



# Is level of knowledge, attitude and use of folic acid among pregnant women in Croatia a call for public health action?

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## Abstract

***Aim:** Knowledge, attitudes and practices of Croatian women regarding use of folic acid (FA) before and during pregnancy are assessed. Croatia has no current official recommendations for folic acid use for women who are planning pregnancy or are already pregnant, and there is no fortification of staple foods with FA.*

***Methods.** Sample consisted of women who delivered at the Clinical Hospital Center Petrova, and a County hospital in Požega, They were interviewed by trained medical technician or nurse about their knowledge, beliefs and use of FA. Statistical analysis included descriptive statistics, binary logistic regression and the  $\chi^2$  test. Also we searched the market for availability of food supplements containing FA.*

***Results:** Among 603 women, 432 (71.7%) planned the current pregnancy, 306 (50.7%) did not take any vitamin supplement; 170 (28.2%) took some multivitamin supplements, and only 127 (21.1%) took FA supplements. Of those who have taken supplements, 58 (19.5%) decided to take FA on their own, 64 (21.5%) based on recommendations from a physician and several mentioned other sources (nurse, pharmacists, family member or media). In total 287 (47.6%) did not know what FA is. Logistic regression analysis showed that planned pregnancy is the strongest positive predictor for taking FA, while smoking and number of pregnancies are negative predictors.*

***Conclusion.** Awareness of FA role and its requirements before and during pregnancy is low among interviewed women. Better education for, both, women and health care professionals, as well as need for fortification of some staple food are recognized as important public health priorities in Croatia.*

## INTRODUCTION

Neural tube defects, serious congenital malformation, including spina bifida and anencephaly in newborns could be reduced 50–70% by mother's consumption of supplements containing folic acid (FA) (1). In the European Union more than 4500 pregnancies per year are affected by neural tube defects (2), yet fortification of staple foods with folic acid is not widely applied. When discussing possible benefits of supplementation it is important to stress the difference between fo-

late and folic acid because they are often interchanged and their dosage misinterpreted in everyday use. They are both forms of water soluble B-vitamin, folate occurs naturally in food, while folic acid is pure synthetic product that on the weight basis is twice as effective as natural folate in food. They are essential nutrients important in periods of rapid cell division such as pregnancy and childhood growth and development (3, 4). Since the intake of folate via modern diet in the industrialized world is not sufficient, the United States Center for Disease Control and U.S. Public Health Service in 1992 recommended that all women of childbearing age consume at least 0.4 mg of FA daily (5). The U.S. Institute of Medicine in Washington in 1998 reaffirmed that recommendation, adding it should be synthetic FA from fortified foods and/or supplements along with balanced diet, including as much as possible folate-rich foods. For women who already gave birth to the child with NTD the dosage should be increased to 5 mg daily (3). It is recommended that the optimal period for women to take the vitamin is from the time of stopping contraception/or from trying to conceive to 12 weeks after conception. The deficiency of FA during pregnancy is associated also with defects of upper lip and mouth, urinary tract or limb morphology by disturbances in nucleic acid synthesis and chromosomal breaks (6).

Despite of 15 years old recommendations the everyday situation is not satisfactory even in the USA. Although in many countries health authorities recommend periconceptional FA supplementation (7, 8, 9, 10), many studies have shown that educational efforts and health campaigns, alone are not sufficient. In the cases when overall percentage of supplementation rose after campaign, still actual consumption of FA at the right time and right dosage did not exceed 25%. Along with that consumption of FA in respect to socioeconomic differences remained the same or it was even amplified. Common suggestion is that fortification of staple foods is an attractive public health decision (11, 12, 13, 14).

In Croatia, regarding recommendations of FA supplementation, official guidelines for women planning pregnancy, or health professionals, do not exist, nor are staple foods fortified. Recently, there are attempts by dairy companies to enrich milk with FA, recommended for pregnant women and growing population (15). The prevalence of neural tube defects in Croatia from the EUROCAT registry in the period from 1983 when Croatia joined EUROCAT until 2006 slightly vary through the years and it is similar to some other Mediterranean countries like northeast Italy, southern Portugal or Spain. Cumulative prevalence in the period of 1983-2006 is 5.2 per 10,000 births (16, 17).

Croatian health care system that is traditionally oriented towards curative rather than preventive programs, even though, going through various reforms, has a constant lack of money and subtle but recognizable gender, poor and unemployed discrimination. Although these discriminations are unintentional they reflect failures in reforming processes. The aim of this study was to assess

the knowledge, attitude and practice of women in fertile age in Croatia regarding periconceptional FA use, and its use within the first trimester of pregnancy, in order to determine what preventive measures would be the most suitable for this population. The study could open another window for promotion of preventive medicine in Croatia.

