

Women's knowledge and periconceptional use of folic acid: data from three birth centers in Italy

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ABSTRACT

The Italian strategy to prevent neural tube defects is based on the periconceptional use of folic acid. This strategy implies a good capacity of control by women over their reproductive choices.

Three sample surveys of delivering women were conducted in three birth centers in two Italian cities. Overall, 973 women were interviewed through a structured questionnaire. Information on women's socio-demographic characteristics, knowledge and use of folic acid and on counselling received by health professional in anticipation of and during pregnancy were collected. Logistic regression models were used to explore factors associated with the outcome variables.

The prevalence of periconceptional use of folic acid was 37.9%. Before or during pregnancy, about half of the women had received partial information on what folic acid is and its benefits but only half of them received information on the correct period of assumption. Internet is a primary source of information for women who have the ability to search for the information they need, and these are the more educated. Older women, better educated, and Italians were more likely to plan a pregnancy, to know the correct period of folic acid assumption and to take it. Among multiparous women, those who received correct information during the previous pregnancy were more likely to use periconceptional folic acid in the present pregnancy OR=6.83 (95% CI:3.58-13.0).

The provision of information on the correct period of assumption of folic acid is associated with better knowledge and with its increasing use. Investing on provision of information instead of the directive approach represented by the compulsory fortification of food, appears an appropriate action. The prevalence of periconceptional use of folic acid is an expression of the level of women's empowerment which the public health services should always aim to improve.

KEYWORDS

folic acid, pregnancy, periconceptional period, prevention, healthcare models

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INTRODUCTION

The consensus conference of Ottawa in 1986 established the principles that should guide health promotion. The basic principle is based on the promotion of the capacity of individuals and communities to control their health status. Maternal health is a sector in which an approach geared towards the empowerment of women can be practiced rather than a medical-directive approach as is now the norm in Italy and elsewhere. Pregnancy and childbirth are mostly natural events in which the capabilities and skills of mothers could and should be strengthened. Rates of breastfeeding and of caesarean sections are outcome indicators which are an expression of women's empowerment and of the quality of maternal care services; never the less, another outcome that could be considered a test of the quality of care services is the assumption of folic acid in the periconceptional period. The periconceptional intake of folic acid requires a conscious choice on two important aspects of a woman's reproductive life: on the one hand, it is an expression of ability and propensity to plan a pregnancy, and on the other hand it involves an understanding of the risks to which the conceptus may be exposed and the remedies that can help to reduce these risks and which are potentially under the control of women.

Neural Tube Defects (NTDs), such as spina bifida, are among the most common and serious congenital malformations [1]. The formation (process of neurulation) of the NT is complete within 28 days of conception [2] (i.e. before the woman has realized that she is pregnant). During this period, the neural tube might not close properly and anomalies can occur [3]. Prevention is the only medical solution possible. In the period 2004-2008, the prevalence of NTDs in Italy was estimated to be 0.9 per 10000 livebirths (about 45-50 cases per year) and the total prevalence (livebirths+early and late fetal deaths+induced abortions) was estimated as 5.9 per 10000 pregnancies. These prevalences, together with those of Spain and Portugal, are among the lowest in Europe [4]. Since scientific evidence has established the link between these birth defects and dietary folate deficiency, and has shown that periconceptional supplements of folic acid (the synthetic form of folate) alone or combined with multi-vitamins, can lower the risk of NTDs by 40-80% [5-9], several countries have improved the assumption of folic acid in the population [10-13]. These interventions imply choices based on scientific, ethical and legal principles and still generate global debate and international controversy [14-17]. Strategies adopted in various countries [18-21] include: 1) mandatory or voluntary fortification of food (in particular grain products) with this vitamin, thus affecting the entire population; 2) recommendation that all women of childbearing age should take folic acid supplements; 3) the promotion of folic acid in the periconceptional period (from one month before conceiving and during the first three months of pregnancy) which concerns all women planning a pregnancy which is the Italian strategy. Since 2004, an Italian network for the promotion of folic acid stimulated the official recommendation on its intake in the periconceptional period, and through a website promotes the dissemination of information on the subject. Periconceptional supplementation is seen as "the central element in a strategy that also includes the increase of knowledge, promotion of dietary habits based on scientific evidence and the exploitation of women's empowerment in the management of personal health and life choices" [22]. Since 2006, the Italian National Health System offers free folic acid for all women planning a pregnancy. These interventions have helped to increase the use of folic acid in recent years. In 2008 and 2010, two population based surveys conducted by the Italian National Institute of Health to evaluate the quality of natal care services, estimated the prevalence of correct use of folic acid among Italian women to be about 21% and 25% respectively [23]. A multi center study estimated the prevalence to be about 22% in 2009 [24]. It was estimated to be about 4-5% only a few years before [25-26].

