

## Knowledge and practice of urban Iranian pregnant women towards folic acid intake for neural tube defect prevention

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### Abstract

**Objective:** To assess the knowledge and practice of urban Iranian pregnant women regarding periconceptual folic acid intake for neural tube defect (NTD) prevention.

**Methods:** The population-based study was done on 676 primiparous women in an urban area in Golestan province in northern Iran from June to November, 2008. A questionnaire was completed by the subjects regarding their knowledge of folic acid. Questionnaires were administered to women who were seeking routine antenatal care at health centres, private gynaecological clinic and the Dezyani Gynaecologic and Obstetric Hospital. Questions covered knowledge and use of folic acid supplements and demographic and socioeconomic characteristics.

**Results:** Out of the 676 women surveyed, 96.2% reported that they heard of folate. Of these, only 27.6% knew that folate was something important in the prevention of neural tube defects. Overall, 20.12% of the total women took folic acid during periconceptual period. The most common information sources on folate were healthcare service (54.5%). Besides, 37.6% of the subjects who heard about folate were aware that green leafy vegetables were fortified with folic acid. In univariate analysis, knowledge and intake of folic acid was not associated with education and the age of women.

**Conclusion:** A healthcare plan for intervention to increase the knowledge and intake of folic acid by pregnant women during the protective period is required.

**Keywords:** Folic acid, Periconceptual, Neural tube defects, Pregnancy, Knowledge, Iran. (JPMA 62: 785; 2012)

### Introduction

The term neural tube defect (NTD) describes any malformation of the embryonic brain and/or spinal cord, including spina bifida, anencephaly and encephalocele. NTDs are among the most common birth defects, contributing to miscarriage, infant mortality, severe congenital abnormalities and serious disability.<sup>1</sup>

Several studies have shown that periconceptual use of folic acid has an effective role in the prevention of NTDs.<sup>2-5</sup> Czeizel et al in a cohort-controlled trial in Hungary reported that periconceptual multivitamin supplementation causes a reduction in certain congenital abnormalities, including NTDs.<sup>2</sup> Wilson et al showed the efficacy of supplementary folic acid in the prevention of NTDs.<sup>3</sup> Bower et al showed that periconceptual folic acid supplementation in Western Australia since 1996 had reduced anencephaly (32%), spina bifida (23%), and encephalocele (34%).<sup>4</sup> Berry et al reported that periconceptual folic acid supplementation reduced the rate of NTDs in China.<sup>5</sup>

Studies have also shown that 50-80% of NTDs can

be prevented if a woman consumes sufficient amount of folic acid daily before conception, and throughout the first trimester of her pregnancy.<sup>3,6</sup> Over the last 2 decades, in several countries, national public health authorities have recommended the consumption of folic acid (at least 400 microgram) as supplementation from 1 month before pregnancy until the 12th week of pregnancy.<sup>5,7</sup>

Folic acid is the fully oxidised monoglutamyl form of the water-soluble vitamin commercially used in supplements. In metabolism process, folic acid is converted into co-enzyme forms required in numerous one-carbon transfer reactions involved in the synthesis, inter-conversion and modification of nucleotides, amino acids and other essential structural and regulatory compounds. Folic acid deficiencies can interfere with DNA synthesis, reduced cell growth and the destruction of cell division.<sup>8</sup>

Despite folic acid recommendations and national campaigns, in many countries periconceptual intake of additional folic acid remains inadequate.<sup>9-12</sup>

Abdulrazzaq et al<sup>9</sup> in the UAE, and Sayers et al<sup>10</sup> in Ireland reported that actual periconceptual use of folic

acid in women was 8.3% and 4.5% respectively. Also, Braekke and Staff in Oslo have shown that only 17% of all women had started taking folic acid supplementation preconceptionally.<sup>11</sup> Colls et al in a Mediterranean area reported that only 6.9% did so during the effective period from 4 weeks before conception to 4 weeks after conception.<sup>12</sup>

Furthermore, NTDs account for 21.7% of all notified congenital birth defects in northern Iran, with an incidence of 28 per 10,000 livebirths during the period 1998-2005.<sup>1</sup> To our knowledge, no study has been conducted on the awareness and intake of additional folic acid among women of child-bearing age in the Golestan province of northern Iran. Thus, this questionnaire-based study was done to assess the knowledge and practice of urban pregnant women regarding periconceptional folic acid intake for NTD prevention.

