

Florida Health Care Providers' Knowledge of Folic Acid for the Prevention of Neural Tube Defects

Kimberlea W. Hauser, MBA, Carol M. Lilly, MD, MPH, and Jaime L. Frías, MD

Objectives: The purpose of this study was to determine the impact of an educational program on the knowledge and practice behavior of health care providers regarding folic acid use for the prevention of neural tube defects.

Methods: A survey was mailed to selected Florida health care providers to determine baseline knowledge and practice behavior. After a statewide educational program, another mail survey was sent to the same groups of providers to determine the effect of the campaign.

Results: Comparison between the two surveys showed a significant increase in knowledge and in the percentage of health care providers who recommended the periconceptional use of folic acid for the prevention of neural tube defects. Providers graduating in 1992 or later were more likely than those graduating before 1992 to have the appropriate knowledge about folic acid use but were less likely to recommend it to their patients.

Conclusions: Significant gains were made in increasing knowledge and changing practice behavior among selected Florida health care providers. Regardless of the magnitude of these gains, our data show that some health care providers who have regular contact with women of childbearing age still do not know the recommended doses of folic acid or do not recommend its use. This points toward the need for continued education as well as efforts to modify provider behavior.

Key Words: folic acid, health care provider survey, neural tube defects, practice behavior

From the Birth Defects Center and the Division of Developmental Pediatrics and Neurology, Department of Pediatrics, University of South Florida College of Medicine, Tampa, FL.

This project was funded by grants from the March of Dimes Birth Defects Foundation (JLF) and the Florida Department of Health (JLF).

We do not have any commercial or proprietary interest in any drug, device, or equipment mentioned in this article. None of the authors has any financial interest in any item mentioned in this article.

Reprint requests to Kimberlea W. Hauser, MBA, Birth Defects Center, Department of Pediatrics, University of South Florida College of Medicine, 17 Davis Boulevard, Suite 200, Tampa, FL 33606.

Accepted March 26, 2003.

Copyright © 2004 by The Southern Medical Association

0038-4348/04/9705-0437

Since the U.S. Public Health Service (USPHS) issued its recommendation regarding the use of periconceptional folic acid for the prevention of neural tube defects (NTDs) 10 years ago,¹ numerous programs have been conducted to promote its use among women of childbearing age. Despite these efforts, only one-third of these women, according to polls conducted by the March of Dimes Birth Defects Foundation, report taking folic acid daily and only approximately 20% know that folic acid can prevent birth defects.² The most recent poll showed that among the women who did not take folic acid, 90% stated they would likely take it if their health care provider recommended it. However, when asked where they had learned about folic acid, only 25% of the surveyed women identified their physician as the source of information.² We report the results of the pre- and post-intervention surveys conducted to evaluate the impact of an educational program on the knowledge and practice behavior of health care providers regarding folic acid use for the prevention of NTDs.

Materials and Methods

Two surveys were sent to all Florida family physicians, nurse midwives, obstetricians/gynecologists, and pediatricians who were members of their respective professional societies. The questions were based on a previous March of Dimes physicians' survey³ and sought to determine the level of knowledge of the selected health care providers regarding the role of folic acid in the prevention of NTDs^{1,4} and how often they recommended it to women of childbearing age.

Key Points

- Periconceptional use of folic acid can reduce the risk of neural tube defects by 50 to 70%.
- Significantly more health care providers could identify the U.S. Public Health Service-recommended folic acid dose for occurrence prevention after an educational campaign.
- Health care providers who provide obstetric/gynecologic care recommend folic acid more often to their patients than family physicians and pediatricians.

The baseline survey was mailed to 5,101 health care providers in November 1999 and was repeated twice during a 5-month period for those who failed to respond. The second survey mailing took place in April 2002. It was sent to 5,680 health care providers and was repeated twice during a 2-month period for those who failed to respond. Respondents returned surveys in an enclosed postage-paid, business reply envelope; and responses were entered into a Microsoft Access (Microsoft Corp., Redmond, WA) database and analyzed using SPSS for Windows, release 11.0.1 (SPSS, Inc., Chicago, IL). The University of South Florida Institutional Review Board approved this protocol.

During the time between the two surveys, the University of South Florida Birth Defects Center, the March of Dimes, and the Florida Department of Health initiated a variety of activities targeted at health care providers to improve folic acid knowledge and to encourage the routine recommendation of folic acid to women of reproductive age. These activities included articles in state professional publications, presentations at continuing medical education courses, direct mailings, and educational booths at professional meetings.

