Folic acid supplementation in pregnant women

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ABSTRACT

INTRODUCTION: Folic acid (FA) deficiency is associated with neural tube defects (NTD). In a non-risk pregnancy, The Danish National Board of Health recommends FA supplementation from planned pregnancy until three month after conception. We explored pregnant women's knowledge about and actual supplementation with FA and related this to education, number of pregnancies and age.

MATERIAL AND METHODS: Eighty four consecutive pregnant women with a midwife consultation were included in the period 25-28 August 2008. All filled in a unified questionnaire.

RESULTS: 82% had knowledge of FA supplementation and 89% received FA supplementation. 51% followed national recommendations. We found a statistically significant correlation between higher educational level and knowledge about FA supplementation, actual supplementation of FA and FA supplementation in accordance with national recommendations. No statistical associations were found between number of pregnancies or age and any FA-related parameters. Family, friends, general practitioner (GP) and the internet were the main information sources.

CONCLUSION: Correct FA supplementation is quite low; conversely, knowledge about and actual FA supplementation are fairly high. Further intervention is necessary to increase the level of correct FA supplementation. Women with a low educational level – which may herald low socioeconomic status – seem to form a suitable target group for information campaigns. Multiple pregnancies or higher age should not be perceived as indicators of a higher information level. Dissemination of information to the pregnant women including family, friends, GPs or the internet is recommended.

Folic acid (FA) deficiency is associated with neural tube defects (NTD). NTD cormprises a group of diseases including spina bifida, anencephaly and encephalocele. NTD has a multifactorial aetiology that involves both genetic and environmental factors; however, it is well-established that FA intake prior to conception has an impact on neural tube defects around the 28th day after conception causing a significant reduction in the number of patients being born with NTD [1-3].

The incidence of NTD is reported to stagnate in Denmark around 1.4 pr. 1,000, equivalent to approx. 76 pregnancies (live-born, intrauterine death and induced abortions after prenatal diagnostics showing malformation) per year [4, 5].

The optimal FA dosage needed to ensure the lowest possible risk of NTD is unknown; however, the effect seems to be dose-dependent. To reduce the risk of NTD in Denmark, The Danish National Board of Health has recommended since 1997 that all women receive an FA supplement of 0.4 mg daily from planned pregnancy until three months after conception, or a 5 mg FA supplement daily from planned pregnancy until two months after conception if at high risk, i.e. women who have had a child with NTD in an earlier pregnancy, who have NTD themselves, or whose partner has NTD [1, 6, 7].

The aim of this study was to investigate pregnant women's knowledge about and intake of FA supplementation in relation to pregnancy, to determine whether they follow The Danish National Board of Health's recommendations and if FA supplementation varies with age, educational level and number of pregnancies (first or multiple pregnancies).

MATERIAL AND METHODS

The study comprised 84 consecutive pregnant women who had a midwife consultation during normal opening hours at the *Jordemodercenter Centrum, Arosgården* in Aarhus (whose catchment area covers zip codes 8000 and 8210 in Aarhus) from 25 August 2008 until 28 August 2008, both days included. Their average age was 30 years (range: 20-41). All were included and all agreed to participate following oral information. They filled in a questionnaire concerning knowledge about and information source concerning FA supplementation, timing of FA supplementation in connection with current pregnancy, age, education as well as number of pregnancies (first- or multiple pregnancies, including miscarriages). Finally, upon completion, all questionnaires were reviewed verbally by the respondent and the first author.

Statistical analyses were performed to calculate relative risk (RR) using 2 × 2 tables, and p values for significance were calculated using likelihood ratio test. 95% significance levels were used. The RR was calculated for knowledge or no knowledge of FA supplementation, FA supplementation or no supplementation in relation to current pregnancy, and FA supplementation initiated or not initiated as from planned pregnancy (in accordance

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Dan Med Bull 2010;57:A4134

with The Danish National Board of Health's recommendations). Furthermore, RRs were calculated for educational level, number of pregnancies and age. Educational level was dichotomized into bachelor level and above versus shorter education, and students were categorized at their expected finished educational level. The number of pregnancies was categorized as first time pregnancies versus multiple pregnancies. Finally, age groups were dichotomized as > 30 or ≤ 30 years of age.

RESULTS

A total of 69 of 84 (82%) patients reported knowledge of FA supplementation and 75 (89%) had received FA supplementation in connection with their current pregnancy. The recommendations from The Danish National Board of Health were followed by 43 (51%) of the pregnant women (**Table 1**).

Analyzing subgroups, we found statistically significant correlations between higher educational level and the following: knowledge of FA supplementation (RR = 1.3 (0.97; 1.7), p = 0.03), supplementation of FA in connection with current pregnancy (RR = 1.2 (0.99; 1.6), p = 0.01), and taking FA in accordance with The Danish National Board of Health's recommendations (RR = 1.9 (1.0; 3.4), p = 0.02).

No statistical differences were found between multiple pregnancies and the following factors: knowledge of FA supplementation (RR = 1.1 (0.94; 1.4), p = 0.21), supplementation of FA in connection with current pregnancy (RR = 0.88 (0.73; 1.1), p = 0.15) or FA supplementation in accordance with The Danish National Board of Health's recommendations (RR = 1.2 (0.78;1.8), p = 0.44). Furthermore, no variables correlated significantly with age > 30 (knowledge of FA (RR = 1.1 (0.91; 1.3), p = 0.36), supplementation of FA in connection with current pregnancy (RR = 0.85 (0.71; 1.0), p = 0.055), FA supplementation in accordance with The Danish National Board of Health's recommendations (RR = 1.2 (0.81; 1.9), p = 0.33)).

