

A Preliminary Study of Clinical Practice and Prenatal Nutrition in Rural Kansas

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ABSTRACT

Introduction. The primary purpose of this study was to determine if new recommendations for prenatal supplements of docosahexaenoic acid (DHA) and choline have been implemented into care by physicians who care for pregnant women in rural Kansas communities. Both nutrients are inadequate in the diet of most pregnant women in the U.S., and not all prenatal supplements provide DHA and choline.

Methods. A cross sectional web-based survey was developed and provided by the University of Kansas Medical Center (KUMC) students to 44 rural Kansas clinics believed to have physicians who provide obstetrical care. Questions about DHA and choline were embedded in a larger survey focused on prenatal care. A total of 29 surveys were returned, however, only 21 were completed by physicians who provided obstetrical care.

Results. DHA (3/21) and choline (0/21) rarely were singled out for recommendation in contrast to folic acid (16/21) and iron (14/21). Participants stated that most women sought prenatal care during the first trimester of their pregnancy and indicated that they recommended prenatal vitamins at the first visit. Eleven gave patients a prescription for prenatal vitamins. The remaining patients either chose traditional over the counter prenatal vitamin capsules or less traditional chewable (gummy) vitamins, which provided lower concentrations of nutrients. Common barriers to nutritional counseling were limited resources and time constraints. Clinicians assessed their confidence and ability to provide nutritional counseling as moderate and competent, respectively.

Conclusions. New nutritional recommendations for DHA and choline have not been implemented into standard of care in rural Kansas.

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INTRODUCTION

Access to prenatal care is linked to infant mortality and morbidity.¹ The factors that were associated with infant mortality included preterm delivery, low birth weight, congenital malformations, and other maternal complications such as preeclampsia.² Infant mortality in rural counties was higher (6.55 deaths per 1,000 births) than in large urban counties (5.44 deaths per 1,000 births). Many rural counties are con-

sidered health professional shortage areas (HPSA); however, a study has not been done linking HPSA and infant mortality.³

The standard of care for prenatal counseling set forth by the American College of Obstetrics and Gynecology (ACOG) included education regarding labor and delivery, nutrition, exercise, and working during pregnancy.⁴ ACOG recommended a daily prenatal vitamin which includes folic acid; however, the market contains a variety of prenatal vitamin supplements of varying quality. Most prenatal vitamins contain the important supplement folic acid, which is recommended by ACOG and the National Institute of Health (NIH),⁵ and minerals including iron, iodine, and zinc; all of which have important roles in pregnancy and fetal development.⁶

Recent studies supported the recommendation to supplement pregnant women with docosahexaenoic acid (DHA) and choline. A 2018 Cochrane Review on the topic of DHA supplementation during pregnancy found a decrease in early preterm births from 4.6% to 2.7% and in all preterm births from 13.4% to 11.9%.⁷ This was a relative risk reduction of 42% in early preterm birth (< 34 weeks gestation), and 11% in all preterm births (< 37 weeks gestation). Though this review clearly stated the benefits of DHA supplementation during pregnancy, it is important that gestation > 42 weeks was increased, as was large for gestation age (LGA) babies with DHA supplementation. While an optimal amount of DHA was not defined, the results largely were due to studies in which women were assigned randomly to a supplement of at least 500 mg/day of DHA. Meanwhile, two recent studies showed early preterm birth and preterm birth were reduced by doses of 800 and 1000 mg DHA/day in women starting pregnancy with low DHA status.^{8,9} Dietary intake of DHA was low in women in the U.S., providing approximately 60 mg per day.¹⁰ While DHA is included with some over the counter prenatal supplements, most provide 200 mg/day or less per dose.

