

Knowledge of periconceptional folic acid use among pregnant women at Ain Shams University Hospital, Cairo, Egypt

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المعرفة باستخدام حمض الفوليك في الفترة المحيطة بالحمل لدى النساء الحوامل في مستشفى جامعة عين شمس، القاهرة، مصر
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الخلاصة: لوحظ في مصر وقوع مرتفع لعيوب الأنبوب العصبي. ومن المعروف أن المعالجة التكميلية بحمض الفوليك في الفترة المحيطة بالحمل تقلل من مخاطر مثل هذه العيوب. وقد هدفت هذه الدراسة المستعرضة إلى قياس مستوى المعرفة حول استخدام حمض الفوليك في الفترة المحيطة بالحمل لدى النساء الحوامل اللائي يترددن على الرعاية السابقة للولادة في مستشفى جامعة عين شمس بالقاهرة في مصر في عام 2012. فتم ملء استبيانات من خلال مقابلات شخصية مع 660 امرأة حامل. فتبين أن 62.4% من المستطاعات قد سمعن بحمض الفوليك، و39.2% منهن على علم بدور المعالجة التكميلية بحمض الفوليك في الوقاية من الشذوذات الخلقية. وكانت المعرفة عن استخدام حمض الفوليك قبل الحمل وفي الأشهر الثلاثة الأولى منه أعلى بين النساء اللواتي تلقين تعليماً جامعياً والنساء اللواتي يعملن في مهن حرفية. وقد أفادت 18.8% فقط من النساء بتناول حمض الفوليك، و8.8% منهن كن قد استخدمنه قبل الحمل. وتم اقتراح القيام بحملات توعية لتحسين المعرفة عن حمض الفوليك لدى النساء اللواتي هن في فترة الإنجاب في مصر.

ABSTRACT Egypt has a high incidence of neural tube defects. Folic acid supplementation in the periconceptional period is known to lower the risk of such defects. This cross-sectional study aimed to measure the level of knowledge about periconceptional folic acid use among pregnant women attending for antenatal care at Ain Shams University Hospital, Cairo, Egypt in 2012. Questionnaires were filled through personal interviews with 660 pregnant women. Of the respondents, 62.4% had heard of folic acid and 39.2% knew about the role of folic acid supplementation in prevention of congenital anomalies. Knowledge about using folic acid before and in the first trimester of pregnancy was highest among university-educated women and those working in professional occupations. Only 18.8% of women reported taking folic acid, and 8.8% had used it before conception. Awareness campaigns are suggested to improve knowledge about folic acid among women in the childbearing period in Egypt.

Connaissances sur l'utilisation périconceptionnelle de l'acide folique chez des femmes enceintes à l'hôpital universitaire Ain Shams, au Caire (Égypte)

RÉSUMÉ En Égypte, l'incidence des malformations du tube neural est élevée. La supplémentation en acide folique durant la période périconceptionnelle est connue pour réduire le risque de telles malformations. La présente étude transversale visait à mesurer le niveau de connaissances sur l'utilisation périconceptionnelle de l'acide folique chez des femmes enceintes consultant à l'hôpital universitaire Ain Shams au Caire (Égypte) pour des soins prénatals en 2012. Des questionnaires ont été remplis pendant des entretiens individuels avec 660 femmes enceintes. Parmi les répondantes, 62,4 % avaient entendu parler de l'acide folique et 39,2 % connaissaient le rôle de la supplémentation en acide folique dans la prévention des anomalies congénitales. Les femmes ayant fait des études universitaires et celles exerçant une activité professionnelle possédaient les connaissances les plus élevées sur l'utilisation de l'acide folique avant et pendant le premier trimestre de grossesse. Seules 18,8 % des femmes ont déclaré prendre de l'acide folique, et 8,8 % y avaient eu recours avant la conception. Des campagnes de sensibilisation sont suggérées pour améliorer les connaissances sur l'acide folique chez les femmes en âge de procréer en Égypte.

