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Provision of Iron and Folic Acid Supplementations for Pregnant Women in Public and Private Sectors of Tabriz, Iran

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ABSTRACT

***Background*:** This study aimed to investigate different methods used to provide necessary supplementations for pregnant women and obtain reliable data about the general status of health promotion during pregnancy.
***Methods*:** This descriptive, cross-sectional study was conducted on 401 pregnant women referring to different women's hospitals of Tabriz, including Alzahra, Taleghani, 29-Bahman, Zakariya, Shafa, and Shams from March 2011 to September 2013. Subjects were selected using simple random sampling and had prior experience of childbirth.
***Results*:** In this study, prenatal care was provided for all the pregnant women at public (55.8%) and private sectors (44.2%). Iron supplementation used by the subjects included ferrous sulfate (150 mg) + folic acid (0.5 mg) (20.2%), regular-release ferrous sulfate (325 mg) (70.4%), folic acid (0.1 mg) + ferrous sulfate (200 mg) (6.5%), and vitamin B12 (15 mg) + ferrous fumarate (350 mg)+ vitamin C (150 mg) + folic acid (1 mg) (1.6%). Supplementations were provided before (56.7%) or after (43.3%) the onset of pregnancy. In total, 40.9% of the subjects received family planning care, 44.7% of whom referred to medical centers, 34.6% referred to health houses, 12.3% consulted gynecologists, 2.8% consulted midwives and 5% received traditional care.
***Conclusion*:** According to the results of this study, general status of iron and folic acid supplementation, their provision and average use of these substances were suboptimal. However, status, provision and use of iron were significantly more efficient than folic acid.

Keywords: Iron; Folic Acid; Pregnancy Supplementation; Pregnant Women; Public and Private Sectors

Introduction

According to statistics, maternal mortality occurs in one woman per minute, as well as 500 million women per year, due to the complications of pregnancy and childbirth. Moreover, 20 million low-birth-weight infants are born every year, and neonatal death occurs in 10.6 million infants per year (1-3). For this reason, Millennium Development Goal 5 aims to reduce the rate of maternal mortality (4). Improvement of maternal health depends on the efficacy of the services provided for pregnant women in terms of time, repetition, potential advantages and risks, and acceptability for these individuals and their family members (5).

Antenatal care is a notable form of prenatal care, which encompasses different aspects, including education, consultation, screening, therapy, monitoring and provision of nutritional supplements, in order to enhance maternal and fetal health (6-9). Medical services provided for mothers and fetuses are inherent to every health care program. Units responsible for providing these services are health houses in rural areas, health care centers in cities (i.e., public sectors), and specialized women's clinics and obstetricians (i.e., private sectors) (6).

Several evaluations have been performed on the efficacy of health services for pregnant women (10). In this regard, supplementation of

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iron and folic acid play a pivotal role in the promotion of maternal and fetal health; for instance, neural tube defect (NTD) is a common complication among women, which could be prevented by the use of iron and folic acid within three months before planning pregnancy, or upon the realization of pregnancy (11).

Since NTD occurs in the primary stages of pregnancy, and pregnancy might go unnoticed within this period, interventions for folic acid supplementation need to be performed in women of the childbearing age. According to previous studies, folic acid supplementation could reduce the rate of NTD by 40-85% among women (12).

Congenital abnormalities have been reported as the main causes of neonatal mortality within the past 25 years, accounting for 22% of the deaths occurring in infants (13). Use of folic acid is considered to be effective in the prevention of severe abnormalities in neonates (14).

Iron deficiency is another prevalent nutritional disorder across the world. According to statistics, the majority of women and infants in non-industrial countries, as well as 30-40% of those living in industrial countries, suffer from anemia. As a successful strategy for the prevention of anemia, iron supplementation is widely used for pregnant women in different countries. According to the literature, iron deficiency anemia (IDA) is associated with increased risk of premature delivery, low birth weight, and maternal and neonatal mortality (15). Incidence and complications caused by IDA are variable across the world, depending on different regions and parameters (16-18).

