



Awareness of Folic Acid Intake among Women of Childbearing Age in Ha'il region, Kingdom of Saudi Arabia

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Authors' contributions

This work was carried out in collaboration among all authors. Author FHK has proposed the plan of this project. She submitted the proposal for ethical approval and did data analysis and wrote methodology and results. Authors SKA, WSA and AHA worked on introduction, discussion and references. All authors have read and approve the final manuscript before submission.

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ABSTRACT

Background: Folic acid deficiency is one of the most common vitamin deficiencies among women of childbearing-age. Folic acid is a water-soluble B-complex vitamin. Although the deficiency is easily corrected by administration of folic acid, but still the prevalence of folic acid deficiency is high. It can lead to neural tube defects (NTDs) in fetus, which are a major cause of severe disability and mortality among infant population, occurring in over one quarter of a million new-borns per year, worldwide. NTDs occur in the very early phase of pregnancy when the mother herself does not know that she is pregnant. This study has assessed awareness of women of childbearing age on folic acid i.e., timing of folic acid supplementation, different sources, symptoms of its deficiency, toxicity and its effect on fetus. Study was conducted in Ha'il region and its suburbs, Kingdom of Saudi Arabia in the period between October 2020 and February 2021.

Methodology: An analytical cross-sectional community-based study was carried out among 842 women aged between 18 and 45 years using a close-ended questionnaire.

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Results: In total, Folic Acid was taken by just 23.87% of participants. Only 33% knew that Folic Acid deficiency causes neural tube defects in fetus. Further it was revealed that postgraduates had a significantly better knowledge on Folic Acid ($p \leq 0.000$) than others. Similarly, those who belonged to household where total monthly income was 5000 Saudi Riyals or more had better awareness on Folic Acid than participants who belonged to low socioeconomic status ($p \leq 0.05$).

Conclusion: It's concluded that in Ha'il and its suburb area, women of childbearing age do not possess adequate knowledge on Folic Acid. Neural tube defects in fetus due to folic acid deficiency were not known by a large majority of respondents. However, awareness has a strong association with educational level and socioeconomic status. Hence it is recommended that female literacy and female employment should be promoted, encouraged and supported in Kingdom in order to improve our health indicators.

Keywords: Folic acid; awareness; neural tube defect; Kingdom of Saudi Arabia.

1. INTRODUCTION

Folic acid deficiency is one of the most common vitamin deficiencies among childbearing-aged women. Folate is essential for metabolic processes and neural development. Foliates are one of the B Complex vitamins, which are known as B9. They are essential for many biosynthetic activities in mammalian cells. Folate acts as a carbon donor therefore it is necessary for de novo synthesis of nucleotide and methionine [1]. Folic acid, an artificial form of the vitamin, as studies show prevent neural tube defects (NTDs) and other birth defects [2]. Due to inability of the mammalian cells to produce folate, the requirements are met fully on the dietary sources. It can be found in foods such as liver, dark leafy green vegetables, citrus fruits, and dry edible beans [1,2]. Fortified breakfast cereals, bread, pasta, rice, and vitamin supplements contain the manufactured form of Folic acid [2].

Even though the deficiency is easily corrected by oral intake of tablet folic acid, but unfortunately the prevalence of folate deficiency is high globally and locally in Saudi Arabia [2,3,4,5]. NTDs occur in the very early phase of pregnancy when the mother herself does not know that she is pregnant. That's why World Health organization (WHO) has recommended that women who are planning to become pregnant should take at least 400mcg of supplemental synthetic folic acid daily, in addition of intake of folate rich diet from 3 months before conception up to 12 weeks of gestation [1,2,3]. Women of childbearing age should obtain a dosage of 0.4mg or 400 micrograms of FA daily preconception-ally (a month before conception and 2 months after) and women who are at high risk for NTDs – women with history of a previous NTD pregnancy - need a higher dose of folic acid; about 4 or 5 mg of FA, also, daily and

preconception-ally [6]. The Medical Research Council did a trial where they chose the recommended dose of 4 mg/d; the trial resulted in a 72% reduction in NTD recurrence [7,8].

Folic Acid deficiency in mother lead to NTDs in fetus, which are severe birth defects of the central nervous system that originate during embryogenesis resulting from failure of the neural tube closure [3]. NTDs are a multifactorial disorder, with risk factors of genetic predisposition and various environmental exposures, the most influential being low maternal periconceptional folate intake [3]. NTDs are the second most common birth defect following congenital heart anomalies and the commonest types of NTDs are spinal bifida, encephalocele, and anencephaly [4]. The two most common types of NTDs are anencephaly and spina bifida. A child with anencephaly cannot survive and dies before birth or shortly afterwards. A child with spina bifida can survive, however has serious functional abnormalities, and may be mentally retarded [5,9]. The prevalence of NTDs varies widely depending on geographic region and ethnical grouping, making them one of the most frequent congenital malformations. It is estimated that approximately 300,000 babies are born each year with NTDs, resulting in approximately 88,000 deaths and 8.6 million disability-adjusted life years (DALYs) [10].

Folic acid supplementation may affect other birth defects as some studies discussed. In Canada 2016, The prevalence rate of congenital heart diseases and its subtypes decreased between the years of 1990 and 2011 [11], also a case-control study in northern Netherland 2010 showed that the risk reduced ~20% after the use of periconceptional folic acid supplements [12]. However, a study done in Denmark and Norway

2019 showed no association between the folic acid supplementation and congenital heart diseases and its subtypes [13].