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Introduction

Neural tube defects (NTDs) are birth defects of the brain and spinal cord that can cause death, or permanent damage to the nervous system (1). The most frequent forms of NTDs are spina bifida and anencephaly (2). Such defects are among the most common birth defects worldwide (3), occurring in an estimated 300 000 newborns each year (2,4). Evidence of the relationship between insufficient intake of maternal folic acid and the risk of NTDs led to the United States Public Health Service recommendation in 1992 that women with the capacity to become pregnant need to consume 400 µg folic acid on a daily basis (5). The incidence of NTDs falls by 50%–80% when women consume folic acid supplements daily, and there is now a consensus that supplementation should begin not only during the first trimester but also earlier, before conception (6–8); this was supported by a cohort study in 1999 by Berry et al. (9).

In view of the benefits of consuming folic acid for women in the childbearing years, several studies have been conducted in different parts of the world to assess women's awareness of the role of folic acid in fetal development. In the United States of America (USA), there has been an increasing trend in the percentage of women who are aware of the benefits of folic acid, up to 85% (10), whereas in Qatar 53.7% of women had heard about folic acid and only 15% of them knew its role in preventing birth defects (11). With regard to preconceptional use of folic acid, a study conducted in Taipei among pregnant women showed that only 15.6% of them had taken folic acid before conception (12).

In Egypt, neurological disorders are the most common birth defects, with NTDs forming 10.2% of neurological disorders (13). One study found the incidence of NTDs in Egypt to be 1.38% (14), which is high compared with other parts of the world, where the reported incidence ranges from

0.05% to 0.36% (2,15). To date, there had been very little evidence in the literature about knowledge and practice of folic acid use among pregnant women in Egypt. The aim of this study was to measure the level of knowledge about periconceptional use of folic acid among pregnant women at Ain Shams University hospital, Cairo, Egypt. The current study will provide a baseline description about folic acid knowledge which can be used to assess the need for awareness campaigns.

Methods

Study design and sample

This cross-sectional, observational study was conducted in the antenatal care (ANC) clinic at Ain Shams University Hospital, Cairo, Egypt. This is considered one of the main hospitals in north-east Cairo, receiving a variety of patients from different regions of Cairo and even from other governorates. Any pregnant women aged 18–45 years who sought medical consultation at the ANC clinic were included. The diagnosis of pregnancy was confirmed by viewing patients' files, previous history, examination and investigations [previous urine beta-human chorionic gonadotropin (βHCG), blood βHCG or ultrasound]. Pregnant woman who were younger than 18 or older than 45 years were excluded. Data were collected by questionnaires from 670 pregnant women during the period from June to August 2012; 10 pregnant women did not give consent for participation in the study, giving a response rate of 98.2%.

Data collection

An anonymous, standardized questionnaire was filled through an interpersonal interview. This included 15 questions about the following: sociodemographic data (age, residency, occupation, educational level); obstetric history (gravidity, previous ANC; number of ANC visits; gestational age); and folic acid

knowledge and use (ever heard about folic acid before, from where she heard about it, recommended period of intake according to her knowledge, whether she took folic acid in the current pregnancy and if so when, benefits of folic acid intake, and different food sources of folic acid). The number of ANC visits in the current pregnancy was classified as sufficient or insufficient, according to the recommendations of the Royal College of Obstetricians and Gynaecologists (16).

The validity of the questionnaire was tested by translating a pre-existing questionnaire (17) to Arabic language and comparing the findings of both questionnaires. The reliability of the questionnaire was evaluated by interviewing 20 patients from the inpatient clinic twice with different interviewers and separated by 5 days. The findings of both interviews were compared. After the pilot study, the questions were rearranged, modified by adding more choices or substituting open questions.

The questionnaire was written in the common Egyptian Arabic dialect and each interviewer followed the question structure strictly with agreed-upon alternative explanations. Each interview was conducted by one of the trained authors. The pregnant women were interviewed while they were waiting for their ANC visit, in a separate area from the other participants to ensure privacy and confidentiality. Participants who agreed to participate were interviewed regardless of whether it was their first or follow-up visit. The interviewers visited the ANC clinic 4 times per week for a 9-week period.

Verbal consent was taken from each participant ($n = 660$) before filling the questionnaire. The study protocol has been approved by the ethics committee of Ain Shams University. The questionnaire was developed by the authors of this study in consultation with the community department at Ain Shams University. Then it received ethical approval from 2 different faculty staff members.