Considering various factors such as extensive health insurance coverage, advances in health care services, increasing referrals of pregnant women to private sectors (19), occasional negligence of health education by professionals, and lack of instructions and proper management in public and private sectors, effective methods need to be planned in order to provide pregnant women with adequate supplementations and promote maternal health.

Method

This descriptive, cross-sectional study was conducted on 401 pregnant women referring to different women's hospitals in Tabriz, including Alzahra, Taleghani, 29-Bahman, Zakariya, Shafa, and Shams from March 2011 to September 2013. Subjects were selected using simple random sampling and had prior experience of childbirth.

Data collection was performed via interviews and using questionnaires in each of the hospitals. Prepared questionnaires consisted of two main parts on demographic data and general information of the subjects, such as history of deliveries, recent deliveries, health care facility, quantity and quality of prescription and consumption of supplementations. In addition, primary information related to infants was obtained from the medical records of parturient women.

The main variables investigated in this study were maternal age, education status, employment status, history of previous pregnancies or abortions, history of any diseases, type of insurance, place of delivery, status of recent pregnancies (i.e., intended or unplanned), health care facility, hemoglobin level before and after childbirth, time and amount of iron and folic acid supplementation, prematurity, congenital malformations, birth weight and one-minute Apgar score. Hemoglobin level was calculated by the researchers before and after delivery using the medical records of the subjects.

Written informed consent was obtained from all the subjects, and the study protocol was approved by the Ethics Committee of Tabriz University of Medical Sciences (TUMS), Iran in accordance with the guidelines of the Declaration of Helsinki. Moreover, required data of the neonates were provided from the medical documents available at the hospitals.

Data analysis was performed using SPSS V.16.0 for windows (SPSS Inc., Chicago, USA), using descriptive statistics, independent t-test, Chi-square test and Fisher's exact test. Quantitative data were presented as mean ± standard deviation (SD), and qualitative data were presented as frequency and percentage (%) at the significance level of $P<0.05$.

Results

In this study, mean age of the participants was 26.83±5.84 years. Among the studied subjects, 27 cases (6.7%) were younger than 18 years, and 35 cases (8.7%) were over 35 years of age during pregnancy; in total, 15.5% of the subjects had high-risk pregnancies. Other subjects (84.5%) were within the age range of 18-35 years.

Education status of the participants is shown in Figure 1. Regarding the occupational status, 19 subjects (4.7%) were employed, and others (95.3%) were housewives. With respect to parity, 197 women (49.1%) had one, 111

(27.7%) had two, 55 (13.7%) had three, and others (9.4%) had four or more parities. Moreover, 55% of the women had one child, 29.7% had two children, 10.7% had three children, and others (4.3%) had four or more children (mean of data: 1.64±0.84).

Evaluation of abortion history indicated that 17.2% of the subjects had prior experience, among which 12.3% had one abortion, while others had undergone more abortions.

Additionally, birth intervals were estimated at 1-3 years in 22% of the subjects, 3-5 years in 23.4%, 5-10 years in 40.5%, and over 10 years in 14.1% of the participants.

As for the insurance status, 21.2% of the subjects had no insurance, while 78.8% were supported by different insurances. Among the participants of this study, 74.1% were hospitalized in educational universities, and others (25.9%) were admitted in non-academic community hospitals. In total, 12.7% of the women had deliveries at private sectors, while 87.3% had deliveries at public sectors. Furthermore, prenatal care was provided at both public (55.8%) and private sectors (44.2%) before (56.7%) or after (43.3%) the onset of pregnancy. Types of iron supplementation used for the subjects are shown in Figure 2.

Maturity status of the infants was as follows: 87.6% term infants, 11.2% preterm infants, 0.3% post-term infants, and 0.9% stillbirths. As for the weight of infants, the findings were as follows: <2500 g in 39 cases (10.3%), >4000 g in 7 cases (1.8%), and normal (2500-4000 g) in other

