
Brief Reports

High Rates of Neural Tube Defects in Ukraine

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BACKGROUND: Oral consumption of synthetic folic acid can prevent neural tube defects (NTDs), which are some of the most severe congenital anomalies. The prevalence of NTDs in Ukraine and other countries of the former U.S.S.R. has not been well studied. We determined the prevalence of NTD-affected pregnancies in Northwestern Ukraine as background for policy decisions related to flour fortification in this country. **METHODS:** The Ukrainian-American Birth Defects Program was established in 1999 and conducts population-based surveillance of birth defects in several oblasts (states) of Ukraine. We determined the prevalence of NTDs in the Volyn and Rivne oblasts of Northwestern Ukraine for three years, 2000–2002. **RESULTS:** There were 75,928 births in the two oblasts in 2000–2002. There were 159 cases of NTDs among live births, stillbirths, and induced abortions. The prevalence of NTDs in the two oblasts in Northwestern Ukraine is 2.1 per 1000 births. **CONCLUSIONS:** The prevalence of NTD-affected pregnancies we found in Northwestern Ukraine is almost four times what it should be. This prevalence suggests that population folate deficiency is widespread in Ukraine. Universal folic acid fortification of flour milled in Ukraine is urgently needed to end this epidemic of birth defects. Such fortification would be expected to prevent folate deficiency anemia, heart attacks, and strokes. *Birth Defects Research (Part A) 70:400–402, 2004.* © 2004 Wiley-Liss, Inc.

INTRODUCTION

Randomized controlled trials have proven that consumption of synthetic folic acid before and during the early weeks of pregnancy prevents neural tube defect (NTD)-affected pregnancies (MRC Vitamin Study Research Group, 1991). Folic acid fortification of flour in Canada and the United States, in the late 1990s, lowered the spina bifida and anencephaly rates, increased the concentration of serum folate, virtually eliminated folate deficiency anemia, and reduced the concentration of serum homocysteine (Jacques et al., 1999; Lawrence et al., 1999; Honein et al., 2001; Persad et al., 2002; Ray et al., 2002a, 2002b; Williams et al., 2002; De Wals et al., 2003). Wheat flour is largely centrally produced and is widely consumed in Ukraine. Universal folic acid fortification of flour in Ukraine could be expected to sharply lower the prevalence of pregnancies affected with NTDs. We determined the prevalence of NTD-affected pregnancies in Northwestern Ukraine as background for policy decisions related to flour fortification in Ukraine.

MATERIALS AND METHODS

The Ukrainian-American Birth Defects Program (UABDP) established an active population-based birth de-

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Conflict of Interest Statement for Dr. Godfrey P. Oakley, Jr.: While employed at the Center for Disease Control and Prevention (CDC), I was a coinventor of a patent held by the CDC and Johnson and Johnson that would cover putting folic acid in contraceptive pills. I may be compensated under the rules of the CDC, and I have been and expect to be a paid consultant of Johnson and Johnson as they seek to bring this product to the market.

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Table 1
Prevalence of Spina Bifida (SB), Anencephaly (AN), and Encephalocele (EN) for the Years 2000–2002 in the Volyn and Rivne Oblasts of Northwestern Ukraine

	Isolated			Plus other anomalies			Total
	SB	AN	EN	SB	AN	EN	
Live births from 75,609 ^a	29	1	3	4	0	1	38
Stillbirths from 319 ^a	6	12	4	1	0	0	23
Induced abortions ^b	23 ^c	45	5	8 ^d	4	1	86
Spontaneous abortions ^b	5 ^c	3	0	1	1	0	10
Total	64 ^e	62 ^f	12	14	5	2	159 ^{e,f}

^aThese data exclude non-resident mothers except for the year 2000 in the Rivne Oblast.

^bThe total number of spontaneous and induced abortions is unknown.

^cIncludes one case of iniencephaly.

^dIncludes two cases of iniencephaly.

