

Short Communication

Folic acid supplementation and social deprivation

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Submitted 14 July 2004; Accepted 25 October 2004

Abstract

Objective: To assess the use of folic acid supplementation in relation to small-area measures of social deprivation.

Design: Cohort study.

Setting: Antenatal clinic, Women's Outpatients Services, Cumberland Infirmary, Carlisle, UK.

Subjects: Four hundred and fifty women attending their 18-week antenatal clinic appointment. No selection criteria were applied. Townsend scores were allocated using postcodes to provide a small-area measure (enumeration district) of social deprivation.

Results: Eighty-nine per cent of women took folic acid prior to their 18-week antenatal clinic appointment; 48% of women took folic acid before 4 weeks of gestation. Younger women and more socially deprived women were less likely to use folic acid supplements before 4 weeks of gestation. Women with a family history of neural tube defects were no more likely to take folic acid than were women with no family history of neural tube defects.

Conclusion: A high proportion of women reported taking folic acid supplements during pregnancy but less than half took them at the most important time in early pregnancy. Younger women and women who were more socio-economically deprived were much less likely to take folic acid during the critical periconceptional period. Future strategies should promote prenatal folic acid supplementation in women under the age of 24 and in women of low socio-economic status. Further attention should also be given to the use of folic acid supplements in women with a family history of neural tube defects.

Keywords

Folic acid
Socio-economic deprivation
Pregnancy
Neural tube defects

The increase in prevalence of neural tube defects (NTD) with increasing socio-economic deprivation has been well documented^{1,2}. Nutritional status is clearly linked to the aetiology of many diseases including NTD³ and it may be possible that the socio-economic gradient observed in relation to NTD is largely driven by nutritional factors, with less affluent families having diets lower in folate⁴. Health intervention strategies that improve dietary intake of all social groups, but especially the less affluent, would therefore serve to reduce inequalities. The Medical Research Council vitamin trial highlighted the importance of folic acid in the prevention of NTD⁵ and since the early 1990s a variety of initiatives have promoted the use of folic acid supplements by women in the periconceptional period. The present study investigated the use of folic acid supplements in a group of pregnant women, in relation to small-area measures of social deprivation in the UK.

Participants, methods and results

The antenatal use of folic acid was investigated using a self-administered questionnaire (Appendix) in a cohort of 450 women attending a routine antenatal clinic at the Cumberland Infirmary, Carlisle, UK, during 2002. The response rate was in excess of 95%. All participants were Caucasian, which reflects the demography of the area served by Cumberland Infirmary. Townsend scores (1991 Census) were generated to describe socio-economic deprivation at enumeration district level. The most common deprivation index used in the UK is the Townsend deprivation index⁶. This is an area-based measure of social deprivation. It is a composite indicator based on information derived from the Census of Population (access to car, overcrowding, unemployment and owner-occupied households). Townsend scores were

derived for the Northern Region using postcode data, divided into quintiles of deprivation, and postcodes from study participants were then ascribed to the appropriate quintile. Multivariate logistic regression analysis of the dataset was undertaken using STATA (version 8.0; Stata Corporation, College Station, TX, USA). Odds ratios with corresponding 95% confidence intervals were generated and P -values <0.05 were deemed statistically significant.

The survey demonstrated that 88.9% of women reported taking folic acid supplements prior to their 18-week antenatal clinic appointment. However, only 48.4% of the women surveyed took folic acid supplements before 4 weeks of gestation, this being the time during which folic acid is effective in the primary prevention of NTD. Questionnaire data were compared in two ways: (1) those women who took no folic acid (never users) versus those women who took folic acid at any point in their current pregnancy (ever users) and (2) those women who started to take folic acid after 4 weeks of gestation plus those women who took no folic acid (late + never users) versus those women who took folic acid at <4 weeks' gestation in their current pregnancy (correct users).

