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# Folic acid knowledge and awareness in a sample of pregnant women in Erbil city

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## Abstract

**Background and objective:** Folic acid is one of the essential vitamins for women of childbearing ages, and its deficiency is the second leading cause of anemia worldwide after iron deficiency. The purpose of the study was to find out the factors associated with supplemental folic acid knowledge of pregnant women visiting primary health care centers in Erbil city.

**Methods:** A cross-sectional study was conducted and involved all the twenty-three primary health care centers in Erbil city. The data collection period was from 1st September 2021 to 1st March 2022. A convenience sample of 727 pregnant women visited primary health care centers in the Erbil city were collected through face-to face interviews by using a pre-designed questionnaire format.

**Results:** The study found that pregnant women had poor knowledge about using folic acid during pregnancy. There was a highly significant (*P* <0.001) positive association between the knowledge of pregnant women about folic acid and the increasing socio-economic class level, older age groups, a greater number of pregnancies, more birth spacing, and the absence of anemia, abortion and existence of congenital malformation during the previous pregnancies.

**Conclusion:** The majority of pregnant women have limited awareness about benefits of folic acid, especially among low socio-economic classes.

**Keywords:** Folic acid; Supplement; Knowledge; Pregnant women.

## Introduction

Anemia is a public health problem and remains the leading universal cause of disability and the most serious global health problem. According to World Health Organization report, 32 million pregnant women worldwide suffer from anemia, which is about 38% of the population out of this, 46.3% (9.2 Million) of them are in Africa, rates increase over the trimesters in developed country. Out of this, 46.3% (9.2 Million) of them are in Africa, rates increase over the trimesters in developed countries such as the United States, where the rate is 18%, Australia 20%, Singapore, 67.8% and China tries such as the United States, where the rate is 18%, Australia 20%, Singapore, 67.8% and China.[1] Because of folic acid's role in red blood cell formation, it is the second most common cause of anemia worldwide. Infants, children and pregnant women are the three groups of people who are most affected by anemia because, they need more folic acid.[2]

An estimated two billion people worldwide are affected by deficiencies of minerals and essential vitamins known as hidden hunger, which negatively impact on their health and economic development.[3] Folate is a water-soluble B vitamin that performs several vital activities in the body.[4] This vitamin helps cell division in to new cells by producing DNA and other genetic material. The body is unable to

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produce folic acid; Therefore, it must be obtained from the diet and can be found in large amounts in the natural source of green leafy vegetables, liver, beef, dairy products, nuts and eggs, all of which are rich dietary sources of folic acid. Because folate is water soluble and cannot be stored by the body, the synthetic form of folate, folic acid, is frequently required.[5,6] Adequate intake of folic acid can help prevent neural tube defects, a group of birth disorders that occur during the first month of pregnancy and affect the developing brain.[7]

Spina bifida and anencephaly are two of the most common types of congenital abnormalities.[6] Spina bifida occulata, spina bifida occult is the mildest type of spina bifida a very high costly disease to diagnosis and treatment.[8] Every year, 30.4 million children are born with spina bifida and other congenital abnormalities globally.[9] The prevalence is nearly 1−5/1000 live births and the risk of recurrence is 2−3% .[10] Folic acid also prevents congenital heart defects, growth retardation, low birth weight of infants, smaller head and chest circumference preterm delivery and cleft lip.[11] Inadequate intake of folic acid during pregnancy may be associated with autism in newborns.[12]

According to the World Health Organization (WHO) all women who are trying to become pregnant should take 400 micrograms of folic acid daily for up to 12 weeks. It is recommended that women who have had previous experience of having a child with a neural tube defect be educated about the risk of recurrence, and that taking folic acid before and during pregnancy is protective and high dose should be taking supplements (5 mg folic acid daily); and they also advised that they increase their dietary folate intake.[5,7]

In a study conducted in southern Brazil a total of 2,685 mothers were interviewed; of all, only 54% of them used folic acid and knew and aware the benefits.[13] A study conducted in Kenya, revealed that only 47% of mothers are aware of the use of folic acid. Addition a study conducted in Iraq.[14] A study conducted in Iraqi indicated that a low prevalence was recorded among the participants and low level of knowledge was revealed.[15] Finally, a study conducted in Erbil city reported that 288 of pregnant women, 58.7% were taking folic acid and 41.3% were not taking any supplements.[16]

As a basis for this field of study, the project that helped solve the problem in hospitals and health centers was offered by the Ministry of Higher Education and Scientific Research.