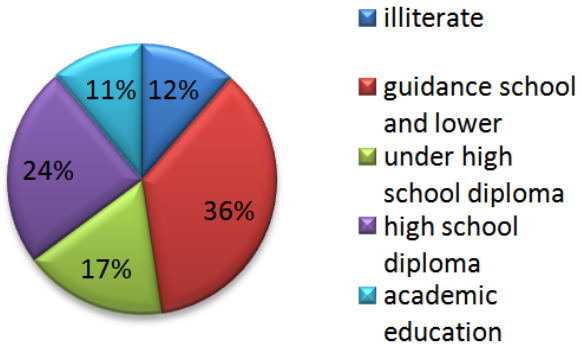

Figure 1. Educational status

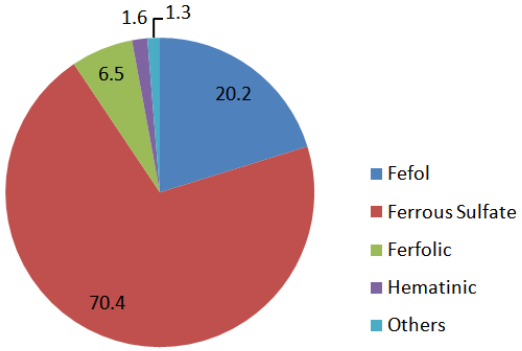

Figure 2. Iron types consumed

neonates. Additionally, mean birth weight of the infants was estimated at 3057±560.53 g, with a median of 3100 and mode of 3000 g.

In the current study, 83.4% of the neonates were born at one-minute Apgar score of 9, 6.1% had Apgar score of 8, and the mean of Apgar scores was calculated at 8.7±0.8. No congenital malformations were reported in 98.5% of the studied infants, while chromosomal abnormalities, microcephaly and harelip were detected in 6 infants (1.5%).

As for family planning, 40.9% of the subjects received these services, 44.9% of whom referred to medical centers, 34.7% referred to health houses, 12.5% consulted gynecologists, 2.8% consulted midwives and 5.1% received traditional care. It is also noteworthy that over 56% of the participants in this study received family planning care before their pregnancy. On average, the subjects received health services since M=1.51±0.71st month and most of them (73.1%) were under regular medical care during the first trimester of pregnancy. Furthermore, 47.1% of the women received medical care at public sectors, 37% at private sectors and 15.7% received health care at both sectors. In 28.67% of the subjects, health care services were offered by urban medical centers.

Supplementation status of the studied patients is presented in Table 1. Among the subjects, 3 cases (0.7%) consumed 2 pills per day, while others consumed one pill daily. The main reason for receiving no supplements from public health units was reported to be regular consultations with gynecologists. Moreover, a significant difference was observed in the consumption rate of iron supplements between the patients who consulted with gynecologists and those referring to medical centers (P<0.05).

Regarding the consumption of folic acid, 80% of the users in this study consumed less than 90 pills, and only 5.6% consumed more than 90

pills. In addition, each pregnant woman was reported to consume 67.48±45.13 folic acid pills. There was a significant difference in the consumption rate of folic acid supplements between the women consulting with gynecologists and those referring to medical centers and health houses (P=0.001).

Some health care providers tend to prescribe iron pills for women before pregnancy; among the subjects of this study, 8.8% started using iron pills before pregnancy, 22.7% started during the first trimester of pregnancy, and 65.8% started supplementation during the second trimester. In general, status of starting iron supplement consumption was better than that of folic acid, and our findings were indicative of no difference in the starting time of iron supplementation between the patients referring to different health care units (P=0.819). According to the information in Table 1, only 5.6% of the participants started folic acid supplementation on time, while 52.2% started within the first months of pregnancy, and 2.1% started during and after the 5th month.

Table 1. Iron and Folic acid supplementation status in studied patients

Supplement	Correct time of beginning	Average time of Beginning	Not use at all	Insufficient use	Average use	Average Sufficient and on time users
Iron	from 4th month of pregnancy	3.49±0.81 month	4.5%	33%	154 out of 180 expected pills	62.5%
Folic acid	from three months before pregnancy	1.29±0.73 month	14.4%	80%	67 out of 180 expected pills	5.6%

In the present study, starting of folic acid supplementation occurred later in patients consulting gynecologists compared to those referring to medical centers and health houses (P=0.0007), as well as the women referring to both centers simultaneously. On the other hand, average number of consumed folic acid pills was higher among the patients referring to health houses compared to those referring to both centers simultaneously.