Younger women were significantly less likely to use folic acid supplements at any time during pregnancy ($P = 0.034$) or before 4 weeks of gestation ($P < 0.001$), compared with those aged 25–29 years (Table 1).

Socio-economic deprivation had no influence on whether or not women used folic acid during their pregnancy ($P = 0.257$). However, a significant reduction

in the *correct* use of folic acid supplementation was seen with increasing levels (quintiles) of deprivation ($P = 0.001$) (Table 1).

Women with a family history of NTD were no more likely to use folic acid supplements than women with no reported family history ($P = 0.105$) (Table 1).

Comment

A high proportion of women reported taking folic acid during pregnancy, which suggests a significant increase on previously reported levels of folic acid supplement use in the UK⁷ and Europe^{8,9}. However, fewer than half of all pregnant women took folic acid supplements during the recommended period required for reducing the risk of NTD-affected pregnancy. Age is clearly a significant determinant of the success of folic acid supplementation as a health intervention strategy and the findings of the current study are consistent with those of Langley-Evans and Langley-Evans⁷ in this regard.

Although the use of folic acid did not differ globally across different socio-economic groups, a different picture emerged when the correct use of folic acid was considered. Women who were more socio-economically deprived were much less likely to use folic acid during the critical periconceptional period. Affluence must therefore be a primary factor in determining periconceptional use of folic acid. This is unsurprising; however, it does serve to emphasise that no matter how effective the current strategy of offering folic acid at pregnancy booking is, this is unlikely to reduce the greater prevalence of NTD in

Table 1 Comparison of the use of folic acid supplements during pregnancy according to age, social deprivation and family history of neural tube defects (NTD)

Variable	<i>n</i>	Never users vs. ever users			Never + late users vs. correct users		
		Odds ratio	95% Confidence interval	<i>P</i> -value	Odds ratio	95% Confidence interval	<i>P</i> -value
Age (years)							
Continuous	442	1.05	1.00–1.11	0.034*	1.08	1.05–1.12	$<0.001^*$
< 20	46	0.23	0.08–0.65	0.005*	0.19	0.09–0.43	$<0.001^*$
20–24	87	0.36	0.14–0.95	0.039*	0.28	0.16–0.51	$<0.001^*$
25–29	117	1.00	–	–	1.00	–	–
30–34	116	0.67	0.25–1.84	0.441	1.10	0.65–1.85	0.728
35–39	62	0.43	0.15–1.25	0.120	0.79	0.43–1.47	0.460
40+	14	0.83	0.09–7.26	0.864	0.93	0.30–2.84	0.895
Social deprivation (Townsend enumeration district score)							
Trend	369	0.87	0.68–1.11	0.257	0.76	0.64–0.89	$<0.001^*$
Quintile 1	68	1.00	–	–	1.00	–	–
Quintile 2	110	0.87	0.31–2.47	0.795	0.76	0.41–1.41	0.385
Quintile 3	75	0.56	0.20–1.62	0.286	0.68	0.35–1.31	0.248
Quintile 4	71	0.59	0.20–1.73	0.335	0.34	0.17–0.67	0.002*
Quintile 5	45	0.63	0.19–2.09	0.449	0.40	0.18–0.87	0.020*
Family history of NTD							
Yes	23	0.42	0.15–1.20	0.105	0.97	0.42–2.26	0.951
No	427	1.00	–	–	1.00	–	–

Never user – used no folic acid supplements before 18-week antenatal clinic appointment; ever user – used folic acid supplements at some point prior to 18-week antenatal clinic appointment; late user – started to use folic acid supplements after 4 weeks of gestation; correct user – started to use folic acid supplements prior to 4 weeks of gestation.

* $P < 0.05$.

lower socio-economic groups as it occurs too late in pregnancy. Thus, future strategies to reduce inequity in NTD prevalence should focus on promoting prenatal folic acid supplementation in women under the age of 24 years and in women of low socio-economic status. Further attention should also be given to the use of folic acid supplements in those women with a family history of NTD.