Data analysis

The collected data were revised, coded and tabulated using SPSS, version 15.0.1 for Windows. Quantitative continuous variables are expressed as mean and standard deviation (SD). Qualitative variables are expressed as frequencies and percentages. Student t-test was used to compare continuous variables between the 2 study groups. Chi-squared and Fisher exact tests were used to examine the relationship between categorical variables. Both univariate and multivariate logistic regression analyses were done to examine the association of awareness and intake of folic acid supplements with selected sociodemographic and obstetric characteristics of the studied women. $P < 0.05$ was considered as the cut-off value for significance.

media, books and the Internet (8.0%). The highest knowledge rates about folic acid were found among women working in professional jobs (90.9%). Women with university education (88.3%) and of women with history of ≥ 6 pregnancies (84.4%) were the most aware about folic acid. The lowest knowledge rates were among illiterate women and those with only primary school educational (25.0% and 35.6% respectively). When the participants who reported knowing about folic acid were asked about sources of folic acid, 92.0% reported folic acid supplements, 2.9% fish, 1.1% liver and 4.0% green vegetables

The relationship between the sociodemographic characteristics of the pregnant women and their knowledge about the use of folic acid was analysed

for 3 groups: those who knew about preconceptional use of folic acid ($n = 79$), those who knew about 1st trimester use of folic acid ($n = 324$) and those who knew the recommended period of intake of folic acid, i.e. knew about folic acid intake during both the preconceptional and 1st trimester periods ($n = 54$) (Table 2). Highly significant relationships between the educational level of pregnant women and their knowledge about folic acid intake were seen in all 3 groups ($P < 0.01$). Occupational status and number of previous pregnancies were significantly related to women's awareness of folic acid utilization preconception ($P = 0.011$ and $P = 0.0001$ respectively) and in both recommended intake periods ($P = 0.004$ and $P = 0.046$ respectively). Having a sufficient number of ANC visits for the current

Results

Sociodemographic characteristics and folic acid knowledge

Table 1 shows the sociodemographic characteristics of all the pregnant women in the study and of the women who had heard about folic acid before. From the total sample of 660 women, 412 (62.4%) had heard about folic acid. Only 79 (12.0%) women knew it was important to take folic acid before pregnancy and 53 (8.2%) knew about taking it in both the preconception and 1st trimester periods. Out of the whole sample of women, 259 (39.2%) mentioned its role in prevention of birth defects.

Out of the total sample of respondents, 124 (18.8%) reported taking folic acid in the current pregnancy; 58 (8.8%) had taken it before pregnancy and 80 (12.1%) took it in the 1st trimester.

For the women who had heard about folic acid their main source of knowledge was the physician, reported by 92.0%; other sources of knowledge were the family, nurses, pharmacists,

Table 1 Sociodemographic characteristics and obstetric history of the study women in relation to their general awareness of folic acid

Variable	All women		Heard about folic acid	
	No.	%	No.	%
Total	660	100.0	412	62.4
Age group (years)				
18-24	209	31.7	111	53.1
25-29	359	54.4	238	66.3
30-34	74	11.2	51	68.9
35-45	18	2.7	12	66.7
Education				
Illiterate	116	17.6	29	25.0
Primary school	45	6.8	16	35.6
Preparatory school	106	16.1	56	52.8
Secondary school	299	45.3	228	76.3
University	94	14.2	83	88.3
Job				
Not working	600	90.9	360	60.0
Skilled work	27	4.1	22	81.5
Professional	33	5.0	30	90.9
Gravidity (no.)				
≤ 2	432	65.5	266	61.6
3-5	196	29.7	119	60.7
≥ 6	32	4.8	27	84.4
ANC visits in current pregnancy				
Insufficient	99	15.0	43	43.4
Sufficient	561	85.0	369	65.8

n/a = not applicable; ANC = antenatal care.