## METHODS

### Study design

The study was questionnaire based. The study took place from March till May 2004 at two locations. One was the Clinical Hospital center – Petrova, Department for Gynecology and Obstetrics in Zagreb with about 4,100 births per year and the other the County hospital in Pozega, Department for Gynecology and Obstetrics with about 650 births per year (18). The Petrova hospital is the oldest maternity hospital in Croatia and because of its reputation has patients from all over the country, and treats most of pathologies related to pregnancy. With the sample from Pozega we reached the rural population because that hospital is the only maternity ward in a county with a predominantly rural population. The ethical committees of both hospitals approved the study.

The participants were mothers after delivery, on the voluntary basis, during their stay in the maternity wards. The participants were interviewed by trained nurses or medical technicians. The nurse visited mornings from Monday till Friday and made interviews with all mothers who gave birth the previous day. Because the minimum stay in maternity wards in Croatia is three days, women who had deliveries during Saturdays and Sundays, were interviewed on Mondays. The interviews were conducted in the patient's room, where the nurse would read the questions with multiple choice answers, and recorded the answer. The goal was to reach between 12 and 15% of annual births which was 500 participants. The procedure was the same in Pozega hospital, with a goal of 100 participants.

### Questionnaire

The questionnaire consisted of two different groups of questions: the first group was to obtain general information about participant like age, place of living, height, weight before pregnancy, marital status, level of education, smoking, and reproductive history (number of pregnancies, number of spontaneous abortions, number of alive children, history of congenital malformations among her children and in the closer family, problems with conception, health problems in pregnancy). The second group included questions about the knowledge and practice of FA intake before conception and during this pregnancy, who advised to take supplementation, the role of FA during pregnancy, and attitude towards FA supplementation.

## Statistical analysis

Statistical analysis included descriptive statistics and binary logistic regression. Adjusted odds ratio (OR) was estimated for the presence of association between taking FA and examined variables. All confidential intervals (CI) were estimated with 95% probability levels. Differences between groups were analyzed using the  $\chi^2$  test. P value < 0.05 was considered statistically significant. Software SAS (SAS Institute Inc., Cary, NC, USA) Property Software Release 8.2 (TS2M0) Licensed to SRCE, Site 0082452004, was used for analysis.

## Availability of supplements on the market

Along with the questionnaire we searched the pharmaceutical market by questioning pharmacists directly, what kind of products, containing FA, they sell, proportion of the health care insurance coverage and over the counter payment including the prices of products. In Croatia pharmaceuticals are sold in pharmacy chains privately or state owned with few exceptions of single private pharmacy shops. All pharmacies are obliged by law, to carry whatever is on the health care insurance list, and most of them carry the same over the counter products distributed by few main *engros* sellers. In Požega we examined three pharmacies from different private chains, and in Zagreb two, state owned, three private and two pharmacies that sell herbal and non prescription drugs only. The sample covers representatives of all described types of pharmaceutical selling shops.

## RESULTS

In total 609 women were interviewed but not every question was answered by every woman, so the final sample numbered 603 women. The response was 99.4% in Zagreb, and 100% in Požega. Such a high response rate we explain by the traditional respect towards medical professionals in Croatia, and to the fact that people generally easily participate in such studies. The interviews were conducted within the medical institution (hospital) which perhaps increased the mixture of both respect and fear feelings of patients. Also, we noted that mothers were more than willing to talk as they felt being left alone after the birth. Only three women due to stillborns or serious medical conditions refused the interview.

Our plan within this study was to compare two samples aiming to draw possible conclusions that would reflect specificity of urban or rural way of life. However, sample obtained from Zagreb consisted of women from city of Zagreb 271 (54.2%) and its satellites 121 (24.2%), from villages in Zagreb county 34 (6.8%) and women from all other counties in Croatia including both villages small towns and county centers 74 (14.8%). Sample from Požega consisted of women from Požega 39 (35.77%) and surrounding villages 70 (64.22%). Our idea to compare those two samples in terms of predominantly rural and urban population failed due to the fact that it is almost impossible to determine the strict difference be-

tween rural and urban way of living. Many small settlements in Croatia which legislatively have status of village in fact in terms of infrastructure or social organization live urban life. On the other hand in some cities including county centers there are people living in poor conditions often characterized for deep rural settings. Satellite cities that surround city of Zagreb recently got administrative status of cities, but there are lot o people in those regions employed in agriculture. Especially in densely populated areas it is difficult to draw the line between the rural and urban way of living, and to determine whether employment could be the differentiating factor. Therefore we can state that analysis of our sample despite being characterized as available, rather than stratified, could produce results that can show existing trends in Croatia and offer valuable course of action. Croatia is such a small country (around 4.1 millions of inhabitants) that personal characteristics, education or social position characterize someone's health behavior more than urban – rural division.