### Subjects and Methods

This cross-sectional population-based study was done involving primiparous women in the urban area of Golestan province in north of Iran from June to November, 2008. Ethical approval for the study was obtained from the Ethics Committee of the Golestan University of Medical Sciences.

The Golestan province, located in northern Iran, has a population of about 1.8 million and covers an area of about 20,460 square kilometers with an annual rate of more than 31000 deliveries. In estimating the true prevalence of folic acid awareness in the general female population, it was assumed that this would be approximately similar to the numbers previously reported.<sup>13</sup>

Sample size for 5% of awareness about folic acid and zinc from a study with certitude 0.015 and type 1 error (0.05) was estimated. The 676 subjects were selected by convenient purposive sampling from among women who were registered with Primary Healthcare Centers (PHCs), private gynaecology clinic and the Dezyani Gynaecology

and Obstetric Hospital. After all the subjects aged 18-45 years agreed to participate in the study, qualified nurses and health educators were instructed to structurally interview them and complete a questionnaire.

The questionnaire covered the knowledge and use of folic acid supplements, source of knowledge, intake of dietary and folic acid supplement, and the potential benefit of taking folic acid supplements. The questionnaire was anonymous and completed on a voluntary basis. It consisted of two different groups of questions: the first part comprised of variables of socio-demographic status (maternal age, level of education, family income) and pregnancy planning (yes/no) for current and previous pregnancies. The term 'pregnancy planning' referred to a decision by the women to stop using contraception in order to achieve pregnancy, and the consideration about changing the dietary habits prior to conception.

The second part included questions about the awareness and knowledge of FA's role, supplementation and fortification, the sources of information (the media, their doctor or a friend); timing of the information (before conception; before the last menstrual period; during or after pregnancy), the practice of FA intake in current pregnancies.

The Statistical Package for Social Sciences (SPSS) version 11.5 was used for statistical analysis. To examine the association of awareness about and intake of folic acid supplement with selected socio-demographic profile of women, univariate logistic regression analyses were done. The results of these analyses were expressed as odds ratios (OR) and their 95% confidence intervals (95% CI). An OR was considered significant if its 95% CI excluded 1.00. The level  $p < 0.05$  was considered to be the cut-off value for significance.

### Results

The mean age of the women included in the study was  $23.4 \pm 4.1$  years. The mean age of gestational stage at which women were interviewed was 24 weeks. In terms of

**Table-1: Knowledge and intake of folic acid among Iranian women.**

Characteristics	Frequency n (%)	Ever heard of folic Acid n (%)	Intake of folic acid		
			Periconceptional n (%)	First Trim n (%)	Any Time After First time n (%)
Age groups(years)					
<20	255(35.4)	247(35.2)	103(34.4)	103(36.2)	32(35.9)
20-25	331(45.9)	319(45.6)	141(47.2)	131(46.1)	37(41.6)
25-30	105(14.6)	104(14.9)	44(14.7)	37(13)	16(18)
>30	30(4.1)	30(4.3)	11(3.7)	13(4.6)	4(4.5)
Level of education					
Illiterate	15(2.1)	13(1.85)	7(2.3)	2(0.7)	3(3.4)
Primary	271(37.48)	261(37.2)	91(30.4)	109(38.2)	43(48.3)
Secondary	137(18.94)	135(19.2)	59(19.7)	57(20)	16(18)
High School	272(37.6)	265(37.7)	134(44.6)	104(36.5)	24(27)
University	28(3.9)	28(4)	9(3)	13(4.6)	3(3.3)

age 23.5% women were under 20, and 5.3% over 30 years old. Pregnancies were planned in 91.3% of the cases. The association of knowledge and intake of supplementary folic acid with age and education of the women was calculated (Table-1). As high as 96.2% of the women reported that they had heard about folic acid. Despite these results, few women (27.6%) understood that the use of folic acid supplement during periconceptional period could help

**Table-2: Univariate analysis of the association of socio-demographic characteristics of women and the awareness about folic acid.**

Characteristics	OR (%)	95%CI	P-value
<b>Age groups(years)</b>			
<20	0.881	0.394-1.97	0.758
20-24	0.77	0.347-1.70	0.52
25-30	0.8	0.335-1.908	0.615
>30	1	-	-
<b>Level of education</b>			
Illiterate	0.485	0.124-1.903	0.299
Primary	0.387	0.174-0.863	0.06
Secondary	0.631	0.275-1.447	0.277
High School	0.659	0.299-1.453	0.301
University	1	-	-