As for iron supplementation, the starting time occurred later in patients consulting midwives compared to those referring to health care centers. Additionally, average number of consumed iron pills was higher in patients consulting gynecologists and urban health care specialists compared to those referring to health houses and medical centers simultaneously.

One of the variables investigated in this study was the place of providing supplementations among the participants. Accordingly, 40% of folic acid supplements were purchased from drug stores with prescriptions, and other common places were health houses and medical centers. There was a significant difference between the provision and consumption of folic acid supplements purchased from drug stores and urban medical centers (P=0.005).

According to the results of this study, the average number of pills provided from drug stores (with or without prescription) was higher than medications purchased from other places. However, there was no significant difference between the amount of consumed iron pills purchased from drug stores and iron supplements obtained from medical centers (P=0.101). In addition, a significant correlation was observed between the age of pregnant women and the time of first antenatal care (r=0.005), starting of folic acid supplementation (r=0.43), starting of iron supplementation (r=0.1), number of consumed iron pills (r=0.09), and number of consumed folic acid pills (r=0.07).

Other variables including age, parity, and number of living children had significant correlations with the starting point and frequency of supplemen-tations. However, no significant correlation was found between birth intervals and folic acid/iron supplementation in the pregnant women.

Moreover, no significant difference was observed between maternal age and reasons for supplement avoidance, iron-related symptoms and place of providing supplementations. Also, there was no significant difference between the place of medical care and reasons for supplement avoidance. Among the subjects of the current study, 5.9% were at pre-hospital level, and 10.3% were approaching delivery time and needed hospital care. Hemoglobin level of these patients was estimated at >11 g/dL and subjects who were in the first trimester of pregnancy had slightly higher serum hemoglobin compared to the patients admitted at the hospital at the time of delivery. Finally, no significant correlations were observed between the time and amount of consumed supplements and the hemoglobin level of pregnant women admitted in the hospital at the time of delivery.

Discussion

Several studies have reported negligence on behalf of pregnant women, physicians and midwives regarding the consumption, prescription, time and amount of iron and folic acid supplementation, which has resulted in the high incidence rate of NTD in many cases (20). The present study aimed to obtain information from women with prior experience of childbirth referring to different urban medical centers in order to investigate the quality of health services. The results could contribute to recognizing the problems associated with pregnancy care in private and public sectors.

In our study, 6.7% of the pregnant women were under 18 years, 8.7% were over 35 years, and 84.5% were within the standard age range for pregnancy. In another research, 98% of the studied pregnant women were within the age range of 17-35 years. According to the statistics of WHO, pregnancies under the age of 18 account for 2% of women in Japan, 13% in England, and 22% in the U.S. (21, 22). These differences could be attributed to research limitations, such as the sample size and diversities in the regions of studies. In one research, it was reported that 14 million pregnancies occur under the age of 18, resulting in the birth of 10% of infants every year, 90% of which take place in developing countries.

In the present study, a significant correlation was found between the education status and amount of iron and folic acid supplementation used by the subjects, which corresponds with the results obtained by a similar study conducted in Fars province, Iran. Furthermore, there was a significant correlation between maternal age and amount of folic acid supplements, while no correlation was observed between maternal age and amount of iron supplementation. However, parity was significantly correlated with the rate of folic acid and iron consumption.

According to the findings of the current study, higher education status was associated with better knowledge of adherence to medical plans during pregnancy. Moreover, there was a significant difference in the consumption rate of folic acid supplements between the pregnant women consulting gynecologists and those referring to medical centers and health houses. This could be due to the workload imposed by populated medical centers, which normally results in lower quality of patient education and low rates of drug compliance.

In the present study, 21.2% of the pregnant women had no insurance. With respect to the weight of the infants, average weight was calculated at 3057 g, and 13.4% of the infants weighed <2500 g, while 84.8% were within the normal range.