The objective of this study is to investigate knowledge of folic acid among women who have given birth in Bari and Rome, the prevalence of correct use among the sampled women, the role that care services and professionals have had in providing correct information and to explore factors associated with its use.

MATERIALS AND METHODS

This study is based on data collected by three obstetric graduate students in three birth centers, one located in the city of Bari in southern Italy, and two in Rome (birth centers "Rome 1" and "Rome 2"). For each birth center, at least 300 women were to be interviewed over a period of 1-2 months. In Bari, the survey was conducted in February 2012, in "Rome 1" the survey was conducted in December 2012 and in December 2010 in "Rome 2". The target population was all women giving birth in the birth centers in the period. The interviews were on alternate days in rotation, so as to ensure coverage of all days of the week. The eligibility criteria were: absence of maternal diseases, absence of neonatal diseases, knowledge of the Italian language. A structured questionnaire was used to interview women in the hospital before their discharge. The questionnaire consisted of 4 sections which aimed to evaluate the use of folic acid, women's knowledge, their independent capacity to search for information and the role of maternal care services in providing information (some of the questions were repeated with reference to different periods: during a previous pregnancy and then in anticipation of and during the present pregnancy); a section was dedicated to women's knowledge of spina bifida and folic acid, and the last section was to collect socio-demographic data. The outcome variables were: planned pregnancy (yes/no), periconceptional use of folic acid (yes/no), knowledge of the correct period of assumption of folic acid (yes/no). Other variables considered were: maternal age at delivery (categorized in three classes: <30 years, 30-34 years and >34 years), parity (primiparous/multiparous), maternal education (low <= 8 years, medium 9-13 years, high >13 years of school), employment status before pregnancy (employed/not employed), marital status (married (married and cohabitants)/unmarried (women who were single, divorced, separated or widowed)) and, only for multiparous women, having received information on the correct

time to take folic acid during the previous pregnancy (yes/no).

The socio-demographic characteristics and the prevalences of the main outcomes of the three birth centers were compared using the Pearson χ^2 test. To increase the power of the study, data of the three surveys were pooled. Logistic regression models were used to explore factors associated with the outcome variables. Robust standard errors were used to account for autocorrelation among observations of the three birth centers. The periconceptional intake of folic acid was also analyzed in the subgroup of multiparous women to explore the effect of having received information during the previous pregnancy. Before pooling the data, regression analyses within birth centers verified that the effects of the factors were similar (not reported). The analyses used STATA (version 11) statistical software.

RESULTS

The survey was completed by 973 women. The response rate in the three birth centers was between 90.1% and 100%. The socio-demographic characteristics of respondents are shown in *Table 1*. Significant differences were found in the three birth centers with respect to marital status, education, employment and citizenship. In general, the women of birth center "Rome 2" have a higher socio-cultural level than the women from Bari. Prevalence indicators in the three birth centers are reported in parenthesis. Overall, the prevalence of the use of folic acid during pregnancy was 95.8% (96.1, 95.3, 96.0%; $p=0.869$). The prevalence of periconceptional use of folic acid was 37.9% (31.3, 37.0, 45.1%; $p<0.001$). A planned pregnancy was reported by 64.4% of the women (66.8, 57.7, 68.6%; $p=0.008$); among women who did plan their pregnancy the prevalence of periconceptional use was 59.2% (46.8, 64.1, 65.8%; $p<0.001$).