**Table-3: Univariate analysis of the association of age and level of education of women and the intake of folic acid.**

Characteristics	OR (%)	95%CI	P-value
<b>Age groups(years)</b>			
<20	1.33	0.37-4.801	0.660
20-24	0.721	0.21-2.47	0.604
25-30	0.690	0.185-2.584	0.582
>30	1	-	-
<b>Level of education</b>			
Illiterate	1	0.082-12.163	1
Primary	0.675	0.152-3.006	0.606
Secondary	0.702	0.150-3.294	0.654
High School	0.571	0.129-2.526	0.460
University	1	-	-

**Table-4: Folate awareness rate and actual periconceptional use among women in different studies.**

Study	Author	Year	Sample Size (n)	Folate awareness (%)	Actual periconceptional use (%)
UK	Wild et al. <sup>21</sup>	1996	300	41	NA
Ireland	Sayers et al. <sup>10</sup>	1997	335	63.6	2.7
USA	Kloeblen <sup>17</sup>	1999	251	57	45
Spain	Coll et al. <sup>12</sup>	2000	1,000	50.6	6.9
Canada	Morin et al. <sup>18</sup>	2002	1,240	70	25
USA	van den Berg et al. <sup>23</sup>	2002	16,555	50	40
China	Ren et al. <sup>24</sup>	2004	693	30	15
U A Emirates	Abdulrazzaq et al. <sup>9</sup>	2003	336	46.6	8.3
Honduras	Ying Wu et al. <sup>25</sup>	2007	636	45	25
Croatia	Gjergja et al. <sup>13</sup>	2003	569	71.7	14.4
Qatar	Bener et al. <sup>14</sup>	2004	1,480	54	20.3
Thailand	Nawapun & Phupong. <sup>16</sup>	2005	401	24.4	9.7
Iran	Present study.	2008	676	27.6	20.1

prevent NTDs. When asked how they had been made aware of the benefits of taking folic acid, the most commonly cited sources of information were the healthcare service (54.5%), radio and TV (17.8%) and midwifery (11.2%).

Most of the women (92.3%) reported that they had taken folic acid at some period, but 20.1% subjects consumed folic acid during the periconceptional period of pregnancy. Univariate analysis showed that the awareness about folic acid was not associated with the level of education and age of the women (Table-2). Also, univariate of selected socio-demographic characteristics of the studied women and intake of folic acid before pregnancy showed that there was no significant association between the intake of folic acid and education or age of the women (Table-3).

Knowledge about types of natural foods rich in folic acid was also assessed. Surprisingly, only 37.6% of the women could identify any. Ninety-nine percent of the women had positive attitude about using folic acid for the prevention of NTDs in their next pregnancy.

## Discussion

The awareness of folic acid in primiparous women in northern Iran was found to be 27.6%. This rate is much lower than in the other middle eastern countries,<sup>9,14</sup> but higher than those among Thai and Japanese women.<sup>15,16</sup>

Abdulrazzaq et al<sup>9</sup> in the UAE and Bener et al<sup>14</sup> in Qatar showed that the awareness of folic acid in women was 46.6% and 54%, respectively.

Also, Kondo et al<sup>15</sup> reported that less than 15% of Japanese women were aware of a link between folic acid and NTDs. Furthermore, Nawapun and Phupong<sup>16</sup> showed that the awareness of folic acid was 24.4% among Thai women.

In our study, although 96.2% of women had heard of folic acid, only 20.1% of the women took folic acid

during the periconceptual period. Folic acid intake rate is similar to a study in Qatar (20.3%),<sup>14</sup> but our rate is lower than the rate from other reports related to the USA (45%)<sup>17</sup> and Canada (25%).<sup>18</sup> Also, our folic acid taken rate is higher than the studies from Spain (6.9%),<sup>12</sup> Thailand (9.7%),<sup>16</sup> Ireland (2.7%)<sup>10</sup> and the United Arab Emirates (8.3%)<sup>9</sup> (Table-4). The folic acid taken rate in our study indicates an urgent need of a systematic plan for improvement in the use of periconceptual folic acid supplement.