Table 2 Relationship between women's sociodemographic and obstetric characteristics and their knowledge about folic acid supplementation in different stages of pregnancy

Variable	Knew about folic acid supplementation during:								
	Preconception (n = 79)			1st trimester (n = 324)			Both periods (n = 54)		
	No.	% ^a	P-value	No.	% ^a	P-value	No.	% ^a	P-value
Age (years)									
18–24	15	13.5	0.098	87	78.4	0.694	9	8.1	0.190
25–29	53	22.3		187	78.6		38	16.0	
30–34	7	13.7		42	82.4		5	9.8	
35–45	4	33.3		8	66.7		2	16.7	
Education									
Illiterate	1	3.4	0.002	15	51.7	< 0.001	0	0.0	< 0.001
Primary school	1	6.3		12	75.0		1	6.3	
Preparatory school	6	10.7		36	64.3		1	1.8	
Secondary school	45	19.7		189	82.9		29	12.7	
University	26	31.3		72	86.7		23	27.7	
Occupation									
Not working	63	17.5	0.011	280	77.8	0.486	40	11.1	0.004
Skilled work	4	18.2		18	81.8		4	18.2	
Professional	12	40.0		26	86.7		10	33.3	
Gravidity (no.)									
≤ 2	39	14.7	< 0.001	206	77.4	0.101	27	10.2	0.046
3–5	28	23.5		100	84.0		21	17.6	
≥ 6	12	44.4		18	66.7		6	22.2	
ANC visits in current pregnancy									
Insufficient	5	11.4	0.164	29	65.9	0.029	3	6.8	0.191
Sufficient	74	20.1		295	80.2		51	13.9	

^aPercentage of women in each sociodemographic and obstetric category who had heard about folic acid.
ANC = antenatal care.

pregnancy was significantly related to knowledge of folic acid intake during the 1st trimester ($P = 0.029$).

Univariate analysis

Table 3 shows the univariate analysis of sociodemographic characteristics of the study women and their knowledge about folic acid intake. Knowledge about folic acid intake during the preconceptional period showed significant relationships with age group (25–29 years), university education level, professional occupation and history of ≥ 2 pregnancies. Women with university education level were about 13-fold more aware about folic acid than illiterate women (OR = 12.8, 95% CI: 1.65–99.0), while specialist working

women were 3-fold more aware about folic acid than non-working women (OR = 3.14, 95% CI: 1.44–6.85). Women who had a pregnancy history of ≥ 3 were 1.8–4.6 times more aware than women with history of ≤ 2 pregnancies.

Secondary school/diploma and university levels of education were highly significantly associated with knowledge about folic acid intake during the 1st trimester. Women with secondary school and university educational level were more than 4-fold (OR = 4.52, 95% CI: 2.02–10.1) and 6-fold (OR = 6.11, 95% CI: 2.33–16.1) more aware than illiterate women respectively. Sufficient ANC visits during the current pregnancy was significantly related to knowledge about folic acid, as women

who had sufficient ANC visits during their current pregnancy were twice as aware about folic acid than those who had insufficient ANC visits (OR = 2.09, 95% CI: 1.07–4.10).

The relationship of sociodemographic characteristics of the women with their knowledge about the both periods of folic acid intake showed very similar results as for knowledge about folic acid during the preconceptional period.

Multivariate analysis

The multivariate analysis of sociodemographic characteristics is shown in Table 4. The relationships between the women's knowledge of folic acid and their sociodemographic characteristics

Table 3 Univariate analysis of association of women's sociodemographic and obstetric characteristics with their knowledge about folic acid supplementation in different stages of pregnancy

Variable	Knew about folic acid supplementation during:					
	Preconception		1st trimester		Both periods	
	Crude OR (95% CI)	P-value	Crude OR (95% CI)	P-value	Crude OR (95% CI)	P-value
Age (years)						
18–24	(Ref.)					
25–29	1.83 (0.98–3.42)	0.057	1.01 (0.59–1.75)	0.967	2.15 (1.00–4.63)	0.049
30–34	1.02 (0.39–2.67)	0.971	1.29 (0.55–3.01)	0.560	1.51 (0.51–4.50)	0.458
35–45	3.20 (0.86–12.0)	0.084	0.55 (0.15–1.99)	0.363	2.27 (0.43–12.0)	0.335
Education						
Illiterate	(Ref.)					
Primary school	1.87 (0.11–32.0)	0.667	2.80 (0.73–10.8)	0.134	1.87 (0.11–32.0)	0.667
Preparatory school	3.36 (0.39–29.3)	0.273	1.68 (0.68–4.18)	0.264	0.51 (0.03–8.45)	0.638
Secondary school	6.89 (0.91–52.0)	0.061	4.52 (2.02–10.1)	< 0.001	4.08 (0.54–31.1)	0.175
University	12.8 (1.65–99.0)	0.015	6.11 (2.33–16.1)	< 0.001	10.7 (1.38–83.5)	0.023
Occupation						
Not working	(Ref.)					
Skilled work	1.05 (0.34–3.20)	0.935	1.29 (0.42–3.91)	0.658	1.73 (0.56–5.36)	0.343
Professional	3.14 (1.44–6.85)	0.004	1.86 (0.63–5.48)	0.262	3.89 (1.70–8.88)	< 0.001
Gravidity (no.)						
≤ 2	(Ref.)					
3–5	1.79 (1.04–3.08)	0.035	1.53 (0.87–2.71)	0.141	1.90 (1.02–3.52)	0.042
≥ 6	4.66 (2.03–10.7)	< 0.001	0.59 (0.25–1.37)	0.213	3.10 (1.20–8.00)	0.019
ANC visits in current pregnancy						
Insufficient	(Ref.)					
Sufficient	1.96 (0.75–5.16)	0.171	2.09 (1.07–4.10)	0.032	2.25 (0.67–7.53)	0.189