Mean of starting time for the consumption of folic acid and iron supplements was M=1.29±0.73 and M=3.49±0.81, respectively. Compositions of consumed supplemental pills in the present study were regular-release ferrous sulfate (325 mg), folic acid (0.1 mg) + ferrous sulfate (200 mg), ferrous sulfate (150 mg) + folic acid (0.5 mg), and vitamin B_{12} (15 mg) + ferrous fumarate (350 mg) + vitamin C (150 mg) + folic acid (1 mg). Additionally, some of the patients used foreign iron pills, containing 30 mg of elemental iron, which is equal to 150 mg of ferrous sulfate heptahydrate, 90 mg of ferrous fumarate or 250 mg of ferrous gluconate.

The main reasons for avoiding supplements, especially iron pills, included lack of information on the benefits of supplementation (34.1%) and iron intolerance (39%). In another study, the main cause of supplement avoidance was reported to be lack of awareness about the importance of folate during pregnancy (20).

Regarding the consumption of folic acid, 14.4% of the women in the current study did not use folic acid supplements at all, 80% consumed less than 90 pills, and only 5.6% used more than 90 folic acid pills (at least during the first trimester of pregnancy). In a similar study, 13% of the pregnant women used no folic acid supplementation, 11% used pills before pregnancy, and 75.6% started using these supplements immediately after learning about their pregnancy (23).

According to several studies, rate of folic acid consumption has a significant correlation with the education status of pregnant women, and folic acid use is significantly higher among the women with academic education or high school diploma. This is consistent with the findings of the current study. In another research, 10% of the studied pregnant women used folic acid before pregnancy, 44% started to use it immediately after the recognition of pregnancy, and 46% used no folic acid supplements (24).

In this study, the studied patients mainly referred to gynecologists, urban medical centers, health houses, and midwives for receiving medical care during pregnancy. Division of these centers into public and private sectors indicated that 47.1% of our subjects referred to public sectors,

37% referred to private sectors, and 15.7% referred to both these sectors. It is also noteworthy that the medical care provided for 28.67% of the pregnant women in this study was covered by urban medical centers due to the reduction in the number of rural health centers.

In the current study, the main places for the purchase of iron and folic acid supplements were classified into the following order: drug stores (with prescription), urban medical centers, health houses, and drug stores (without prescription). In a similar study, 43% and 20% of pregnant women purchased supplements from rural and urban health staff, respectively, while others referred to drug stores (23). Therefore, it could be concluded that the performance and functionality of health care centers should be improved in urban areas.

According to the results of the present study, prevalence of congenital abnormalities was reported to be 1.5% among the subjects, which corresponds with the findings of a similar study conducted in the Northwest of Iran (1.655%). Furthermore, prevalence of harelip was estimated at 0.3% in our study, while it was reported to be 0.103% in the study performed in the Northwest of Iran (15).

Among the limitations of the current study were collecting parts of the data depending on the memory of the subjects, disregarding abortion cases, and evaluation of the consumption of iron and folic acid supplements in the form of combined pills.

Conclusion

According to the results of this study, there was a significant difference in the consumption rate of folic acid between the patients consulting gynecologists and those referring to medical centers and health houses. Correspondingly, starting of folic acid supplementation occurred later in patients consulting with gynecologists. Moreover, average number of consumed folic acid pills was higher in women referring to health houses compared to those referring to urban medical centers, or both sectors simultaneously.

In conclusion, status of iron and folic acid supplementation, starting time of consumption, and average use of these compounds were suboptimal. However, status of iron supplementation during pregnancy was observed to be more efficient compared to the consumption rate of folic acid.