^eIncludes one case of spina bifida which has insufficient data for classification in this table.

^fIncludes two cases with insufficient data for classification in this table.

fect surveillance system in the Rivne and Volyn oblasts (states) in 1999. Neonatologists and pediatricians in medical departments and facilities throughout the oblasts collect and submit data on live births, stillbirths, and spontaneous/elective abortions, with or without birth defects. For the initial detection of NTDs, ultrasonography is used as the most appropriate method of prenatal diagnosis. As a part of perinatal care, all pregnant women are required to have an ultrasound examination at least two times during pregnancy (at 16–18 and 24–26 weeks of pregnancy). Maternal serum alpha-fetoprotein and other maternal serum biomarkers of birth defects are detected occasionally, on a nonscreening basis. The birth defects data are reviewed and coded by registry staff according to the definitions for anencephaly, spina bifida, and encephalocele established by the International Clearinghouse for Birth Defects Monitoring Systems (International Classification of Diseases, 9th Revision, codes: 740.0, 741.0–741.9, and 742.0, respectively). Iniencephaly is classified as spina bifida. We determined the prevalence of NTD-affected pregnancies by dividing the total number of NTD-affected pregnancies (live births, stillbirths, prenatal diagnosis with induced abortions, and spontaneous abortions) by the number of live and stillbirths reported by residents of the two regions.

RESULTS

We found an overall NTD-affected pregnancy prevalence of 21 per 10,000 for all types of NTDs. Based on birth defect and neonatal data, there were 75,928 live- and stillbirths and 159 cases of NTDs among live births, stillbirths, and abortuses (159/75,928) (Table 1). We were not able to exclude nonresident births from the denominator for births in Rivne in 2000. However, there are approximately 1.3% nonresident births in Rivne per year; therefore the number of nonresident mothers for Rivne in the year 2000 would presumably not significantly influence the denominator, considering that for the years 2001 and 2002 in Rivne, there were only 183 and 195 nonresident births, respectively.

DISCUSSION

Good surveillance of NTD-affected pregnancies is difficult because NTD-affected pregnancies can be diagnosed prenatally and aborted. If one counts only babies born with

birth defects, there can be considerable underreporting of NTDs. The UABDP pays particular attention to counting all NTDs, including those that are aborted after prenatal diagnosis and those that are stillborn. The 21 per 10,000 NTD-affected pregnancies is high. Rates of 20–25 per 10,000 were found in Canada before folic acid fortification (De Wals et al., 2003). Before fortification in the United States, the rates were about 10 per 10,000 (Williams et al., 2002). Inadequate folic acid fortification of flour in the United States and Canada has been associated with 20–50% reductions in the prevalence of NTD-affected pregnancies.

Data reported from China suggest that consumption of just 400 µg of synthetic folic acid a day lowers NTD-associated pregnancies to about 5 per 10,000 (Berry et al., 1999a, 1999b). Oakley (2003) has proposed that it is reasonable to assume that the prevalence of non-folic acid-preventable NTDs is no higher than 5 per 10,000. He further concluded that, if the prevalence of NTD-affected pregnancies is above 5 per 10,000, then there is widespread folate deficiency in the population. Therefore, according to his conclusion, the 21 per 10,000 prevalence of NTD-affected pregnancies we found is four times what it would be were the population consuming enough folic acid.

Universal fortification of flour in the United States and Canada has reduced the NTD rate and prevented much, if not all, folate deficiency anemia. These programs have lowered serum homocysteine concentrations, suggesting that they lowered mortality from heart attacks and strokes (Wald et al., 2002).

Universal folic acid fortification of flour is urgently needed in Ukraine to reduce the epidemic of NTDs. Every day that passes with no fortification is a day that Ukrainian pregnancies are affected by epidemic folic acid-preventable NTDs. The experience in other countries has shown that folic acid fortification can be easily done and can make a substantial improvement in the health and nutrition of the population.

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