Intervention strategies such as 'once-a-week' folic acid supplementation have been shown to be effective in elevating physiological folate reserves in women of childbearing age¹⁰, and may have a role in overcoming the current impasse observed in folic acid supplementation practice in the UK. The data presented herein support the accumulating body of evidence that the primary prevention of NTD and other folate-related pathologies will be most effectively achieved by fortification of staple foods rather than through supplementation¹¹.

Acknowledgements

The assistance of the midwifery staff at the Cumberland Infirmary, Carlisle, in administering the questionnaire is gratefully acknowledged.

References

- 1 Little J, Elwood H. Socio-economic status and occupation. In: Elwood JM, Little J, Elwood H, eds. *Epidemiology and*

- Control of Neural Tube Defects*. Oxford: Oxford University Press, 1992; 456–520.
- 2 Wasserman CR, Shaw GM, Selvin S, Gould JB, Syme SL. Socioeconomic status, neighborhood social conditions, and neural tube defects. *American Journal of Public Health* 1998; **88**: 1674–80.
 - 3 Molloy AM. Folate bioavailability and health. *International Journal for Vitamin and Nutrition Research* 2002; **72**: 46–52.
 - 4 James WP, Nelson M, Ralph A, Leather S. Socioeconomic determinants of health. The contribution of nutrition to inequalities in health. *British Medical Journal* 1997; **314**(7093): 1545–9.
 - 5 MRC Vitamin Study Research Group. Prevention of neural tube defects: results of the Medical Research Council vitamin study. *Lancet* 1991; **338**: 131–7.
 - 6 Townsend P, Phillimore P, Beattie A. *Health and Deprivation: Inequality and the North*. London: Croom Helm, 1988.
 - 7 Langley-Evans SC, Langley-Evans AJ. Use of folic acid supplements in the first trimester of pregnancy. *Journal of the Royal Society of Health* 2002; **122**: 181–6.
 - 8 Sayers GM, Hughes N, Scallan E, Johnson Z. A survey of knowledge and use of folic acid among women of child-bearing age in Dublin. *Journal of Public Health Medicine* 1997; **19**: 328–32.
 - 9 Van der pal-de Bruin KM, de Walle HE, Jeeninga W, de Rover C, Cornel MC, de Jong-van den Berg LT, *et al.* The Dutch 'Folic Acid Campaign' – have the goals been achieved? *Paediatric and Perinatal Epidemiology* 2000; **14**: 111–7.
 - 10 Norsworthy B, Skeaff CM, Adank C, Green TJ. Effects of once-a-week or daily folic acid supplementation on red blood cell folate concentrations in women. *European Journal of Clinical Nutrition* 2004; **58**: 548–54.
 - 11 Mills JL, Signore C. Neural tube defect rates before and after food fortification with folic acid. *Birth Defects Research. Part A, Clinical and Molecular Teratology* 2004; **70**: 844–5.

Appendix – Study questionnaire

Folic Acid Questionnaire

1. Is this your 1st 2nd 3rd 4th pregnancy?
Please circle
2. Did your GP know that you were planning a pregnancy? Yes/No
3. Were you offered folic acid supplements before conception? Yes/No
4. Do you or your partner have a family history of Neural Tube Defects (e.g. spina bifida)? Yes/No
5. Were you offered folic acid supplements when your pregnancy was confirmed? Yes/No
6. Who offered you these supplements or advised you to seek them?
GP Other doctor Midwife Pharmacist
Family/friend Other _____
Please circle
7. At what stage of your pregnancy did you begin taking folic acid?
Before conception After booking (____ weeks) Other (____ weeks) Didn't take any
Please circle
8. At what stage of pregnancy were you told that folic acid would no longer be beneficial?
8 weeks 12 weeks No specific advice
Please circle

Please place patient label here