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References

1. Organization WH. The World Health Report 2005. Make every mother and child count. Geneva: World Health Organization; 2005.
2. Vollset SE, Clarke R, Lewington S, Ebbing M, Halsey J, Lonn E, et al. Effects of folic acid supplementation on overall and site-specific cancer incidence during the randomised trials: meta-analyses of data on 50 000 individuals. The Lancet. 2013; 381(9871):1029-36.
3. Kelly D, O'Dowd T, Reulbach U. Use of folic acid supplements and risk of cleft lip and palate in infants: a population-based cohort study. Br J Gen Pract. 2012; 62(600):e466-e72.
4. Organization WH. Guideline: Daily iron and folic acid supplementation in pregnant women. Geneva: World Health Organization; 2012.
5. McNulty B, McNulty H, Marshall B, Ward M, Molloy AM, Scott JM, et al. Impact of continuing folic acid after the first trimester of pregnancy: findings of a randomized trial of Folic Acid Supplementation in the Second and Third Trimesters. Am J Clin Nutr. 2013; 98(1):92-8.
6. Health Evidence Network. What is the effectiveness of antenatal care? J Health Serv Res Policy. 2005; 11(3):191.
7. World Health Organization. Unit:3.5. Community Base Initiality. Egypt: Regional office for the Eastern Mediterranean; 2003.
8. Sehhati-Shafaii F, Asadollahy M, Piri R, Naghavi-Behzad M, Farzollahpour F. Prevalence and risk factors of preterm labor in Health Educational Centers of Northwest Iran (2009-2010). Life Sci J. 2013; 10(3).
9. Ghojazadeh M, Velayati A, Mallah F, Azami-Aghdash S, Mirnia K, Piri R, et al. Contributing death factors in very low-birth-weight infants by path method analysis. Niger Med J. 2014; 55(5):389-93.
10. Gautam CS, Saha L, Sekhri K, Saha PK. Iron deficiency in pregnancy and the rationality of iron supplements prescribed during pregnancy. T Medscape J Med. 2008; 10(12):283.
11. Cordero AM, Crider KS, Rogers LM, Cannon MJ, Berry RJ. Optimal serum and red blood cell folate concentrations in women of reproductive age for prevention of neural tube defects: world health organization guidelines. MMWR Morb Mortal Wkly Rep. 2015; 64(15):421-3.
12. Green NS. Folic acid supplementation and prevention of birth defects. J Nutr. 2002; 132(8 Suppl):2356S-60S.
13. Wilson RD, Johnson JA, Wyatt P, Allen V, Gagnon A, Langlois S, et al. Pre-conceptional vitamin/folic acid supplementation 2007: the use of folic acid in combination with a multivitamin supplement for the

prevention of neural tube defects and other congenital anomalies. J Obstet Gynaecol Can. 2007; 29(12):1003-26.
14. Czeizel AE, Dudás I, Vereczkey A, Bánhidy F. Folate deficiency and folic acid supplementation: the prevention of neural-tube defects and congenital heart defects. Nutrients. 2013; 5(11):4760-75.
15. Dastgiri S, Imani S, Kalankesh L, Barzegar M, Heidarzadeh M. Congenital anomalies in Iran: a cross-sectional study on 1574 cases in the North-West of country. Child Care Health Dev. 2007; 33(3):257-61.
16. Chang S, Zeng L, Brouwer ID, Kok FJ, Yan H. Effect of iron deficiency anemia in pregnancy on child mental development in rural China. Pediatrics. 2013; 131(3):e755-63.
17. Pasricha SR, Drakesmith H, Black J, Hipgrave D, Biggs BA. Control of iron deficiency anemia in low- and middle-income countries. Blood. 2013; 121(14):2607-17.
18. Miller JL. Iron deficiency anemia: a common and curable disease. Cold Spring Harbor perspectives in medicine. 2013; 3(7):pii:a011866.
19. Bank W. Main Report. Iran: Islamic Republic of Iran Health Sector Review. 2007;1.
20. Bestwick JP, Huttly WJ, Morris JK, Wald NJ. Prevention of neural tube defects: a cross-sectional study of the uptake of folic acid supplementation in nearly half a million women. PloS one. 2014; 9(2):e89354.
21. Vaidya A, Saville N, Shrestha BP, Costello AM, Manandhar DS, Osrin D. Effects of antenatal multiple micronutrient supplementation on children's weight and size at 2 years of age in Nepal: follow-up of a double-blind randomised controlled trial. Lancet. 2008; 371(9611):492-9.
22. Mahaini R. Improving maternal health to achieve the Millennium Development Goals in the Eastern Mediterranean Region: a youth lens. East Mediterr Health J. 2008; (14 Suppl):S97-106
23. Kadivar MR, Massumi SJ, Moradi F, Shenavar B. Folic acid consumption in Fars province, southern Iran. J Res Health Sci. 2005; 5(2):11-4.
24. Bille C, Murray JC, Olsen SF. Folic acid and birth malformations. BMJ. 2007; 334(7591):433-4.