The American Academy of Pediatrics highlighted choline and long chain polyunsaturated fatty acids, including DHA, as key nutrients to support fetal brain development during pregnancy and lactation;¹¹ however, choline was ranked last among common nutrients that doctors recommend for a healthy diet.¹² Only 6% of obstetricians and gynecologists reported they are likely to recommend foods that are good choline sources or supplements for pregnant women. A similar study has not been performed in family medicine physicians providing obstetric care. The Adequate Intake (AI) for choline during pregnancy is 450 mg/day,¹³ while pregnant women consume only about 322 mg from food and supplements.¹⁴ Evidence for the importance of ensuring good choline intake during the perinatal period continues to grow.¹⁵ Meanwhile, there was also evidence that choline and DHA act synergistically in brain and eye development.^{16,17}

Physicians can ensure that policy recommendations are implemented in patient care. However, it takes an average of 17 years for significant research to be implemented in clinical practice.¹⁸ A delay in uptake of new findings by physicians can delay further implementation. This study was designed to determine if pregnant women in rural Kansas received information about the need for additional DHA and choline, as well as general information on prenatal nutrition counseling and resources. The study results will identify possible opportunities to amend prenatal

nutrition counseling provided to women by obstetrical providers. We hypothesized that recommendations for DHA and choline have not been implemented into standard of care in rural Kansas.

METHODS

The study was approved by the Institutional Review Board at the University of Kansas Medical Center (KUMC). The survey used a cross sectional design. Prior to releasing the survey, nine physicians providing obstetrical care at KUMC completed the survey and made recommendations for clarifying the survey prior to implementation. Their data were not analyzed.

All 44 KUMC medical students in the Summer Training Option in Rural Medicine (STORM) program provided the web-based "Prenatal Nutrition Survey" as a REDCap® link to rural Kansas preceptors. Preceptors were considered rural if their practice took place in counties outside of the top six urban counties of Johnson, Wyandotte, Leavenworth, Sedgewick, Shawnee, and Douglas. All student researchers received basic interview training the week before the program began and completed a Human Subjects Committee (HSC) on-line training course.

Informed consent was sought at the beginning of the survey. Participants were asked about their practice demographics, patient choices on prenatal care, prenatal supplements, and barriers in providing that care in rural settings. Lastly, participants were asked about their confidence and self-assessed ability to provide patients with nutrition guidance. To be included in the analysis, surveys needed to be completed by participants with either a Doctor of Medicine (M.D.) or Doctor of Osteopathic (D.O.) degree and who provided prenatal care. A total of 29 of the 44 surveys were returned, however, eight were excluded from our analysis. Specifically, one was excluded because the individual who completed the survey did not provide informed consent, two others were excluded as they were not an M.D. or D.O., and five respondents did not provide obstetrical care. Statistical analysis included descriptive statistics and frequencies. Statistical Analysis Software (SAS) version 9.4 was used to complete data analysis.

RESULTS

Results are reported in frequency or sample size for each question and percentages. Of the 44 obstetric providers in rural Kansas, a total of 21 responses were used in analysis, giving a 47.7% response rate. The professions of the sample included 20 M.D.s and 1 D.O. Length of practice ranged from less than 1 year to 33 years. Of the 21 participants, five (23.8%) reported caring for one to ten pregnant women per year, six (28.6%) reported caring for 11 - 25, nine (42.9%) reported caring for 26 - 50, and one (4.8%) reported caring for 51 - 100. These physicians reported providing pre-pregnancy counseling, prenatal care, delivery services, and postpartum care. Nineteen participants (90.5%) reported that greater than half of their patients seek prenatal care in the first trimester.

Eighteen participants (85.7%) reported they would recommend prenatal supplements during pre-pregnancy counseling; although, most participants (90.5%) reported that less than 25% of their patients sought pre-pregnancy counseling. A comment by one participant clarified that they selected pre-pregnancy counseling on the questionnaire as the time they would recommend a prenatal supplement or vitamin, but so few women seek pre-pregnancy counseling that the

recommendation for prenatal supplements or vitamins usually occurred at the first appointment patients are seen during the pregnancy.