Results

We received 1,489 responses to the baseline survey, for a response rate of just over 29%. The second survey response rate increased to 32%, with 1,765 completed surveys returned. Response rates among provider groups varied greatly. Nurse midwives had the highest response rate for both surveys (68 and 47%), and family practice physicians had the lowest (24 and 29%). The response rate for pediatricians declined from 35% in the baseline survey to 31% in the second survey, whereas the obstetricians/gynecologists' response rate improved from 26 to 38%.

There was little variation in the respondent demographics between the two surveys. For both, the majority of respondents graduated before 1992 and had been in practice for 15 or more years. Of those responding to the second survey, 11% reported participating in the previous survey, 45% said they had not, and 43% could not remember. Overall, statistically significant increases in knowledge were noted in the second survey (Table 1). Knowledge of the USPHS-recommended dose of folic acid (400 μ g) among respondents increased 12 percentage points to 70% ($P < 0.0001$) and knowledge of the recurrence prevention dose (4 mg) increased 10 percentage points to 36% ($P < 0.0001$). In the baseline survey, 80% of respondents knew that folic acid should be taken at least 1 month before conception, whereas 85% did in the second survey ($P < 0.0001$).

Knowledge of the dose of folic acid recommended by the USPHS for occurrence prevention showed statistically significant differences between the two surveys among the physician groups. These reached more than 15 percentage point increases for both obstetricians/gynecologists (from 74 to

Table 1. Overall health care provider knowledge and practice behavior

	1999 (%)	2002 (%)	P value
Knowledge			
400- μ g folic acid dose for occurrence prevention	58	70	<0.0001
4-mg folic acid dose for recurrence prevention	26	36	<0.0001
Take folic acid at least 1 mo before conception	80	85	<0.0001
Practice behavior			
Recommend folic acid most of the time or always to women of childbearing age	45	57	<0.0001

89%; $P < 0.0001$) and pediatricians (from 48 to 65%; $P < 0.0001$) and seven percentage points for family physicians (from 58 to 65%; $P = 0.009$). Similar results were found for knowledge of the recommended folic acid dose to prevent NTD recurrence. The largest change in knowledge was seen for obstetricians/gynecologists, with a 20-percentage point increase (from 53 to 73%; $P < 0.0001$). Changes were also found among pediatricians (from 20 to 27%; $P = 0.011$) and family physicians (from 21 to 28%; $P = 0.006$). In the baseline survey, the vast majority of each health care provider group knew that for the USPHS-recommended 400- μ g dose to be effective, consumption must be initiated at least 1 month before conception (periconceptional use). This trend remained in the second survey, with significant changes found for family physicians (from 77 to 82%; $P = 0.022$), obstetricians/gynecologists (from 87 to 94%; $P = 0.040$), and pediatricians (from 77 to 83%; $P = 0.026$). Among nurse midwives, 82% recognized the occurrence prevention dose of folic acid in the baseline survey, and the increase of six percentage points observed in the second survey was not statistically significant ($P = 0.137$). This group's knowledge of the recurrence prevention dose of folic acid went from 45 to 48% ($P = 0.595$), and virtually no change was found in their knowledge that folic acid use must be initiated at least 1 month before conception (from 94 to 96%; $P = 0.560$).

Regarding the practice of recommending folic acid to women of childbearing age, nurse midwives and obstetricians/gynecologists improved from slightly more than 60% in the baseline survey to more than 80% in the second survey. Family physicians went from 41 to 51% ($P = 0.001$), but there was a nonsignificant increase among pediatricians (from 39 to 42%; $P = 0.348$).

Additional analysis showed that the year when the health care provider obtained his or her degree had an impact on folic acid knowledge and practice behavior. Those who graduated in 1992 or later compared with those who graduated before 1992 were more likely to know the recommended dose

for occurrence (74 and 61%, respectively; $P < 0.0001$). A similar trend was found between the two groups regarding the knowledge of when to take folic acid, with 91% of the post-1992 graduates knowing when to take folic acid compared with 80% of pre-1992 graduates ($P < 0.0001$). Little difference was observed between the pre-1992 graduation group (31%) and those who graduated later (34%; $P = 0.157$) in identifying the recurrence prevention dose of folic acid. In contrast, 53% of health care providers who were pre-1992 graduates compared with 48% of post-1992 graduates tended to recommend folic acid most of the time or always ($P = 0.050$).

