



# Decreased Nutrient Intake Is Associated With Premature Cervical Remodeling

Mary Dawn Koenig, Barbara L. McFarlin, Alana D. Steffen, Lisa Tussing-Humphreys, Carmen Giurgescu, Christopher G. Engeland, Michelle A. Kominiarek, Christina Cieczak-Karpel, William D. O'Brien Jr., and Rosemary White-Traut

## Correspondence

Mary Dawn Koenig, PhD, RN, CNM, Department of Women, Children, and Family Health Science, College of Nursing, University of Illinois at Chicago, 845 S. Damen Ave., MC802, Room 814, Chicago, IL 60612. [marydh@uic.edu](mailto:marydh@uic.edu)

## Keywords

African American  
cervical remodeling  
nutrition  
pregnancy

## ABSTRACT

**Objective:** To examine the direct relationship between nutrient intake and cervical remodeling.

**Design:** Longitudinal descriptive design.

**Setting:** Maternal–fetal medicine clinic in a Midwestern urban city.

**Participants:** Forty-seven pregnant African American women.

**Methods:** Participants completed the Block brief food frequency questionnaire at 19 to 24 weeks and 27 to 29 weeks gestation and had quantitative ultrasonic attenuation estimates at 19 to 21 weeks, 23 to 25 weeks, 27 to 29 weeks, 31 to 33 weeks, and 35 to 37 weeks gestation.

**Results:** Trajectory mixture models identified two subpopulations within our sample: those at risk ( $n = 36$ ) and at less risk ( $n = 11$ ) for premature cervical remodeling. More participants in the less-risk group consumed the dietary reference intake for calcium, vitamin A, folate, vitamin E, zinc, and vitamin D than in the at-risk group. The percentage of participants in the less-risk group who consumed the recommended dietary reference intake for vitamin E was twice the percentage of women in the at-risk group (82% and 44%, respectively;  $p = .004$ ). Mean intake of calcium was almost 1.3 times more ( $p = .05$ ) and for zinc was 1.5 times more ( $p = .04$ ) in the less-risk group than in the at-risk group.

**Conclusion:** Practitioners can inform women that certain nutrients, particularly zinc, calcium, and vitamin E, could be important to the health of the cervix and inhibit premature cervical remodeling, which in turn may help prevent preterm birth.

*JOGNN*, 46, 123–134; 2017. <http://dx.doi.org/10.1016/j.jogn.2016.08.006>

Accepted August 8 2016

Mary Dawn Koenig, PhD, RN, CNM, is an assistant professor in the Department of Women, Children, and Family Health Science, College of Nursing, University of Illinois at Chicago, Chicago, IL.

Barbara L. McFarlin, PhD, CNM, RDMS, FACNM, is an associate professor and Head of the Department of Women, Children, and Family Health Science, College of Nursing, University of Illinois at Chicago, Chicago, IL.

(Continued)

The authors report no conflict of interest or relevant financial relationships.



Although there has been a steady decline in rates of preterm birth among all racial and ethnic groups in the United States, African American women continue to have approximately twice the rate of preterm birth than White women (Martin, Hamilton, Osterman, Curtin, & Matthews, 2015). It is unknown why this disparity exists, but evidence suggests that maternal nutrient deficiency is one of several possible factors (Dunlop, Kramer, Hogue, Menon, & Ramakrishnan, 2011). Decreased intake of multivitamins, zinc, calcium, iron, fat, carbohydrates, and protein has been associated with preterm labor and birth (Catov, Bodnar, Ness, Markovic, & Roberts, 2007; Hennessy, Volpe, Sammel, & Gennaro, 2010; Hofmeyr, Duley, & Atallah, 2007; Siega-Riz et al., 2006). Researchers have indicated that pregnant African American women in the United States consume fewer nutrient-dense foods (Siega-Riz, Bodnar, & Savitz, 2002) and have greater rates

of nutrient deficiencies (Siega-Riz & Popkin, 2001) than pregnant White women.

Women who give birth preterm have greater concentrations of matrix metalloproteinases (MMPs), specifically MMP-2, -3, -8, and -9 in cervical mucus and placenta tissue than women who give birth at term (Becher, Hein, Danielsen, & Uldbjerg, 2010; Sundrani, Chavan-Gautam, Pisal, Mehendale, & Joshi, 2013). The MMPs are calcium-dependent, zinc-containing endopeptidases (Verma & Hansch, 2007) that have a crucial role in remodeling the extracellular matrix of cervical tissue during pregnancy (Sundrani, Chavan Gautam, Mehendale, & Joshi, 2011). The MMPs degrade extracellular matrix constituents, including collagen, elastin, gelatin, casein, and nonmatrix proteins (Sundrani et al., 2011; Verma & Hansch, 2007), which contribute to cervical tissue remodeling in pregnancy (Yan & Boyd, 2007).

## Nutrient intake may be an important predictor of cervical remodeling.

Alana D. Steffen, PhD, is a research assistant professor in the Department of Health Systems Science, College of Nursing, University of Illinois at Chicago, Chicago, IL.