This study aims to find out the factors associated with supplemental folic acid knowledge among pregnant women in Erbil city. The main objectives are to assess the knowledge of pregnant women about folic acid and its importance in pregnancy, to determine the association between knowledge with the reproductive characteristics of pregnant women, and to demonstrate the association between knowledge and socio-demographic characteristics of pregnant women.

## Methods

Setting of the study: This cross-sectional study was conducted in twenty-three primary health care centers in Erbil city. The time of the study was start between 1st September 2021 and 1st September 2022; the data collection period was from 1st September 2021 to 1st March 2022.

Using a convenience sampling method, a sampling of 727 pregnant women were enrolled in the study. “Epi- info” was used to calculate the sample size from a population size of 14245 pregnant women in Erbil city, with 95% confidence level and a 5% margin of error.

A structured questionnaire was designed for purpose of data collection which was conducted through face-to-face interview with the pregnant women. Pre-testing of study questionnaire was done two weeks before starting the data collection to provide time for any correction. The questionnaire consisted of three parts:

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First: This part about the Socio demographic information about the pregnant women consist of the followings (maternal age, education level of pregnant women and her husband, residential area, occupation of pregnant women and her husband, type of housing, family size, economic state of the family, distance from home to primary health care, possession of car, number of rooms except kitchen and bathroom, and number of children).

Second: This part about the reproductive characteristics of pregnancy women (pregnancy history) which is consist of (Age of marriage, number of pregnancies, gestational age, type of care setting, history of anemia in previous and current pregnancy, birth spacing from last pregnancy, history of unsuccessful of pregnancy, congenital anomalies, chronic diseases).

Third: In this part questions about the knowledge regarding the use of folic acid during pregnancy which is include of (knowledge about anemia, prevention of anemia during pregnancy, high risk for anemia during pregnancy, what is folic acid ,in which source heard, symptoms of vitamin B12 or folate deficiency, right time and dosage to take folic acid, time can change folic acid in to Ferro folic acid, benefits of folic acid, condition need take extra folic acid, total month need intake folic acid, foods are high rich in folic acid).

Reliability, and validity of questionnaire**:** Our questionnaire was also reviewed by eight experts and the reliability of questionnaire (Cronbach's alpha) was 0.80.

**Statistical analysis:**

The statistical package for social sciences (SPSS, version 25) and, Microsoft excel 2010 were used to summarize the data. Kruskal-Wallis, Mann-Whitney U and Chi square tests were used to determine whether there are statistically significant differences between different sub-groups. *P* value of ≤0.05 was considered statistically significant.

**Ethical consideration:**

The research topic and contents were approved by the ethics committee of the College of Medicine, Hawler Medical University. Optional participation in the study was explained to all participants and they received verbal consent from of them before to inclusion in this study.

## Results

Table 1 demonstrates the descriptive analysis of knowledge questions. Among 727 participants, 91.7% have heard about folic acid, more than two-third 68.2% of them have got the information from the doctors and more than half 54.5% of them were unaware about the importance of folic acid. Only 12% of the participants knew that folic acid is vitamin B, and only 1.7% knew that it should be taken before pregnancy. The majority 98.3% of them did not know the right dose of the folic acid, and only 26.3% of them knew when to stop folic acid and change it to Ferro-folic. Finally, only 26.5% knew the total period in months required to take folic acid, pre and during pregnancy.

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**Table 1** Descriptive analysis of knowledge` questions regarding Folic Acid