In this study, 37.6% subjects identified natural foods rich in folic acid. This rate is almost similar to other studies.<sup>16,17</sup> Nawapun and Phupong among Thai women reported that 32.4% women could identify types of natural foods rich in folic acid.<sup>16</sup> Also, Kloeblen study among 251 low-income, predominantly minority, pregnant women in Atlanta, USA, determined that only 30% of the women could list any food sources of folate.<sup>17</sup>

This may suggest that folic acid intake through diet in the population could be due to the impact of healthcare recommendations. Despite the existence of scientific evidence on the effectiveness of folic acid supplementation in the prevention of NTDs, and its recommendation by healthcare authorities, only 20.2% women in our setting took this vitamin properly. This finding is similar to other reports from developed and developing countries where 20.3-70% of women take folic acid during the periconceptual period.<sup>14,18,19</sup>

The poor intake of folic acid in our region may be due to certain reasons. First, the awareness of the population about the need to take folic acid is low (27.6%). This is considerably lower than the report from The Netherlands with 74%.<sup>20</sup> Also a reason may be that folic acid is not prescribed in time. A late medical appointment is an important factor in this regard. The other reason may be disorders in the absorption of folic acid, because gastrointestinal disorders and h.pylori infections are high in the region.<sup>21,22</sup>

Another reason may be the misperception that folic acid consumption increases gastrointestinal disorders.

According to Univariate analysis, we found no relation between educational level, age of mothers, and the awareness about folic acid. Also, educational level and age of mothers did not relate to the correct intake of folic acid, but in other studies these relations have been reported.<sup>14,16</sup>

Bener et al's study<sup>14</sup> showed that awareness of folic acid among Qatari women was significantly associated with education of the mother. Also, women with higher education (from high school to university level) knew more about folic acid, and used it more often

in the periconceptual and first trimester period.<sup>14</sup> A study among Thai women also showed that the educational level was related to the intake of folic acid during the correct period.<sup>16</sup>

The sources of information reported by the subjects were not similar to those reported in previous studies.<sup>12,14,16,23,24</sup> In our study, a majority of women recalled hearing about folate from the healthcare service, but in some studies, a majority of women recalled hearing about folate from their doctors.<sup>14,24</sup>

Bener et al reported that the most common sources of information about folate were the physicians (63.4%) and newspaper/magazine/books (21.7%).<sup>14</sup> French et al also reported that a majority of women recalled hearing about folate from their doctors.<sup>24</sup> Furthermore, in several studies the majority of women recalled hearing about folate from the media.<sup>13,16,23</sup> Gjergja et al reported that among Croatian pregnant women, the media (TV, radio, newspapers, internet, etc.) was the most frequent source of information about folic acid (40.68%). The physician was the second source of information (30.82%).<sup>13</sup> Nawapun and Phupong also reported that the media was the most frequent source of information (48.6%) for Thai women. The other sources of information were doctors/healthcare personnel (20.8%) and friends/relatives (6.7%).<sup>16</sup>

In our study, however, 96.2% of the women had at least heard about folic acid. Only 27.6% of them knew about its role against NTDs. Also, only 20.1% of the women took folic acid during the periconceptual period. Our findings indicated low awareness and knowledge about folic acid among Iranian women in urban area in northern Iran. Further efforts are needed to inform the population and promote optimal use of folic acid supplements at the correct time and in enough dosage. Promoting knowledge about the importance of folic acid intake via healthcare personnel and media should contribute to the efforts.

## Conclusion

There is a strong need for immediate public health education initiative. Information to specifically inform women about the need to take folic acid for the prevention of NTDs by all tiers of healthcare system and media, can improve the intake of folic acid during the protective period.