Table 1. Women's socio-demographic characteristics, proportions of planned pregnancies and folic acid intake, by birth center. (Continues)

Variables	Birth center "Bari" N= 304	Birth center "Rome 1" N=319	Birth center "Rome 2" N=350	P values	Total N=973
Age	%	%	%		%
<30	26.6	20.1	20.0	0.144	22.1
30-34	30.6	32.6	36.6		33.4
>34	42.8	47.3	43.4		44.5
Parity					
primiparous	54.0	58.6	61.7	0.131	58.3
multiparous	46.0	41.4	38.3		41.7
Marital status					
married/cohab.	95.7	90.9	54.0	<0.001	82.4
single/sep/div/wid	4.3	9.1	46.0		17.6
Educational level					
low	25.0	14.1	5.1	<0.001	14.3
medium	41.1	49.8	58.9		50.4
high	33.9	36.1	36.0		35.3
Employment before pregnancy					
not employed	40.5	29.1	23.7	<0.001	30.7

Women's socio-demographic characteristics, proportions of planned pregnancies and folic acid intake, by birth center. (Continued)

employed	59.5	70.9	76.3		69.3
Citizenship					
Italian	94.1	88.7	84.9	<0.001	89.0
foreign	5.9	11.3	15.1		11.0
Planned pregnancies	66.8	57.7	68.6	0.008	64.4
Folic acid intake during pregnancy	96.1	95.3	96.0	0.869	95.8
Periconceptual folic acid intake	31.3	37.0	45.1	<0.001	37.9
Periconceptual folic acid intake among planned pregnancies	46.8	64.1	65.8	<0.001	59.2

Overall, among the 371 women who took periconceptual folic acid, 19.4% did so on their own initiative, 73% following the indication of their general practitioner (GP) or gynecologist, 3.5% following advice given by relatives/friends and 4% were advised by others (not reported in table). Less than half of the 627 women who had planned their pregnancy (45.8%; low education 23.0%, medium education 47.8%, high education 50.0%) reported that, in anticipation of it, their GP or gynecologist had provided information on folic acid (*Table 2*). The information provided by the GP/gynecologist explains what folic acid is (97.6%), the benefits of a proper intake (88.5%) and the importance of taking it before conception (89.2%); to a lesser extent information was given on the dose (44.2%). The information on folic acid provided during pregnancy by the GP/gynecologist (overall to the 54.8% of women; low education 43.2%, medium education 55.9%, high education 57.9%), the main subjects were: what folic acid is (97.6%), its benefits (78.3%), the importance of taking it before conception (48.5%) and dose (21.9%).

Table 2. Counselling on folic acid provided by gynecologist/general practitioner in anticipation of- and during pregnancy

Kind of information	In anticipation of pregnancy N= 627 (planned pregnancies)	During pregnancy N=973
Counselling on folic acid	%	%
Yes	45.8	54.8
If yes, on what?		
What is it	97.6	97.6
Benefits	88.5	78.3
Dose	44.2	21.9
When to start	89.2	48.5

Before conception, 65.7% of women who had planned their pregnancy (low education 43.2%, medium education 65.9%, high education 72.1%), sought information about the protection of their own health and that of their unborn child. Among the sources of information used were the Internet (50.9%) followed by the gynecologist and friends/relatives (both about 38%), books (17.5), newspapers (14.4%), midwives (11%), family physician (8.1%) and the Health Family Centers (HFC - consultori familiari (5.1%) (not reported in table)).

Overall, 66.4% of the 973 women reported that they knew about spina bifida and NTDs. Most of those women, 94.3%, said they knew the role of folic acid in reducing these risks but only 80.5% knew when it should be taken. Knowledge of NTDs is slightly higher for pluriparous than for primiparous while knowledge of correct period of assumption is lower (*Table 3*).

Table 3. Women's knowledge by parity.