OR = odds ratio; CI = confidence interval; ANC = antenatal care; (Ref.) = reference category.

in the multivariate analysis were similar to those in the univariate analysis, except for occupational status which was not significant in multivariate analysis.

Discussion

The impact of NTDs is considered a global health-care issue affecting huge number of newborns each year (4). Fortunately, the risks of NTDs can be reduced by using folic acid before and during the 1st trimester of pregnancy (6,8,9). In Egypt, the high incidence of NTDs (14) points to a need for prevention by increasing women's awareness of periconceptional use of folic acid. The present study at a tertiary care clinic in

Cairo, Egypt showed that 62.4% of the pregnant women surveyed knew about folic acid in pregnancy. Looking at different studies conducted in the Middle East, the level of awareness ranged from 46.6% to 85% (11,18,19). In Taiwan the awareness rate among pregnant women was 89.1% (12). In a study in Kansas, USA, the level of general awareness about folic acid was 88% among women of child-bearing ages (20). A small percentage of women in the present study had some university education (14.2%) whereas in the Kansas study 65.6% of women had some college education or were college graduates (20), which might explain their higher general awareness level.

The present study demonstrated that the proportion of all participants

who knew about the benefits of folic acid in prevention of birth defects was 39.2%. This percentage is higher than in other nearby countries in the Middle East (8.7%–14%) (11,18,21), but lower than in Israel and Abu Dhabi, United Arab Emirates (UAE) (46.6%–77.7%) (19,22), which shows that there is room for improvement. When compared with Israel our women's knowledge about taking folic acid both preconception and in the 1st trimester was considerably lower (Egypt: 8.2%, Israel: 77.7%) (19).

Although in the present study the nature of the women's occupation affected their knowledge about use of folic acid before conception, it was significant in univariate analysis but not in multivariate analysis, which suggests

Table 4 Multivariate analysis of association of women's sociodemographic and obstetric characteristics and their knowledge about folic acid supplementation in different stages of pregnancy

Variable	Knew about folic acid supplementation during:					
	Preconception		1st trimester		Both periods	
	Adjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Age (years)						
18–24	(Ref.)					
25–29.	1.42 (0.72–2.81)	0.313	1.04 (0.57–1.88)	0.906	1.69 (0.73–3.87)	0.218
30–34	0.71 (0.24–2.11)	0.536	1.44 (0.55–3.77)	0.461	0.99 (0.28–3.45)	0.983
35–45	2.07 (0.46–9.38)	0.343	0.68 (0.17–2.77)	0.589	1.58 (0.25–9.96)	0.628
Education						
Illiterate	(Ref.)					
Primary school	1.94 (0.11–35.0)	0.653	2.66 (0.66–10.8)	0.171	1.85 (0.10–33.4)	0.676
Preparatory school	3.00 (0.33–27.2)	0.329	2.11 (0.82–5.44)	0.124	0.47 (0.03–8.12)	0.605
Secondary school	7.65 (1.00–58.7)	0.050	5.67 (2.44–13.2)	< 0.001	4.62 (0.60–35.8)	0.143
University	15.33 (1.88–124)	0.011	7.23 (2.52–20.7)	< 0.001	13.1 (1.59–108)	0.017
Occupation						
Not working	(Ref.)					
Skilled work	0.77 (0.23–2.54)	0.666	1.07 (0.33–3.48)	0.906	1.11 (0.33–3.75)	0.865
Professional	1.53 (0.61–3.84)	0.370	1.03 (0.31–3.47)	0.959	1.40 (0.53–3.74)	0.499
Gravidity (no.)						
≤ 2	(Ref.)					
3–5	2.17 (1.18–4.00)	0.013	1.73 (0.93–3.23)	0.083	2.30 (1.13–4.67)	0.021
≥ 6	6.23 (2.37–16.4)	< 0.001	0.61 (0.24–1.57)	0.307	4.83 (1.59–14.7)	0.006
ANC visits in current pregnancy						
Insufficient	(Ref.)					
Sufficient	1.90 (0.68–5.29)	0.220	2.21 (1.08–4.52)	0.030	2.01 (0.57–7.10)	0.281