The participant's age ranged from 16 to 45 years (mean value 28.2). Regarding education 61.1% of women had medium educational level (secondary school), 25.5% have graduated at university and 13% had low educational level (elementary school). Most of them 594 (98.5%) were in permanent relation with the child's father and only 9 (1.5%) women stated to be single mothers.

Among the 603 women interviewed, 432 (71.7%) planned this pregnancy. At the moment of interview 107 women were smokers (17.7%). Others were non-smokers, some of them never smoked, other stopped at different periods of life either connected or not with pregnancy. The range of body mass index (BMI) before pregnancy was from 14.9 to 39.9.

The substantial number of women 287 (47.6%) did not know what FA is, while 270 (44.8%) women believed that intake of FA is useful. Almost the same proportion 273 (45.2%) stated that they did not believe in the benefit of FA, and the rest, about 10%, were undecided. Out of 287 who did not know what FA is 11,5% had lower education, 53,1% finished secondary school, and 35,3% had higher education. None of the women had a previous child with neural tube defect or any other related disorder.

For the question why FA is useful, 158 (26.2%) women mentioned prevention of some congenital malformations. Among women who had taken FA supplements 58 (19.5%) decided to take FA on their own, and 64 (21.5%) on the recommendations from a physician. Only few women mentioned other sources of recommendation like a nurse, pharmacist, family member, friend or media. During this pregnancy 306 women did not take any vitamin supplement, 170 had taken some multivitamin supplements and only 127 had taken FA supplements specific for pregnant women (Figure 1).

Results of logistic regression show that among all examined variables, age, smoking, planning of pregnancy, number of pregnancies and education are independently and statistically associated with intake of folic acid (Table

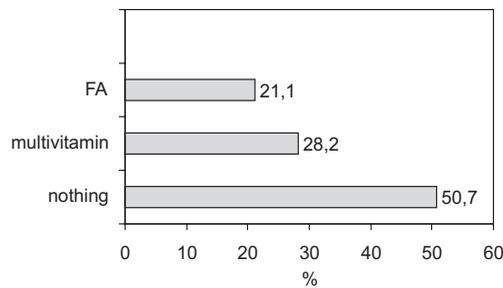


Figure 1. Supplement intake by interviewed women.

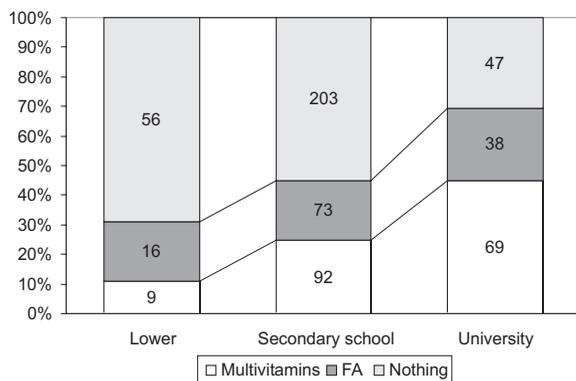


Figure 2. Relation between education level and consumption of FA.

1). Consumption of FA supplementation is more frequent among older women and women with higher education (vocational or high school and up). Planned pregnancy is the strongest positive predictor for taking FA indicating that women who planned their pregnancy took other precautionary steps as well. Smoking and

number of pregnancies are negative predictors, meaning that FA consumption among women who smoke and women who had higher number of previous pregnancies is least frequent.

Odds ratio for all variables shows that if pregnancy is planned likelihood for taking FA is 8.5 times higher than if pregnancy is not planned. Also if woman is older it is 1.1 times more likely that she will take FA.

Since variable describing education could have 8 sub-categories we wanted to see how they affect taking of supplements or FA, if analyzed according to three levels of schooling i.e. lower level (up to 8 years, elementary school, which was compulsory at the time of study in Croatia), secondary level comprised of vocational school, general high school (gymnasium) and specialized high school, and university level comprised of undergraduate and postgraduate studies. This division is best describing following job availability on the market and income. Comparing those three groups we have found statistically significant difference ( $\chi^2 = 45.2998$ ,  $p < 0.001$ ) in the way that more educated women have taken more frequently multivitamins, but for supplement containing FA only, difference was small (Figure 2).