Physicians were asked to select the type of supplements and vitamin options that patients in their practice choose. Eleven participants (52.4%) responded that women choose prescription prenatal supplements and 17 (81%) selected that women choose over-the-counter prenatal supplements. All 11 who chose prescription also selected over-the-counter supplements. Only one participant (4.8%) selected women choose to consume no prenatal supplements or vitamins. When asked to comment on preference on type of prenatal vitamin, respondents reported a preference for prescription prenatal supplements or vitamins, due to the increased amount of folic acid and preference and tolerance of patient. Most women selected over-the-counter prenatal supplements with about half selecting gummy prenatal supplements.

Participants were asked if they recommend specific nutrients to be included in prenatal supplements and could choose more than one option (Table 1). Folic acid and iron were chosen most frequently, with 16 (76.2%) and 14 (66.7%) of the participants, respectively. Less frequently recommended were vitamin B6 (8/21, 38.1%), vitamin D (6/21, 28.6%), and DHA (3/21, 14.3%). Choline and iodine were not chosen by participants. Two participants reported recommending other nutrients but did not offer comments. A comment by one participant stated that they sometimes recommended many of the nutrients, but on a case-by-case basis. As for herbal supplements, 19 participants reported that their patients do not choose to use herbal supplements during pregnancy. Comments on this topic included: herbal supplements are not safe or recommended as they are not well researched or regulated, and safety has not been established.

Table 1. Physician's recommendations for prenatal nutritional supplements.

Nutrient	N (%)
Folic acid	16/21 (76.2)
Iron	14/21 (66.7)
Vitamin B6	8/21 (38.1)
Vitamin D	6/21 (28.6)
DHA	3/21 (14.3)
Choline	0/21 (0)
Iodine	0/21 (0)
Other	2/21 (9.5)

Counseling on nutritional information in pregnancy was completed by a variety of clinic personnel (Table 2). All participants (100%) selected physicians provide education on nutrition. Nurses (12/21, 57.1%), midwives (2/21, 9.5%), and registered dietitians (7/21, 33.3%) were less frequently selected as providing additional counseling. The reported format of informational material provided to women were written handouts (17/21, 81%), prenatal classes (16/21, 76.2%), and guided internet searches (6/21, 29%). Barriers to providing

information on nutrition to patients included time constraints (13/21, 61.9%), lack of community resources (7/21, 33.3%), and other (1/21, 4.8%). Participants commented that limited community services and time are the chief barriers. Resources available to patients included a hospital or clinic registered dietitian (14/21, 66.7%), a referral less than 50 miles away (4/21, 19%), and a referral greater than 50 miles (3/21, 14.3%).

Table 2. Nutritional counseling during pregnancy.

Who provides counseling	N (%)
Physician	21/21 (100)
Nurse	12/21 (57.1)
Midwife	2/21 (9.5)
Registered dietitian	7/21 (33.3)
Counseling format	
Written handouts	17/21 (81.0)
Prenatal classes	7/21 (33.3)
Guided internet searches	6/21 (28.6)
Barriers to counseling	
Time constraints	13/21 (61.9)
Lack of community resources	7/21 (33.3)
Other	1/21 (4.8)
Additional resources	
Registered dietitian	14/21 (66.7)
Referral less than 50 miles	4/21 (19.0)
Referral more than 50 miles	3/21 (14.3)

Participants answered questions on organizations and resources used to keep up-to-date on new information. The American Academy of Family Physicians/Kansas Academy of Family Physicians was the most frequently selected with 18 participants (85.7%) referring to this source, followed by ACOG being referred by 17 participants (81%), and 7 participants (33.3%) referring to the U.S. Centers for Disease Control and Prevention. No participants reported use of resources from the Academy of Nutrition and Dietetics or the World Health Organization (WHO). UpToDate® was reported as the most used resource with 90.5% (19/21) of participants selecting this option, followed by academic journals (8/21, 38.1%). Live continuing medical education was selected by 57.1% (12/21) of participants as a format of obtaining new knowledge. Other resources reported by participants included additional publication and texts, and their partners.