| Characteristics | | No. | (%) |
|---|---|---|---|
| **Have you heard about folic acid?** | No | 60 | 8.3 |
| | Yes | 667 | 91.7 |
| **If yes, from which source** | Social media | 22 | 3.0 |
| | Books and magazine | 18 | 2.5 |
| | Nutritionist | 13 | 1.8 |
| | Others pregnant women | 40 | 5.5 |
| | Doctor | 496 | 68.2 |
| | Family members | 26 | 3.6 |
| | Previous experience | 52 | 7.2 |
| **Level of folic acid awareness** | Uninformed | 396 | 54.5 |
| | Somewhat informed | 217 | 29.8 |
| | Informed | 114 | 15.7 |
| **What is folic acid** | Minerals | 166 | 22.8 |
| | Vitamin A | 64 | 8.8 |
| | Vitamin B | 87 | 12.0 |
| | Vitamin C | 89 | 12.2 |
| | Have no idea | 321 | 44.2 |
| **When is the right time to start taking folic acid** | Before pregnancy | 12 | 1.7 |
| | First trimester | 625 | 86.0 |
| | Second trimester | 65 | 8.9 |
| | Third trimester | 2 | 0.3 |
| | Don't Know | 23 | 3.2 |
| **Do you know recommended dose of folic acid during normal pregnancy** | No | 715 | 98.3 |
| | Yes, it is 0.4 mg | 12 | 1.7 |
| **Do you know which time can stop folic acid and change to Ferro folic** | First trimester | 10 | 1.4 |
| | Second trimester | 191 | 26.3 |
| | Third trimester | 247 | 34.0 |
| | Don't Know | 279 | 38.4 |
| **Do you know total month need intake folic acid pre and during pregnancy** | No | 534 | 73.5 |
| | Yes | 193 | 26.5 |

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Figure 1 below shows the pregnant women's knowledge about benefits of folic acid intake before/during pregnancy. The highest percentage 45.5% was for "good for pregnant women" followed by "prevents anemia" (42.1%), "good for bones and body" (41.5%) and "helps growth and development" (40.9%).

Table 2 below demonstrates different socio-demographic criteria of the studied participants. It also shows the association between the knowledge and socio–demographic characteristics of the studied participants. A highly significant ($P$ <0.001) association was found between knowledge and older age subgroup 30-39 years. Higher socio-economic class subgroup, socio-economic class with better knowledge among the high socio-economic subgroup. An insignificant ($P$ = 0.836) association was found between distance from primary health care center and knowledge scores.