Kind of knowledge	Primiparous	Multiparous	Total
	N=567	N=406	N=973
knowledge of "NTDs and spina bifida"	%	%	%
Yes	65.8	67.2	66.4
If yes:			
Woman knows that folic acid can reduce the risk	93.8	94.9	94.3
Woman knows the correct period of assumption	82.3	78.0	80.5

The results of the logistic regression analyses showed that women who were significantly more likely to plan a pregnancy (Table 4a) were older, married, better educated, and Italian. Knowledge of when to take folic acid (Table 4b) was statistically significantly higher for women who were older, better educated, employed, Italian and who planned their pregnancy. With borderline significance, also primiparous and married women were more likely to know when folic acid should be taken. Among women who planned their pregnancy, those who were significantly more likely to use periconceptual folic acid (Table 5a) were older, primiparous, higher educated, employed and Italian. The logistic regression model applied only to multiparous women (Table 5b) confirmed that higher education and Italian citizenship increase the use of periconceptual folic acid. Women who had received information about folic acid from the gynecologist, during the previous pregnancy, were more likely to use periconceptual folic acid in the present pregnancy: 79.4% vs 34.2% - OR=6.83 (95% CI: 3.58-13.0); in more detail, the prevalences of periconceptual use of folic acid by educational level, comparing women who have and who have not received a correct information were: low/medium education 86.5% vs 32.2% - high education: 72.7% vs 38.8% (not reported in table).

Table 4. Logistic regression models for planned pregnancy and for knowledge of correct period of assumption of folic acid (Continues)

	Model a			Model b		
	% of planned pregnancy N=973	Adj OR*	95% CI	knowledge of correct period of folic acid intake n=973	Adj OR*	95% CI
Age						
<30	51.2	1		44.6	1	
30-34	67.7	1.59	1.09-2.32	66.8	1.53	0.99-2.36
>34	68.6	1.54	1.04-2.28	74.1	1.92	1.24-2.99
Parity						
primiparous	62.8	1		66.3	1	
multiparous	66.8	1.02	0.75-1.38	63.6	0.72	0.51-1.03
Marital status						
married/cohabitant	67.3	1		68.2	1	
single/divorced/separated/widowed	53.7	0.41	0.28-0.61	53.7	0.71	0.45-1.10
Education						
low (≤ 8 years)	53.2	1		30.2	1	
medium (9-13)	61.0	1.16	0.76-1.76	63.9	3.50	2.14-5.72
high (>13)	73.8	1.88	1.18-3.00	81.1	5.65	3.27-9.74
Employment						
no	58.2	1		44.8	1	
yes	67.2	0.98	0.70-1.36	74.2	1.77	1.23-2.53
Citizenship						

Logistic regression models for planned pregnancy and for knowledge of correct period of assumption of folic acid (Continued)

Italian	66.2	1		70.3	1	
foreign	50.5	0.56	0.36-0.87	23.4	0.17	0.10-0.31
Planned pregnancy						
no	-	-	-	47.4	1	
yes	-	-	-	75.0	3.36	2.41-4.69

*OR adjusted for all the variables in the table and for birth center

DISCUSSION

This study based on more than 900 delivering women shows a prevalence of periconceptional folic acid intake (37.9%) which is higher than the prevalences of about 20-25% found out in previous larger studies conducted in Italy in the period 2008-2011 [23-24]. However, our study is in no sense representative of all Italy.