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## References

1. Golalipour M, Mobasheri E, Vakili M, Keshtkar A. Epidemiology of neural tube defects in northern Iran, 1998-2003. *East Mediterr Health J* 2007; 13: 560-6.
2. Czeizel AE, Dobó M, Vargha P. Hungarian cohort?controlled trial of periconceptional multivitamin supplementation shows a reduction in certain congenital abnormalities. *Birth Defects Res A Clin Mol Teratol* 2004; 70: 853-61.
3. Wilson R, Davies G, Desilets V, Reid G, Summers A, Wyatt P, et al. The use of folic acid for the prevention of neural tube defects and other congenital anomalies. *J Obstet Gynaecol Can* 2003; 25: 959.
4. Bower C, D'Antoine H, Stanley FJ. Neural tube defects in Australia: trends in encephaloceles and other neural tube defects before and after promotion of folic acid supplementation and voluntary food fortification. *Birth Defects Res A Clin Mol Teratol* 2009; 85: 269-73.
5. Berry RJ, Li Z, Erickson JD, Li S, Moore CA, Wang H, et al. Prevention of neural-tube defects with folic acid in China. China-U.S. Collaborative Project for Neural Tube Defect Prevention. *New Eng J Med* 1999; 341: 1485-90.
6. Johnston Jr RB. Folic acid: new dimensions of an old friendship. *Adv Pediatr* 1997; 44: 231-61.
7. ACOG practice bulletin. Clinical management guidelines for obstetrician-gynecologists. Number 44, July 2003. (Replaces Committee Opinion Number 252, March 2001). *Obstet Gynecol* 2003; 102: 203-13.
8. Potzsch S, Hoyer-Schuschke J, Seelig M, Steinbicker V. Knowledge among young people about folic acid and its importance during pregnancy: a survey in the Federal State of Saxony-Anhalt (Germany). *J Appl Genet* 2006; 47: 187-90.
9. Abdulrazzaq YM, Al-Gazali LI, Bener A, Hossein M, Vergheze M, Dawodu A, et al. Folic acid awareness and intake survey in the United Arab Emirates. *Reprod Toxicol* 2003; 17: 171-6.
10. Sayers G, Hughes N, Scallan E, Johnson Z. A survey of knowledge and use of folic acid among women of child-bearing age in Dublin. *J Public Health Med* 1997; 19: 328-32.
11. Braekke K, Staff AC. Periconceptional use of folic acid supplements in Oslo. *Acta obstetrica et gynecologica Scandinavica*. 2003; 82: 620-7.
12. Coll O, Pisa S, Palacio M, Quintó L, Cararach V. Awareness of the use of folic acid to prevent neural tube defects in a Mediterranean area. *Eur J Obstet Gynecol Reprod Biol* 2004; 115: 173-7.
13. Gjergja R, Stipoljev F, Hafner T, Tezak N, Luzar-Stiffler V. Knowledge and use of folic acid in Croatian pregnant women--a need for health care education initiative. *Reprod Toxicol* 2006; 21: 16-20.
14. Bener A, Al Maadid MGA, Al-Bast DAE, Al-Marri S. Maternal knowledge, attitude and practice on folic acid intake among Arabian Qatari women. *Reprod Toxicol* 2006; 21: 21-5.
15. Kondo A, Kamihira O, Shimosuka Y, Okai I, Gotoh M, Ozawa H. Awareness of the role of folic acid, dietary folate intake and plasma folate concentration in Japan. *J Obstet Gynaecol Res* 2005; 31: 172-7.
16. Nawapun K, Phupong V. Awareness of the benefits of folic acid and prevalence of the use of folic acid supplements to prevent neural tube defects among Thai women. *Arch Gynecol Obstet* 2007; 276: 53-7.
17. Kloeblen AS. Folate knowledge, intake from fortified grain products, and periconceptional supplementation patterns of a sample of low-income pregnant women according to the Health Belief Model. *J Am Diet Assoc* 1999; 99: 33-8.
18. Morin P, De Wals P, St-Cyr-Tribble D, Niyonsenga T, Payette H. Pregnancy planning: a determinant of folic acid supplements use for the primary prevention of neural tube defects. *Can J Public Health* 2002; 93: 259-63.
19. Bekkers RLM, Eskes TKAB. Periconceptional folic acid intake in Nijmegen, Netherlands. *Lancet* 1999; 353: 292.
20. De Walle H, Cornel M, De Jong-Van den Berg L. Three years after the Dutch folic acid campaign: growing socioeconomic differences. *Preventive Medicine* 2002; 35: 65-9.
21. Ghasemi-Kebria F, Asmar M, Angizeh AH, Behnam-Pour N, Bazouri M, Tazike E, et al. Seroepidemiology and determination of age trend of *Helicobacter Pylori* contamination in Golestan province in 2008. *Govaresh* 2011; 14: 143-7.
22. Bagheri H, Behnampour N, Ghaemi E. The frequency of Anti-Cytotoxin associated Gene A (CagA) antibody in Golestan province of Iran. *J Gorgan Univ Med Sci* 2010; 12: 74-8.
23. Wild J, Schorah CJ, Maude K, Levene MI. Folate intake in young women and their knowledge of pre-conceptional folate supplementation to prevent neural tube defects. *Eur J Obstet Gynecol Reprod Biol* 1996; 70: 185-9.
24. French MR, Barr SI, Levy-Milne R. Folate intakes and awareness of folate to prevent neural tube defects: a survey of women living in Vancouver, Canada *J Am Diet Assoc* 2003; 103: 181-5.