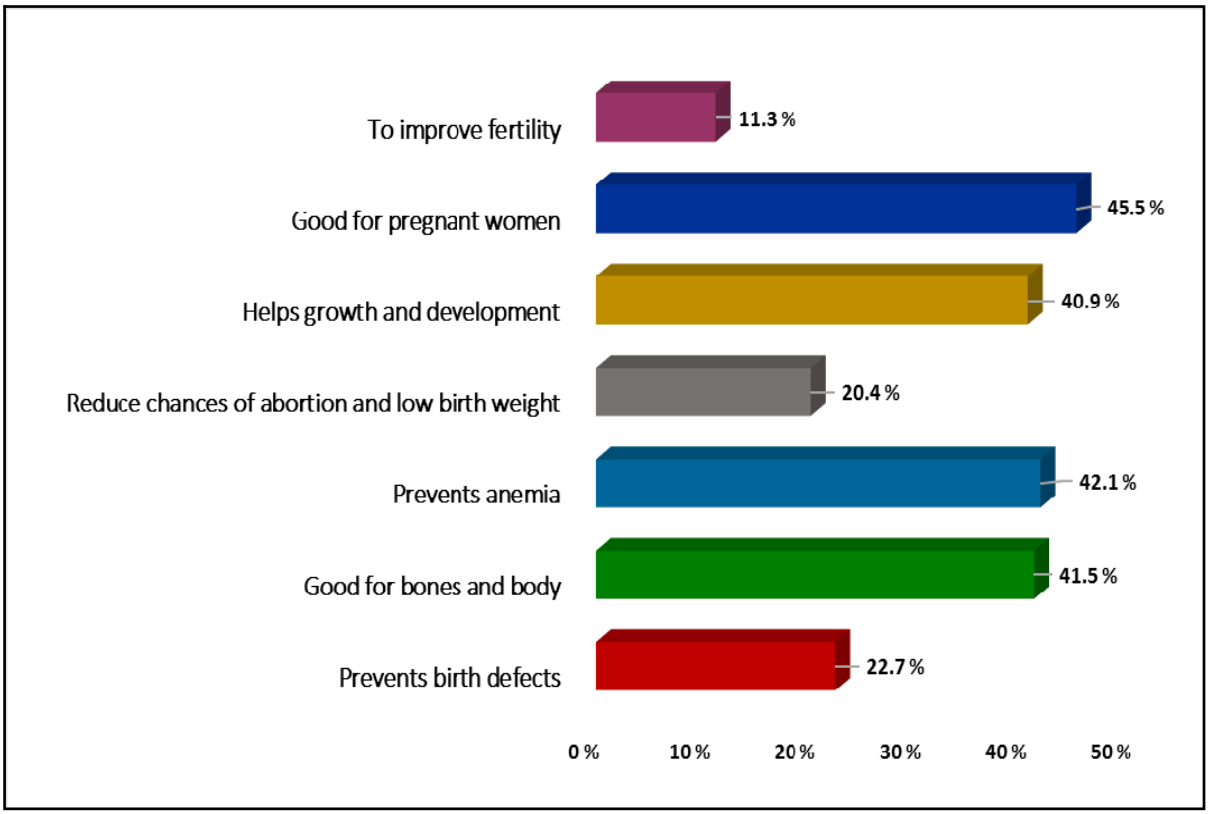


**Figure 1** Pregnant women's knowledge about benefits of folic acid intake pregnancy before/during

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**Table 2** Association between knowledge and socio-demographic Characteristics (Use of Kruskal-Wallis test and Mann-Whitney U test)

| Age groups | N | (%) | Median | Mean Rank | *P* Value |
|---|---|---|---|---|---|
| **Age groups *** | | | | | |
| Equal and less than 20 years | 43 | (5.9) | 4 | 171.97 | < 0.001 |
| 21-29 years | 489 | (67.3) | 6 | 355.55 | |
| 30-39 years | 195 | (26.8) | 7 | 427.55 | |
| **Age groups **** | | | | | |
| Equal and less than 20 years | 43 | (5.9) | 4 | 137.50 | < 0.001 |
| 21-29 years | 489 | (67.3) | 6 | 277.84 | |
| Equal and less than 20 years | 43 | (5.9) | 4 | 52.84 | < 0.001 |
| 30-39 years | 195 | (26.8) | 7 | 134.20 | |
| 21-29 years | 489 | (67.3) | 6 | 323.72 | < 0.001 |
| 30-39 years | 195 | (26.8) | 7 | 389.59 | |
| **Socio-economic classes *** | | | | | |
| Low socio-economic class | 54 | (7.4) | 5 | 172.45 | < 0.001 |
| Medium socio-economic class | 430 | (59.1) | 6 | 251.30 | |
| High socio-economic class | 243 | (33.4) | 12 | 172.67 | |
| **Socio-economic classes **** | | | | | |
| Low socio-economic class | 54 | (7.4) | 5 | 172.45 | < 0.001 |
| Medium socio-economic class | 430 | (59.1) | 6 | 251.30 | |
| Low socio-economic class | 54 | (7.4) | 5 | 42.49 | < 0.001 |
| High socio-economic class | 243 | (33.4) | 12 | 172.67 | |
| Medium socio-economic class | 430 | (59.1) | 6 | 250.68 | < 0.001 |
| High socio-economic class | 243 | (33.4) | 12 | 489.75 | |
| **Distance from primary healthcare center **** | | | | | |
| Less than 15 min | 563 | (77.4) | 6 | 363.13 | 0.836 |
| 16-30 min | 164 | (22.6) | 6 | 366.98 | |

***:** Kruskal-Wallis test, **: Mann-Whitney U test

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Table 3 shows the association between the knowledge and history of the pregnant women. There was a highly significant (*P* <0.001) association between knowledge and the older marriage age subgroup, multigravida subgroups, absence of anemia during pregnancy and absence of abortion/stillbirth, but an insignificant statistical association was found with birth spacing and history of birth problems/ congenital malformation.