On the basis of the strategy adopted in Italy with regard to the prevention of neural tube defects, the proportion of women who should use periconceptional folic acid is limited by the proportion of pregnancies which are planned. In this study, 64.4% of women reported that they had planned their pregnancy which is similar to that estimated in a large European survey [27] which reported that, among Italian women, the proportion was 65%. A survey for evaluating the pre- and post-natal assistance in Italy [24], showed that the proportion of “planned” or “not excluded” pregnancies was about 78% for Italian women (foreign women: 70%); different ways of asking the question could explain this variation. Although nearly all the women (95.8%) took folic acid during pregnancy, only about half said that they received information from the gynecologist/doctor. The knowledge of women about birth defects and how to prevent them is fragmentary; among women who claimed to know about spina bifida and neural tube defects (64%), almost all knew that folic acid has a role in prevention but only 80.5% knew the correct period of intake. Although these results are not directly comparable because of the different settings and way and the order in which the questions were asked, various studies in other countries have produced similar results; the majority of women have heard of folic acid, but those who know of its relationship with neural tube defect are far fewer and fewer still are those who know the correct period when it should be taken [28-29]. In our study, women’s knowledge is consistent with the quality of the information received during the current or previous pregnancy. Slightly more than half of the women have received information about folic acid from the gynecologist; most of these women were told what folic acid is and what benefits it brings, but information on when to start taking it (useful for a subsequent pregnancy) is given to fewer women (48.5%). This percentage is lower for less educated women, 32.8% (not reported in table), although our results suggest that it may be less educated women who receive greater benefit from the information; 86.5% vs 72.7% take periconceptional folic acid among low vs high educated multiparous who received information. These results identify missed opportunities for NTDs prevention on the part of health professionals, particularly gynecologists who only provide generic information to women. In addition, less information is given by gynecologists to the least educated women, perhaps because of a tendency to assume a behavior more directive with women who are stigmatized as “unable to control their own health”, rather than focusing on their empowerment. This suggests the need for adequate training of health personnel. There is also a possible negative effect caused by receiving incomplete information rather than none. To believe to have received all the necessary information in fact, might give a false sense of security and lead women to think they have no need to delve deeper into the subject. The importance of providing women with correct and complete information is that periconceptional intake of folic acid in the current pregnancy is 2.5 times greater for multiparous women who received correct information during the previous pregnancy, compared to those who did not receive such information (Table 5). Moreover, pregnancy is for the women a very particular period that increases their sensitivity and activates reflection processes. Evidence indicates that pregnant women tend to abandon risky behaviors. This is seen, for example, among pregnant smokers who may be willing to quit [30]. This study shows that the Internet is a primary source of information for those who have the ability to search for the information they need. Thus, web sites such as the Italian network [22], could play a crucial role in the prevention of NTDs and the promotion of folic acid intake. However, it is the most educated women who are more likely to be able to take advantage of this. Moreover, our study shows that young single women with the lowest educational level and immigrant women are least likely to have planned their pregnancies and to know about and use folic acid. Thus, the health care system should adopt strategies that tend to reduce social inequalities in health. In several countries, various models of pre-conception care have been proposed but there is no consensus on how best to deliver them [9-11, 31]. Evidence on the efficacy of strategies based on the mandatory fortification of food for reducing NTDs has mainly come from countries with high baseline prevalences of these congenital malformations [32]. Moreover, it is questionable that fortification of food is able to reduce the socio-economic gap in prevalence of NTDs [33].

Table 5. Logistic regression models for periconceptional folic acid intake

	MODEL A			MODEL B		
	% of peri-conc. folic acid intake (planned pregnancies) N=627	Adj OR*	95% CI	% of peri-conc. folic acid intake (planned pregnancies) Multiparous N=271	Adj OR*	95% CI
Age						
<30	44.6	1		39.1	1	
30-34	59.6	1.46	0.87-2.46	37.8	0.71	0.28-1.80
>34	64.3	2.03	1.18-3.46	59.8	1.62	0.69-3.79
Parity				-	-	-
primiparous	64.6	1		-	-	-
multiparous	52.0	0.53	0.36-0.76	-	-	-
Marital status						
married/cohabitant	66.1	1		60.0	1	
single/divorced/separated/widow.	57.7	0.86	0.50-1.45	50.8	0.85	0.33-2.16
Education						
low (≤8 years)	27.0	1		14.3	1	
medium (9-13)	62.5	2.52	1.36-4.67	60.8	4.83	1.77-13.2
high (>13)	64.6	2.27	1.20-4.31	56.7	2.44	0.82-7.26
Employment						
no	41.4	1		34.6	1	
yes	66.0	1.58	1.03-2.41	59.5	1.16	0.56-2.40
Citizenship						
Italian	62.3	1		56.1	1	
foreign	25.9	0.27	0.14-0.56	14.8	0.28	0.08-1.02
Info on peri-concept. assumption received by gynecologist during the previous pregnancy						
no	-	-	-	34.2	1	
yes	-	-	-	79.4	6.83	3.58-13.0