Discussion

Our findings demonstrate a positive impact of the educational campaign on folic acid-related knowledge and practice behavior of health care providers. Even among obstetricians, however, whose general knowledge about folic acid was high, 1 in 10 still did not identify the dose recommended to prevent occurrences of NTDs and almost one in four still did not recognize the dose recommended to prevent recurrences. Although nurse midwives were most likely to identify the correct responses, their impact on the incidence of NTDs may be limited by the fact that obstetricians manage the majority of pregnancies. The lower level of knowledge regarding folic acid use among family physicians and pediatricians is of concern. Family physicians provide preventive health care to large numbers of women of childbearing age and, therefore, play an important role in the prevention of NTDs. Pediatricians, during routine office visits, are in a unique position to contribute to the prevention of birth defects through education of mothers of younger children and when caring for adolescents.

Of greatest concern is that those health care providers who have the appropriate knowledge do not communicate this information to their patients. This discrepancy, which was also evident in the previously cited studies,^{3,5,6} suggests that efforts to modify provider practice behavior are needed, especially as women would be more likely to take folic acid if advised by a physician or other health professional.²

There are limitations to our survey data. First, the response rate was lower than those found in a review of the literature, which showed an average physician response rate to surveys of $54 \pm 17\%$ and $61 \pm 23\%$ for nurses.⁷ The low response rate may indicate poor interest or lack of familiarity with this type of problem. For both surveys, however, more than 3,200 health care providers returned their responses. Second, we were not able to analyze the demographics of the nonrespondents. Even with these limitations, the data do offer

insight into the knowledge and practice behavior of some Florida health care providers about folic acid and its role in the prevention of NTDs.

Conclusion

These surveys show that the folic acid educational program resulted in a positive change in the knowledge of health care providers regarding its use in the prevention of NTDs. However, 35% of family physicians and pediatricians still could not identify the correct folic acid dose to prevent occurrences of NTD. In addition, approximately 50% of these two groups fail to recommend folic acid on a regular basis to women of childbearing age. It seems that knowledge of the role of folic acid to prevent NTD is still lacking. It is critical that educational efforts targeted at health care providers be continued with increased emphasis on incorporating the folic acid message into their routine patient counseling.

Acknowledgments

We acknowledge the support of the March of Dimes staff of Florida, especially Lori Reeves, MPH, State Program Director, and Jane Correia, BS, Bureau of Environmental Epidemiology, Florida Department of Health. In addition, we thank the staff of the Spina Bifida Association of Florida, the University of Florida Institute for Food and Agricultural Sciences, and the other members of the Florida Folic Acid Council for providing folic acid educational tools and materials to the health care providers of Florida.

References

- Centers for Disease Control and Prevention. Recommendations for the use of folic acid to reduce the number of cases of spina bifida and other neural tube defects. *MMWR Recomm Rep* 1992;41:1-7.
- March of Dimes Birth Defects Foundation. *Folic Acid and the Prevention of Birth Defects: A National Survey of Pre-Pregnancy Awareness and Behavior Among Women of Childbearing Age, 1995-2001*. White Plains, NY, March of Dimes Birth Defects Foundation, 2002. Available at: http://www.marchofdimes.com/files/executive_summary_0901.pdf. Accessed May 5, 2003.
- Centers for Disease Control and Prevention. Knowledge and use of folic acid by women of childbearing age: United States, 1995 and 1998. *MMWR Morb Mortal Wkly Rep* 1999;48:325-327.
- Institute of Medicine. *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B₆, Folate, Vitamin B₁₂, Pantothenic Acid, Biotin, and Choline: A Report of the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes and its Panel on Folate, Other B Vitamins, and Choline and Subcommittee on Upper Reference Levels of Nutrients*, Food and Nutrition Board, Institute of Medicine. Washington, DC, National Academies Press, 1998.
- Chan A, Pickering J, Haan E, et al. "Folate before pregnancy": The impact on women and health professionals of a population-based health promotion campaign in South Australia. *Med J Aust* 2001;174:631-636.
- Folic Acid Alliance of Ontario. Ontario Folic Acid Survey. Available at: http://www.folicacid.ca/pdf/faoo_servey.pdf. Accessed May 5, 2003.
- Asch DA, Jedrzejewski MK, Christakis NA. Response rates to mail surveys published in medical journals. *J Clin Epidemiol* 1997;50:1129-1136.