**Table 3** Association between knowledge and characteristics of pregnant history (Use of Kruskal-Wallis test, Mann-Whitney U test)

| Characteristics | No. | (%) | Median | Mean Rank | *P* Value |
|---|---|---|---|---|---|
| **The age of marriage groups *** | | | | | |
| Equal and less than 20 years | 117 | (16.1) | 6 | 263.83 | < 0.001 |
| 21-29 years | 566 | (77.9) | 7 | 383.65 | |
| 30-39 years | 44 | (6.1) | 8 | 377.58 | |
| **The age of marriage groups **** | | | | | |
| Equal and less than 20 years | 117 | (16.1) | 6 | 244.82 | < 0.001 |
| 21-29 years | 566 | (77.9) | 7 | 362.09 | |
| Equal and less than 20 years | 117 | (16.1) | 6 | 72.90 | <0.001 |
| 30-39 years | 44 | (6.1) | 8 | 102.55 | |
| 21-29 years | 566 | (77.9) | 7 | 306.32 | 0.68 |
| 30-39 years | 44 | (6.1) | 8 | 294.92 | |
| **Total numbers of pregnancies **** | | | | | |
| Primigravida | 166 | (22.8) | 4 | 212.73 | < 0.001 |
| Multigravida | 561 | (77.2) | 7 | 408.76 | |
| **Birth spacing from last pregnancy **** | | | | | |
| Less than 2 years | 16 | (2.8) | 7 | 247.50 | 0.393 |
| Equal & more than 2 years | 546 | (45.4) | 6 | 282.50 | |
| **Anemia during previous pregnancy **** | | | | | |
| No | 422 | (75.1) | 8 | 304.24 | < 0.001 |
| Yes | 140 | (24.9) | 6 | 212.95 | |
| **Unsuccessful pregnancy (abortion or stillbirth) **** | | | | | |
| No | 674 | (92.7) | 7 | 372.29 | < 0.001 |
| Yes | 53 | (7.3) | 5 | 258.57 | |
| **History of birth problems and congenital malformations **** | | | | | |
| No | 551 | (98.2) | 7 | 282.54 | 0.092 |
| Yes | 10 | (1.8) | 6 | 195.95 | |

***:** Kruskal-Wallis test and ****:** Mann-Whitney U test

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Table 4 shows demonstrate the Chi square association between the socio-economic levels of the participants and knowledge categories (equal/less than median and more than median). A highly significant (*P* <0.001) statistical association was found between high knowledge group with increasing socio-economic level of the participants.

## Discussion

Folic acid (vitamin B9) is one of the important vitamins for embryonic growth and development. It also prevents the incidence of congenital malformations, which a significant health problem in developing countries and throughout the world, since they have a direct effect on the infants, their families, and the community.[17]

In the present study, the majority of pregnant women 91.7% have heard about folic acid. These results were agreed with a study conducted in Babylon, Iraq which revealed that 90.2% of pregnant women had heard about folic acid.[17] Concerning sources of the knowledge of pregnant women in the present study the most common 68.2% source of knowledge was doctors. It means that the doctors played an important role in increasing women's knowledge about the role of folate during pregnancy. While in a study conducted in Korea, healthcare professionals constituted the most important 41.2% source of information.[18] These results contrast with a research carried out in Japan in 2018 which discovered that internet was the primary source of folic acid information.[19]

In present study more than half 54.5% of the participants had no idea about importance of use folic acid during pregnancy. However, a study in Riyadh city from Saudi indicated that 99.5% of Saudi pregnant women were found to be highly educated about advantages of taking folic acid during pregnancy.[20] Concerning what is folic acid, in the present study, only 12% knew that it is vitamin B. While another study done in Basra revealed that 71.5% of the pregnant women believed that it is a type of vitamin.[21] and the Babylon study showed that 24.90% of pregnant women knew that folic acid is a type of B vitamin.[17] Only 1.7% of participants in the current study knew that folic acid should be taken before conception. In a study conducted in Korea, a higher percentage of women 77% stated that folic acid is best to be taken at least one month before conception.[18] On the other hand, in our study, almost all 98.3% of the participants

**Table 4** Association between socio economic levels and knowledge category based on median

| Socio economic Levels | Knowledge Category based on Median | | | |
|---|---|---|---|---|
| | Less and equal to median | More than median | Total | *P* value |
| **Low socio-economic status** | 48 | 6 | 54 | < 0.001 |
| | 88.9% | 11.1% | 100.0% | |
| **Medium socio-economic status** | 286 | 144 | 430 | |
| | 66.5% | 33.5% | 100.0% | |
| **High socio-economic status** | 46 | 197 | 243 | |
| | 18.9% | 81.1% | 100.0% | |
| **Total** | 380 | 347 | 727 | |
| | 52.3% | 47.7% | 100.0% | |

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did not know the right dose of the folic acid. According to WHO, all women who are trying to get pregnant should take 400 micrograms of folic acid every day for up to 12 weeks. However, in this study, more than a quarter 26.5% also knew that how long they had been taking folic acid before and during pregnancy.