*OR adjusted for all the variables in the table and for birth center

The Italian strategy for the prevention of birth defects, as opposed to strategies that provide for the fortification of foods, fits a perspective of “public health literacy” defined as “the degree to which individuals and groups can obtain, process, understand, evaluate, and act on information needed to make public health decisions that benefit the community” [34]. Care services and professionals dedicated to the reproductive health of women could and should be a prime source of information regarding prevention, especially as most women are regularly in contact with them. All care services and the professionals who deal with women’s reproductive health and, in particular, the maternal and infant care services, family planning centers and gynecologists, have a great responsibility and opportunity to increase and improve knowledge of all women, especially women with lower levels of education. A literacy action is particularly important for younger women who have lower levels of knowledge and awareness for all the considered outcomes. The kind of service that can best serve this function is multi-disciplinary as it takes an integrated approach to health; a service in which each contact with the woman for a pap-test or a pregnancy or a scheduled vaccination or family planning consultations etc, might also be an opportunity for providing women with all the information she may need in related subjects, particularly periconceptional care. From this point of view, the chance of achieving the health goals relies heavily on the motivation of health personnel. In Italy, Family Health Centers (FHC - consultori familiari) have existed since 1975

and should have these characteristics. Nevertheless, the FHCs would need strengthening and improved governance on the part of the authorities and professionals to convince women who, in the majority, still prefer to go to a private gynecologist. Although the effectiveness of health promotion and education interventions on use of folic acid in the periconceptional period resulted sub-optimal in some countries [31], the Italian strategy for the prevention of NTDs is supported by two further important considerations: 1) the mediterranean diet provides extensive consumption of fruit and vegetables, foods rich in folate, and thus folic acid supplement may be appropriate only for particular groups at risk of deficiency, and 2) the risks to the health due to increased intake of folic acid through the fortification of food or through the increase of supplements in the diet, cannot be definitively excluded. Indeed, some authors have suggested that high folic acid intake may accelerate the development of certain cancers [14, 35-37].

This study is affected by some limitations.

First, this is an exploratory study that is not “population based” and not representative of the population of Italy as it refers to only three different birth centers. However, the information gathered is valuable to assess the knowledge and awareness of NTD and folic acid and to evaluate the associated factors. Second, the questionnaire used for the interviews had many intercorrelated questions with pre-defined answers. Thus, it may have not provided some options and the sequence of the questions may have influenced some answers. The extent of this problem depends not only on the characteristics of the questionnaire, but also on the training of the interviewers. In this case, the study was conducted in the context of three graduate theses and interviews were conducted by the same students who had been individually and constantly guided by a supervisor (epidemiologist) on both the content of the survey as well as on the methodology.

In addition, questions concerning knowledge of NTD and folic acid, in contrast to other surveys, have been placed in the order as shown (first question on knowledge of NTDs and then on folic acid). This could have affected the answers given on folic acid and have produced an overestimation of knowledge. Finally, recall bias might affect the results; i.e. it is possible that pluriparous women who have used periconceptional folic acid were also more likely to recall having received counselling during the previous pregnancy. To the extent the recall bias is present, it might weaken the association found between use of periconceptional folic acid and counselling received.

Despite these limitations, this study provides more information to supplement that already known about the situation in Italy which should be monitored in future. Monitoring of the quality of care is particularly important but may also have a broader significance given the current lively debate about what are, among the various proposals, the best public health strategies to improve the intake of folic acid in the periconceptional period and for the prevention of NTDs.

CONCLUSIONS

This study confirms the evidence that the availability and/or provision of valid information on the correct period of assumption of folic acid is associated with a better knowledge and an increasing use of folic acid in periconceptional period. It is reasonable that using most of the opportunities given by the high schools, the pre-wedding and prenatal classes, the pre-pregnancy assistance and the vaccination settings, would determine a further increase. It is interesting to underscore that also less educated women, if informed, behave like the more educated ones. In general, these results confirm the possibility to invest on promotion of competence and consciousness instead of the directive approach represented by the compulsory fortification of food. The prevalence of periconceptional use of folic acid is an expression of the level of women’s empowerment which the public health services should always aim to improve.

CONFLICT OF INTEREST:

None to declare.

AUTHORS’ CONTRIBUTIONS

LL conceptualized the manuscript, conducted the analyses and drafted the manuscript; AG, PF and BE contributed to the implementation of the project, collected data and contributed to the interpretation of the results; MG designed and implemented the project, commented on the interpretation of the results and critically reviewed the draft of the manuscript.

All authors contributed to and approved the final manuscript.

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