TABLE 1

Epidemiological data and data on knowledge about and actual intake of folic acid supplementation.

Patients included, n	84
Patients excluded, n	0
Age, yrs, average	30
Age, yrs, range	20-41
First-time pregnancy, n	56
Multiple pregnancies, n	28
Planned pregnancy, n	72
Unplanned pregnancy, n	12
Highest educational level (including students), n	
9th/10th grade from public school	6
Upper secondary school (gymnasium) or corresponding level	7
Short further education	12
Bachelor level or corresponding level of education	27
Masters degree or corresponding level of education	32
Students, n	16
Knowledge of folic acid intake in connection with pregnancy	69
Knowledge of folic acid from (more than one selection possible), n	
Family/friends	36
General practitioner	29
Internet	23
Radio/TV	5
Weekly magazines	4
Newspapers	2
Other	14
Folic acid intake in relation to current pregnancy, n	
Currently take folic acid	75
From planned pregnancy	43
From the pregnancy was discovered	32
Do not have a folic acid intake	9

DISCUSSION

In our study of 84 pregnant women with an above-average educational level consulting the midwife centre of Aarhus, we found compliance to be rather low, as only 51% of the pregnant women received FA supplementation in accordance with recommendations from The Danish National Board of Health.

Conversely, levels of information and supplementation in relation to pregnancy were relatively high among the pregnant women of whom 82% reported knowledge of the need for FA supplementation, and an even higher share, 89%, actually received FA supplementation in connection with their pregnancy. This supplementation however, had not been initiated during the critical period of the first four weeks of pregnancy. The rather low number of unplanned pregnancies in this study, 12 out of 84 cases, suggests that there is room for further intervention to improve supplementation.

We found significant correlations between educational level and all aspects of FA, including informational level and actual supplementation intake. The following other predictors for low compliance with FA supplementation in pregnancy have previously been reported: immigrant status, young maternal age, lack of a partner and unplanned pregnancies (1, 4, 9, 10, 12). Most of these risk factors co-occur with low socio-economic status, and therefore to raise FA supplementation, targeting information to this subgroup may be considered.

Surprisingly, neither age nor prior knowledge from earlier pregnancies was significantly associated with knowledge about or actual FA supplementation intake.

When asked about information sources, the majority report family, friends and their general practitioner, suggesting that knowledge of FA supplementation is known to the public, and that general practitioners are

aware of their task. This is also suggested from the fact that the pregnant women who actually use FA supplementation outnumber those who declare their knowledge of the need for FA supplementation. Further, one third reported that they had independently collected information on FA supplementation via the internet. This suggests to us the possibility of reaching the pregnant public via these information channels.

It is important to point out that this study comprised a rather limited group of respondents with an above-average educational level (59 patients (70%) had a bachelor degree or higher). The reason for this bias is probably that the interviews were performed in the centre of Aarhus. A setup that relies on patient-reported intake could also bias the results towards higher reported knowledge about FA supplementation and FA supplementation during pregnancy. Also, the size of the study itself may explain the lack of association between knowledge of FA supplementation or actual FA supplementation intake and number of pregnancies or age. Any extrapolation of our data to a broader patient group should therefore only be done with caution.

Worldwide, the focus on FA as a preventive measure to reduce NTD is increasing. Possible interventions aimed at raising FA levels include: increased intake of natural FA-rich foods, FA supplementation or FA fortification of common foods.

Natural FA has a poor bioavailability and becomes unstable during normal cooking, which can substantially reduce the vitamin content. One study found that an increase in natural FA-rich foods in the diet did not raise FA levels [1, 8].

Information about FA supplementation may either be given as advice to all fertile women, or it may be targeted at those planning a pregnancy, as recommended in Denmark. Limitations of such interventions are possible low compliance levels. Furthermore, if only women planning a pregnancy are targeted, all those with a non-planned pregnancy will not receive the information needed. The proportion of unplanned pregnancies in studies from the UK and the USA has reached 50% of all pregnancies. Adding to the problem, several studies from abroad suggest that preconceptional FA supplementation compliance is quite low, ranging from 0.9-50%, even following various public awareness campaigns [4, 9].

Several countries such as the USA, Canada, Chile, Australia, New Zealand and Ireland have implemented FA fortification of foods and achieved reductions in NTD from 20-50% [6, 10]. Raised FA levels in the general public as a result of fortification are debated internationally. Besides a significant fall in NTD, positive effects reported include birth weight, reduced risk of foetal growth retardation, and possibly a positive impact on vascular disease via modification of elevated plasma homocysteine concentrations. Arguments which have been presented against FA food fortification comprise the risk of concealing vitamin B12 deficiency if the daily intake exceeds 1 mg/day. Furthermore, concerns related to concurrent use of certain drugs, such as methotrexate and phenytoin, have also been presented [1, 4, 9, 11].

In conclusion, data from our study suggests that further measures are necessary to achieve adequate FA supplementation, and we have identified pregnant women with a low educational level – a possible indica-

Folic acid intake is recommended for all women planning a pregnancy from planned pregnancy until three months after conception.

LIST OF ABBREVIATIONS

FA = folic acid
NTD = neural tube defects
RR = relative risk

tor for low socio-economic status – as one target group of interest to such interventions. Likewise, our data suggests that careful information should be given to all who plan a pregnancy, and that there is little reason to expect women with multiple pregnancies or more life experience to have knowledge on correct FA supplementation. We recommend that interventions comprise information channels already commonly used by pregnant women, especially family, friends, general practitioners and the internet.

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ACCEPTED: 23 November 2009

CONFLICTS OF INTEREST: None

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