Same subdivision was done for the number of pregnancies, including latest one and regardless outcome, (one, two and three +) and results show that women with three or more pregnancies have taken statistically significant less multivitamins but more often FA only containing supplement, than women with lesser number of pregnancies ( $\chi^2 = 20.243$ ,  $p < 0.001$ ). It is interesting that women with two pregnancies almost equally opt for multivitamins and FA only containing supplements (Figure 3). When analysis was performed comparing number of live born children in two categories formed of

TABLE 1

Estimation of selected variable impact on taking FA.

Variable	B	S.E.	Wald $\chi^2$	d.f.	p	Exp (B)	95% CI for Exp (B)	
							Lower	Upper
Age	0,0646	0,0238	7,3973	1	0,0065	1,0668	1,0182	1,1176
BMI	-0,0100	0,0314	0,1006	1	0,7511	0,9901	0,9310	1,0528
Smoking	-0,6557	0,1624	16,3133	1	<0,001	0,5191	0,3776	0,7135
Planned pregnancy	2,1515	0,3006	51,2269	1	<0,001	8,5981	4,7700	15,4981
Number of pregnancies	-0,4965	0,1225	16,4287	1	<0,001	0,6086	0,4787	0,7738
Education lower*	-1,2859	0,4370	8,6590	1	0,0033	0,2764	0,1174	0,6509
Education higher <sup>†</sup>	-0,5783	0,2401	5,8014	1	0,0160	0,5609	0,3503	0,8979
Constant	-2,8090	0,8928	9,8985	1	0,0017			

\* up to 8 years of elementary school compulsory in Croatia, compulsory

<sup>†</sup> vocational or high school and up

B logistic regression coefficient

S.E. standard error of B

df degrees of freedom

p significance level

Exp (B) estimated relative risk, odds ratio

CI confidential interval

women with up to three children and with four and more children, again women with more children have taken statistically significant ( $\chi^2 = 19.157, p < 0.001$ ) far less multivitamins and more FA only supplements.

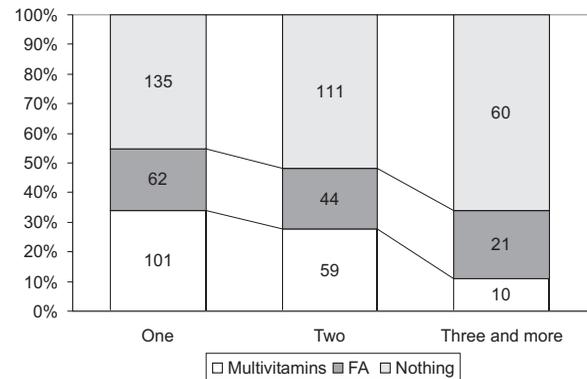
Comparing groups according to the BMI categories, marital status or number of spontaneous abortions, we did not find differences in the taking FA supplementation.

At the time of the study there were 15 various types of supplements containing FA, on the Croatian market, produced by Croatian and major international pharmaceutical companies, present in the most pharmacies. Beside that, a number of less known products could be found in various herbal pharmacies (pharmacy with only herbal and non prescription drugs). On the list covered by health care insurance was only one product with the highest, among all, concentration of FA, of 0.5 mg per tablet. Other supplements were in the form of multivitamin with concentration of FA ranging from 0.1 to 0.4 mg per tablet, with not clear directions for use. Depending on the number of tablets the prices of package ranged from 5 to 20 Euros.

## DISCUSSION

Croatia does not have any official recommendations about FA periconceptional use. The study dated in 2003 revealed a low percentage, only 14%, of appropriate FA intake in Croatian pregnant women (19). Another study conducted in Croatia measured blood concentration of folates in women in fertile age in three regions representing Mediterranean diet, typical urban life diet and meat rich diet in rural settings. Results have shown that none of these diets supplied enough folates. Only in some rural areas, during the November, when traditionally animals are slaughtered for winter-time preservation, and lot of meat with entrails is consumed, folates in women's blood reached acceptable concentration (20).

Studies from other countries showed that the educational level has positive influence on FA intake (21, 22). Our study confirms that influence but more to the overall use of multivitamin supplement, than specifically of FA. Although the most educated women had the highest percentage of general FA use, it shows that even higher educated women are not informed sufficiently about what the FA is, and subsequently what are the benefits of FA. Related to the number of pregnancies our data show that with higher number of pregnancies the percentage of vitamin supplementation decreases, but mainly because of lower intake of supplements containing multivitamin formulation. Consumption of FA only formulation intake was higher among women with higher number of pregnancies. A possible explanation is that along with the higher number of pregnancies women were more exposed to health educational message of this subject. We obtained similar results regarding the number of children and FA intake. Women with three or more children had a lower percentage of overall vitamin supplement use but reported slightly higher specific intake of only



**Figure 3.** Relation between number of pregnancies and consumption of FA.

FA. This is in the contrast with data of Gjergja *et al.* who found that in families with higher number of children the probability of use FA was lower. In addition to health education, or rather more information from the primary health care practitioners as possible explanation of these results, we can speculate that in first pregnancy families are still in better economical position, so they opt for more expensive supplementation, frequently and attractively advertised, thinking that price guaranties better quality. In second pregnancy where use of multivitamins and FA is about the same we can see the beginning of a trend towards prescription FA supplements.