OR = odds ratio; CI = confidence interval; ANC = antenatal care; (Ref.) = reference category.

that as a variable it has less influence than educational level or number of pregnancies. Knowledge about the use of folic acid during both the preconceptional and 1st trimester periods was very high among women with university education, and increased significantly with the number of pregnancies.

In the present study 18.8% of the pregnant women reported consuming folic acid during the current pregnancy. In the UAE the percentage was much higher, at 68% (18,22), which may be due to the fact that the UAE government ANC facilities provided folic acid free of charge. Supplying folic acid supplements for all visitors to ANC clinics is likely to raise the percentage of females using them and hence

decrease the incidence of NTDs. This is an important consideration for policy-makers. Besides the emotional, psychological and physical effects of spina bifida, the total cost of lifetime management of the cases who survive is high and causes a huge burden on the community (23). Further studies should be done to study the cost–benefit of providing folic acid free of charge in Egypt.

A study in Qatar demonstrated that the physician was the main source of women's knowledge about folic acid (63.4%) (11), although in Taipei the percentage was 44.4% (12). Other sources of knowledge in those studies included newspapers, books, nurses, pharmacists and the family. Our study

revealed that 92.0% of women knew about folic acid from the physician. This finding should be considered in folic acid promotion campaigns. Amtai et al. suggested that every family planning consultation and every child vaccination should be used as an opportunity to promote folic acid use (19). This is also applicable in Egypt, especially during visits for obligatory childhood immunizations. Another method of spreading folic acid awareness is through awareness campaigns, which could include posters, announcements in the media and sessions for high-school or even university students. These campaigns should educate women about foods that are rich in folic acid, in addition to encouraging the consumption of the

recommended daily dose of folic acid supplements or as part of multivitamin tablets.

Fortification of foods with folic acid is another strategy for decreasing NTDs. Data has revealed an association between folic acid fortification and a decrease in the risk of NTDs (24). It is noteworthy that the fortification of some foods, including enriching cereals and grains with folic acid, was mandated in the USA since 1998 (25). After folic acid fortification was implemented the reduction in the prevalence of NTDs in the country was 23% (26).

There were some limitations that may have affected the study findings. First, the study may have been subjected to population bias, as the data were collected from only one health-care centre in Cairo, Egypt. Secondly, the study women were attending a tertiary health-care facility and they may not have had the same level of knowledge

as women attending for ANC in primary or secondary health-care facilities. Thirdly, women below age 18 years and older than 45 years were not included in our sample and therefore our results might not accurately reflect the level of knowledge about folic acid in all women of childbearing ages. Finally, women were included regardless their previous number of ANC visits.

In conclusion, there is room for improvement regarding the knowledge about folic acid among women in the childbearing years in Egypt. The present study revealed that a small proportion of women were aware about the importance of preconceptional folic acid, and even fewer had consumed folic acid in the preconceptional period. Knowledge about folic acid intake was significantly higher among women with university education and high gravidity. Although doctors were the main source of knowledge, we suggest that

health-care providers should be given guidelines about raising awareness of folic acid among women of reproductive age. Additionally, awareness campaigns about folic acid should be held, targeting women in the reproductive age groups. Further studies need to be conducted in Egypt to demonstrate the cost-benefit of providing folic acid supplementation free of charge to all women at ANC clinics and for a programme of food fortification with folic acid.

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