Finally, participants were asked to self-assess their ability to provide information on nutritional requirements during pregnancy and their confidence on this topic (Table 3). Self-assessed ability was rated from beginner, developing, competent, and advanced. Most participants reported competent ability (16/21, 76.2%), with three participants (14.2%) rating themselves developing and two (9.5%) as advanced. Confidence was rated as minimally, somewhat, moderately, and very

confident. Most (14/21, 66.7%) reported they are moderately confident on nutritional requirements of pregnancy, five (23.8%) reported feeling very confident, and two (9.5%) were somewhat confident in their ability to provide prenatal nutritional counseling.

Table 3. Physician's confidence in their ability to provide prenatal nutritional counseling.

Confidence	N (%)	Self-assessed ability	N (%)
Minimally confident	0/21 (0)	Beginner	0/21 (0)
Somewhat confident	2/21 (9.5)	Developing	3/21 (14.3)
Moderately confident	14/21 (66.7)	Competent	16/21 (76.2)
Very confident	5/21 (23.8)	Advanced	2/21 (9.5)

DISCUSSION

These findings correlated to the hypothesis that new nutritional recommendations have not been implemented into standard practice in rural Kansas. Recent studies have shown that DHA is an important nutrient during pregnancy,⁷ and the National Academy of Medicine has set a choline intake of 450 mg as an AI during pregnancy;¹³ however, few of the respondents to our survey recommended DHA and none recommended choline. These results could be related to the time it takes for new information to become a standard of care. Even though an AI was set for choline during pregnancy in 1998,¹³ implementation could have been delayed because it was understood only recently that dietary intake of choline did not meet the AI for most women.¹⁴ The reported confidence and ability levels could be referring to nutrients like folic acid and iron that have been studied and in standard practice for many years. It also was possible that those surveyed misunderstood the question, considering one physician said each nutrient could be recommended on a case-by-case basis.

Americans living in rural communities face barriers in access to healthcare, especially women seeking prenatal care. According to the 2010 U.S. Census Bureau data, 17% of the U.S. population lives in rural communities, while only 9% of physicians practice in these areas.¹⁷ The situation is similar in Kansas, where 25 of the 105 counties are designated as a whole county primary care HPSA and an additional 89 counties have some level of HPSA. This was reflected in the small number of physicians providing obstetrical care in rural Kansas. The work by Kennedy et al.^{19,20} has identified just 44 physicians providing obstetrical care in this area, which were the sample we sought to obtain for this study.

A limitation of the research was the small sample size. Results were obtained from only 29 of the 44 physicians whose practice includes obstetrics, with only 21 of the 29 respondents meeting all inclusion criteria to be included in the study. The COVID-19 pandemic meant that not all physicians were able to be contacted in-person, decreasing the intended sample size. However, the sample size was large enough to serve as a starting point for further investigation and to consider how to best provide information on the importance of DHA and choline to physicians caring for pregnant women in Kansas. Our findings cannot be generalized to physicians practicing in urban and suburban settings, although there was evidence to suggest that the findings for choline could be similar.¹²

According to our study, rural physicians were using UpToDate®, ACOG, and the American Academy of Family Physicians most commonly for knowledge acquisition. Physicians have cited barriers of journal use to include “time, resource reliability, data credibility, and information overload”.²¹ With these barriers in mind, options for research dissemination in rural Kansas could include: open access to journal articles, increased time and funds for conference attendance (e.g., Kansas Academy of Family Physician conferences), continuing education courses specific to prenatal nutrition, and virtual education meetings from the academic research communities to rural Kansas providers. The efficacy and interest in these options would need to be assessed in further studies.

This preliminary study showed the need for further research, as well as offering educational ideas for shortening the time gap between evidence from research and recommendations for practice becoming standard of care. Bridging this gap can have more significant impacts such as reducing infant morbidity and mortality in the rural U.S.

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