There are two prescription drug lists in Croatia: one is a basic drugs list, which cost covers the Croatian institute for health insurance (the single compulsory national health insurance plan), the other contains additional drugs that patients cover themselves. The FA supplement is on the first list, free of charge if prescribed by a physician in primary health care GP or gynecologist. It is important to mention that in Croatia all women, during the pregnancy, regardless their employment or marital status, are covered by health care insurance, and they can benefit from free prescription drugs. This could also be a component of explanation for higher use of FA among women with higher number of children, who are mainly from lower income groups and it could be that they reach for the physician's prescription instead for over the counter expensive multivitamins. In addition to that, one liter of enriched milk that was available on the market at the time of the study was priced at about 1.5 Euro, which could be burden to fragile household's budget, in comparison with various types of non enriched milk that ranges from 0.4 to 0.8 Euro. Functional and/or enriched food is absolute novelty on Croatian market so it is hard to estimate its acceptance. Nevertheless, price of enriched milk indicates that it is intended for higher income families.

In our sample almost 72% of women planned their pregnancy which is similar to the results from the other Croatian study, Gjergja *et al.* who found 75% of planned pregnancies. These are higher, than usual reports of 50% of pregnancies, being unplanned (23), so that one could

expect also higher likelihood of FA supplementation. On the other hand term planned pregnancy in Croatian socio-cultural setting might have different connotation, predominantly meaning just unprotected intercourse. However, the percentage of women in Croatia who took FA is low, and some 45% of participants do not believe in the use of FA.

This study also stresses the problem of smoking which by itself indicates general neglect towards health, and in this case both for the mother herself and the child. An attitude towards smoking in this study reflects as strong predictor for non taking FA, nor other multivitamin supplements. These results, beside education on FA, call for stronger actions and education about smoking cessation in general and particularly during the pregnancy, on both primary and secondary health care level.

Based on non existing recommendation and modest consumption among pregnant woman, we can say that the potential of FA to prevent NTDs is still not recognized in Croatia among women of reproductive, age and health professionals. In the light of prices, availability of vitamin supplements and clarity of information on the product itself, on one hand, and widely promoted Mediterranean diet which is poor in folates on the other, need for some changes is evident. Direction of those changes should be towards official recommendations by professional organizations followed by health education of target population groups. Since the benefits of FA could influence the overall health status of population with additional impact on major health problems such as cardiovascular diseases (24), the option of fortification of staple food is even more attractive as a public health intervention. Although food fortification is sometimes perceived as forced medication, it became a standard public health intervention (iodine fortification of salt being best example) in many countries with mature democracy and strong civil liberties. In order to avoid income discrimination, expenses for the fortification should not be a burden for the population, and fortification should be well legislatively regulated and monitored. Also to avoid possibly unnecessary burden for population not at risk fortification could be selective and coupled with health education and promotion concerning lifestyle, self care and appropriate nutritional habits.

An editorial in the BMJ in 2002 concluded that the governments that do not ensure fortification are committing »public health malpractice« (25). Around the world 39 countries fortify flour or have agreed to do so. A comprehensive Cochrane review of the literature shows that interventions to increase knowledge and practice of FA supplements before and during pregnancy increased knowledge but lead to very modest improvement in compliance (26). On the other hand, food fortification in Canada mandating folic acid addition to flour since 1998 has been associated with decreased prevalence of neural-tube defects from 1.58 per 1000 births before fortification to 0.86 per 1000 births during the full-fortification period, a 46% reduction. The magnitude of the decrease was proportional to the refortification baseline rate in each pro-

vince, and geographical differences almost disappeared after fortification (27).

Our study supports the conclusion that folic acid fortification of flour or similar ingredient of most of the foods, is essential to reach the population in need and should be accompanied by expanded health education to promote awareness and usage of folic acid by women of childbearing age in Croatia. Food fortification should be a part of comprehensive nutrition strategy that Croatia needs to develop for groups of population at risk for micronutrient deficiency at various growth and development stages.

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