Regarding the advantages of folic acid intake before/during pregnancy, this study showed that 45.5% of the pregnant women thought that it is "good for pregnant women" Other studies in Basra city recorded a low percentage of pregnant women 21% knew the significance of folic acid in prevention of neural tube defects.[21] While another study conducted in Korea reported 70% of participants knew that the importance of folic acid in prevention of neural tube defects. [18] In Nigeria study showed 64.6% in prevention of neural tube defects.[22] Also, 30% of Babylon's women accepted that folic acid can avoid birth defects.[17] Therefore, by comparing our results with the above mentioned studies, it reveals a relatively poor knowledge about folic acid intake before/during pregnancy among pregnant women in this study.

The current study showed a significant association of knowledge with older age women. These results agree with another study conducted in Ethiopia in same age.[23] Also like another study in Yanbu City, in Saudi showed that the participants who are aged 31–35 years had a significantly higher mean knowledge score than the participants aged 18–25years.[24] But disagree with a study in North-Western Tanzania where young women were more awareness obtained information.[25] This study also showed a highly significant ($P$ <0.001) association between knowledge score and the age of marriage with a better knowledge for 21-29 years subgroup. A study conducted in Nigeria also found that there is a significant association between age and knowledge of folic acid with better knowledge among 20 and 29 years.[22] In another study in Yanbu City, in Saudi Arabia showed that similar to the present study the participants who had been married at the age more than 25 years had significantly higher mean knowledge than those who had been married at equal and less than 20 years.[24] The study conducted in Babylon, Iraq, also revealed a significant association of knowledge level with those aging 20-29 years.[17] These results differed from a study done in Taiwan in 2010 no a significant relationship between demographic factors with the knowledge about folic acid.[26]

The present study showed that no significant association with the history of birth problems. Similar to study conducted in Babylon, Iraq, revealed that no significant association between knowledge and history of having children with congenital anomalies.[17] Because mothers who have children with congenital defects may have more information and frequent visits to their doctors and primary care providers for obtaining information fear for recurrence this disease. In another study in Iran, a high level of knowledge was with those women with lower parity, higher level of education, employment, young age and looking for health information.[27]

In general, the current study revealed that 52.3% of the participants had relatively a poor knowledge about folic acid and the remaining 47.7% had a fair knowledge. The association between different socio-economic levels of the participants with knowledge association was found between better knowledge with high socio-economic level. These findings agreed with a study done in Taiwan in 2010 which also revealed a significant association of better knowledge about folic acid with improved socio-economic status of the participants. [26] The study conducted in Babylon, Iraq, also revealed a significant association of knowledge level with those 69.4%, urban residents 76.5% and those employed 69.4%.[17] Also in a study conducted in Sudan, it was discovered that urban residence, higher education levels, and antenatal care were associated with folic

acid knowledge and usage .The study in Sudan also found a significant relationship between preconception use of folic acid and living in urban areas, having a higher level of education, and receiving antenatal care. Women who lived in rural areas and had lower levels of education were less knowledgeable about folic acid and less likely to use it.[28] On the other hand, a study conducted in Saudi Arabia revealed that participants with income >9000 Saudi Rial salary had significantly higher mean knowledge scores than those with income betwee7000–9000 Saudi Rial.[24]

Although The research was carried out in all primary health care centers within a large city, some of which had time limitations. Pregnant women might visit the main health care centers only two days per week. Inappropriate environmental factors at certain primary health care locations, such as interruptions from other students, might lead to maternal fatigue from responding to inquiries or resulted in withdrawal from the research.

## Conclusion

The study found that the majority of pregnant women did not have adequate knowledge about benefits of using folic acid before and during pregnancy. The pregnant women knowledge about folic acid was significantly associated with maternal old age, age of marriage, multigravida, absence of anemia, unsuccessful pregnancies (abortion and stillbirth). And the pregnant women knowledge about folic acid was significantly associated with high socio-economic status.

## Competing interests

The authors declare that they have no competing interests.

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