviation.

* t test for racial differences.

Activity. The mean daily caloric intake was greater for black women than for white women (2039 ± 947 versus 1552 ± 626 kcal, respectively; P < .001). In addition, black women reported a higher percentage of fat in their diets. White women reported significantly higher prenatal and postpartum physical activity scores (Table 3).

Next, multiple linear regression modeling was performed to explore the factors that predict postpartum weight change. Twenty-seven percent of the variance in weight change was explained by six independent variables: pre-pregnancy weight, gestational weight gain, parity (primiparous or multiparous), race, prenatal physical activity score, and race by prenatal physical activity (an interaction term) (Table 4). Using the model to adjust for the aforementioned factors, race predicted a 6.4-lb increase in weight change for black mothers.

Because race was a significant variable throughout the model-building process, race analysis was performed. Again, all of the variables were entered into the multiple linear regression model and nonsignificant factors were eliminated with stepwise procedure. However, the same variables were most significant in pre-

Table 4. Variables Predicting Weight Change: Results of Multiple Linear Regression

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Index estimate</th>
<th>Standard error</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-pregnancy weight</td>
<td>0.0797</td>
<td>0.0167</td>
<td>.001</td>
</tr>
<tr>
<td>Gestational weight gain</td>
<td>0.4362</td>
<td>0.0511</td>
<td>.001</td>
</tr>
<tr>
<td>Parity</td>
<td>3.201</td>
<td>1.249</td>
<td>.011</td>
</tr>
<tr>
<td>Race</td>
<td>9.776</td>
<td>1.917</td>
<td>.001</td>
</tr>
<tr>
<td>Prenatal activity score</td>
<td>0.0038</td>
<td>0.0018</td>
<td>.042</td>
</tr>
<tr>
<td>Race by prenatal activity score</td>
<td>–0.0066</td>
<td>0.0023</td>
<td>.005</td>
</tr>
</tbody>
</table>

Pre-pregnancy weight is the self-reported average weight before pregnancy. Parity is a dummy variable in which primiparous = 0 and multiparous = 1. Race is a dummy variable in which white = 0 and black = 1.

n = 345; R² = 0.2672.

* Weight change is current measured weight minus preconceptual weight.
dicting postpartum weight change in both racial
groups.

Discussion

The findings of this study agree with other recent
studies that report that black women retain more
weight after pregnancy than do white women. We
found that black women reported more total calories, a
diet with a higher percentage of the calories from fat,
and less physical activity prenatally and postpartum
than did their white counterparts.

As in a previous report, black women in our study
were significantly heavier postpartum, even though
mean gestational weight gains were similar for both
black and white women. We conclude that this weight
retention is the result of black women failing to lose
weight in the postpartum period. These findings are
consistent with the study of Kahn et al, which sug-
gested that nonpostpartum black women are not nec-
essarily at increased risk of gaining weight, but rather
they are less likely to lose weight.

Although the association between calorie intake and
body weight is not completely understood, energy
balance ultimately translates into body weight. In this
study, postpartum black women reported calorie in-
takes that were significantly higher than those of the
white women. These results are similar to those of a
recent study that used data from the 1985-1986 Con-
tinuing Surveys of Food Intakes by Individuals to
examine energy intakes of women before, during, and
after pregnancy. The authors reported that among
nursing women, white women appeared to de-
crease their energy intake, whereas black women re-
ported mean increases of 150 kcal over their pre-
pregnancy intake during the first 3 months after
delivery, and more than 300 kcal over their pre-
pregnancy intake later in the postpartum year. Thus,
there is evidence that black women may be heavier
postpartum because they do not restrict their calorie
intake, whereas white women do.

Recently, Ohlin and Rossner reported that postpar-
tum weight retention correlated negatively with degree
of physical activity. The lower physical activity re-
ported in black women in this study concurs with other
reports of activity levels in women.

The variables predicting weight change were pre-
pregnancy weight, prenatal weight gain, parity, race,
prenatal exercise score, and race by prenatal exercise
score. As in other studies, women who had higher
pre-pregnancy weights retained larger amounts of
weight postpartum. With this model, a woman (black or
white) who enters pregnancy at 150 rather than 125 lb
would be predicted to have a 2-lb increase in postpar-
tum weight that is attributable to the higher pre-
pregnancy weight. Likewise, the model can illustrate
the effect of gestational weight gain. A woman (of either
race) who gained 40 rather than 30 lb would have 4.4-lb
increase in postpartum weight attributable to the in-
crease in gestational weight gain. This concurs with
other studies reporting that weight gained during
pregnancy is a strong predictor of postpartum weight
change. The significance of parity (primipara versus
multipara) was true for both races and has been re-
ported in other studies. Multiparous women would
be predicted to have a 3.2-lb increase in weight reten-
tion associated with parity.

Calorie intake was significant in models only when
the variable race was not in the model, which can be
explained by black women reporting higher calorie
intake while also having greater weight change. When
analysis included the variable race (or when analysis
was race specific), calorie intake was not significant.

The relationship between physical activity and
weight change was also considered. Reported postpar-
tum activity was not significant. However, prenatal
physical activity was a significant factor. The effect
of prenatal physical activity differed by race (and therefore
appears in the model as an interaction term). This
means that for white women, the more prenatal exercise
they reported, the more weight they retained postpar-
tum. The spread between the bottom and top quartile
for prenatal activity score was about 500 points, and this
would mean an increase in the predicted weight reten-
tion of 2 lb for white women that would be associated
with this amount of physical activity. For black women,
the more prenatal exercise they reported, the less
weight change postpartum. The same 500-point spread
would predict a decrease of 1.5 lb attributable to the
increase in the prenatal activity score. It has been
suggested that obese subjects may overestimate their
physical activity. This may be especially true for white
women who perceive more social pressure to be thin.
Thus, overweight white women may be overestimating
their prenatal physical activity and obscuring the effect.

Investigations of the association of breast-feeding and
postpartum weight loss are equivocal. We found
breast-feeding was not significant in predicting postpar-
tum weight change.

This study was based on self-report and considered
dietary intake and physical activity level in a group of
postpartum women. The study group was limited to
WIC participants in a metropolitan area in the southeast,
and generalizations of the findings should be limited to similar populations. Also, this study mea-
sured postpartum weight at only one period of time.
Some women may have gained weight during the
postpartum period, and it is likely that these women
may be different than those who failed to lose weight gained during pregnancy.

During pregnancy, many women make marked changes in health norms and behaviors. Studies have found that prenatal nutritional counseling affects eating behavior during pregnancy and that an intervention program in the postpartum period facilitates weight loss. Our results support the need for additional efforts in these areas. In particular, appropriate, culturally specific intervention strategies offered in the prenatal and postpartum periods may have an effect on the prevalence of overweight for at-risk mothers. Prospective studies that would assess diet and activity throughout pregnancy and the postpartum period are recommended to further clarify the effects of diet and activity on the weight of postpartum women.

References


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