Lisa Tussing-Humphreys, PhD, MS, RD, is an assistant professor in the Department of Medicine, University of Illinois at Chicago, Chicago, IL.

Carmen Giurgescu, PhD, RN, is an assistant professor in the College of Nursing, Wayne State University, Detroit, MI.

Christopher G. Engeland, PhD, is an assistant professor in the Department of Biobehavioral Health and College of Nursing, Pennsylvania State University, University Park, PA.

Michelle A. Kominarek, MD, MS, is an associate professor for the Feinberg School of Medicine, Northwestern University, Chicago, IL.

Christina Cieczczak-Karpel, BS, is a research assistant in the Department of Women, Children, and Family Health Science, College of Nursing, University of Illinois at Chicago, Chicago, IL.

William D. O'Brien Jr., PhD, is a research professor and professor emeritus, Department of Electrical and Computer Engineering, University of Illinois, Urbana-Champaign, Urbana, IL.

Rosemary White-Traut, PhD, RN, FAAN, is a professor emerita, University of Illinois at Chicago and Director of Nursing Research, Children's Hospital of Wisconsin, Milwaukee, WI.

Under pathologic conditions and conditions of nutrient deficiency, MMP activity increases, which results in tissue degradation (Verma & Hansch, 2007).

Although several researchers examined the associations between nutrient deficiencies and MMP activity (Sundrani et al., 2011; Verma & Hansch, 2007), we did not find any studies on the relationship between nutrient intake and cervical remodeling. Serial ultrasonic attenuation assessments of the cervix provide a measure of tissue integrity, including collagen organization and water content (Labyed, Bigelow, & McFarlin, 2011; McFarlin, Balash, et al., 2015). As pregnancy progresses, collagen becomes disorganized, and ultrasonic attenuation decreases as the cervix remodels to allow passage of the fetus (McFarlin, Kumar, et al., 2015). The aim of this study was to examine the relationship between nutrient intake and cervical remodeling as measured by ultrasonic attenuation among a sample of pregnant African American women. We hypothesize that those women with nutrient deficiencies will have greater cervical remodeling.

## Methods

### Recruitment

This study is a secondary analysis of a larger pilot study examining multiple pathways to preterm birth. Approval for the study was received from the institutional review board of a city in the Midwestern United States. Medical records of potential research participants were prescreened for eligibility. Before 19 weeks gestational age, qualified women from the maternal-fetal medicine clinic at a medical center in the Midwest were approached during their clinic appointments. If a woman agreed to participate, an intake appointment was scheduled between 19 and 24 weeks gestation. At the intake visit, the study team obtained written informed consent from the participant in a face-to-face private meeting. A total of 54 participants were recruited, and there were 47 women with complete data for analysis.

### Eligibility

Eligible participants were less than 19 weeks pregnant with singleton pregnancies, self-identified as African American, and lived in Chicago or the surrounding suburbs. Participants

were also at least 15 years old and able to read and write English. Participants were excluded if they had major fetal anomalies, autoimmune disorder (e.g., HIV, Type I diabetes, lupus, Graves disease), were receiving steroid treatments (including inhalers for asthma) or had a cervical cerclage.

### Measures

*Demographic and clinical characteristics.* Participants completed a demographic questionnaire that included age, sex, employment status, monthly household income, and receipt of public assistance. Weight, medical history, and current and past obstetric history and birth data were collected by accessing participants' medical records.

*Nutrient intake.* Participants completed the Block brief food frequency questionnaire (FFQ; Block et al., 1986). This questionnaire is designed to provide estimates of usual dietary intake and includes 70 food items. Participants were asked to estimate their usual dietary intake during the past 3 months. Pictures were provided so participants could estimate food and beverage portion sizes. The food list was created from the National Health and Nutrition Examination Survey III dietary recall data. The nutrient database was based on the United States Department of Agriculture Nutrient Database for Standard Reference. The FFQ was self-administered and collected between 19 to 24 weeks and again at 27 to 29 weeks gestation.

Total nutrient amounts were summed across food and supplement sources and averaged across the two data collection time points. Valid FFQs had estimated kilocalories between 500 and 5,000 and had five or fewer missing responses to food intake questions.

*Cervical remodeling assessment.* Ultrasonic attenuation estimates were used to examine the process of cervical (collagen) remodeling during pregnancy. *Ultrasonic attenuation* is a quantity that refers to a reduction in the strength (or energy) of an ultrasonic signal and is quantified in decibels (dB). When attenuation is normalized to distance (in cm) and ultrasonic frequency (in MHz), it is termed *ultrasonic coefficient* and is quantified in dB/cm·MHz.

The participants underwent between one and five transvaginal ultrasonographic examinations to

Download English Version:

<https://daneshyari.com/en/article/5565636>

Download Persian Version:

<https://daneshyari.com/article/5565636>

[Daneshyari.com](https://daneshyari.com)