Both animal and human studies have shown the essential role of folate during nervous system and brain development [6]. Women are especially susceptible to folate deficiency during pregnancy, which is a period of rapid fetal growth, and high rates of cell division. Studies showed that up to 50% of NTD cases could be prevented simply by using folic acid containing supplements [5]. The Grain Silos & Flour Mills Organization in Saudi Arabia began requisite folic acid fortification of wheat flour in the year the of 2000 obliging to the appeal done by the Nutritional Administration Department of the Ministry of Health of Saudi Arabia (Ministry of health, 2000 [14]. There was an obvious recession in the incidence of NTDs since the initiation of fortification; from 1.9/1000 live births 2000 (1997-2000) to 0.76/ 1000 live births (2001-2005) [15]. However, even with the prosecution of flour fortification in 2001, the prevalence of NTDs in the kingdom of Saudi Arabia remains high [16]. This may be as a result of other causes that cannot be prevented by folic acid [16].

A research done in 2013 in Ha'il, Kingdom of Saudi Arabia assessed awareness of folic acid supplementation in women of childbearing age [5]. The results showed that 91% have read or heard of folic acid and 81% knew that folic acid prevents neural tube defects, however, only 10% out of a sample size of 300 subjects who had knowledge of folic acid indicated it should be taken before pregnancy, which shows a very low level of awareness [5]. After that period, similar research on folic acid was not conducted again in Ha'il to assess if the level of awareness has increased or not. The level of awareness in other areas in Saudi Arabia are also diverse. In the west, a research was done in Jeddah in 2016 out of a sample size of 501, only 169 (34%) knew that it should be taken preconceptionally and 193 (57%) knew that folic acid prevents neural tube defects [15]. In Riyadh, a research was conducted in 2018 on 600 subjects; 42% of women knew folic acid should be taken before pregnancy and 80% were aware that it prevents the development of neural tube defects [17]. Furthermore, Taibah University in Almadinah Almunawwarah carried out a research on 149 subjects, out of 66 participants; 74% knew it should be taken before gravidity and 56% of women presumed the clinical picture of folic acid deficiency will result in central nervous

complications [18]. Moreover, a study was performed in Tabuk on 101 subjects; 49% knew that folic acid should be taken 3 months before pregnancy and the first trimester whereas, just 50% said folic acid deficiency will lead to neural tube defects [19].

2. MATERIALS AND METHODS

This analytical cross-sectional community-based study was conducted between October 2020 and February 2021 in the city of Ha'il and its suburbs, Kingdom of Saudi Arabia.

Questionnaire along with informed consent form were first written in English then translated by a language expert in Arabic. After getting Ethical Approval from University of Ha'il, it was sent to 850 study participants by Google Link and on WhatsApp. Study participants were women between the ages 18 to 45 years who did not belong to medical background as otherwise their preexisting knowledge could confound the results. Participants had the right to refuse to participate.

Participation was voluntary. Only those who filled the informed consent form were registered in study.

Questionnaire focused on awareness of women on Folic Acid (its necessity, dosage, sources, effects of its deficiency and toxicity on women and on newborn etc.). Incompletely filled forms were excluded. In our study 842 participants have filled the whole questionnaire.

Personal identity of the respondents was kept confidential.

Data was entered and analyzed by using Statistical Package for Social Sciences (SPSS) version 23.

Data file was cleaned and edited before analysis.

Frequencies were calculated from quantitative and qualitative data. Demographic profile of the respondents was cross tabulated (Chi-Square Test) with different variables of knowledge on Folic Acid dosage, symptoms of deficiency, symptoms of toxicity, effects on fetus etc. by keeping level of significance $p \leq 0.05$.

3. RESULTS

Table 1 shows the demographic profile of study participants. Most of the respondents were Saudi females (98.5%) of Hail region, mostly above 36

years of age (30.8%). Most of the study participants were unmarried (55.8%) followed by married (39%). Eighty percentages of our study participants were undergraduates with total monthly income of the household more than 10,000 Saudi Riyals (46.6%). Most of the respondents were not pregnant (95.8%).

Fig. 1 shows that most of the respondents (55.8%) didn't have any child, as they were unmarried. Most of the married respondents were grand multipara or great grand multipara (having 5 or more than 5 children).

Table 2 shows that those participants who were 21 years and above in age and having 5 or more children knew that Folic Acid is a vitamin. Marital status has no effect on the knowledge on Folic Acid. Further it reveals that those who were postgraduates have a significantly better knowledge regarding Folic Acid ($p \leq 0.000$) than others. Similarly, those who belong to household where total monthly income is 5000 Saudi Riyals or more have correct definition of Folic Acid than participants who belonged to low socioeconomic status ($p \leq 0.05$).

Table 3 shows relationship of intake of Folic Acid with demographic profile. It shows that who were married, pregnant, grand-multipara and above 36

years of age took Folic Acid more (96%) than other women, this difference is significant ($p \leq 0.000$). Similarly, those women who were having higher education level took Folic Acid regularly ($p \leq 0.000$). Other variable that revealed significant association was high socio-economical status ($p \leq 0.001$).

Results revealed by Table 4 are consistent with the results of previous 2 Tables. Those who took Tablet Folic Acid once a day were the same group of women (married, pregnant, grand-multipara, women above 36 years of age and those belonged to high socioeconomic status) who had significant associations in the previous 2 tables ($p \leq 0.000$).

Table 5 reveals that most of the study participants answered that Tab. Folic Acid should be taken by women of childbearing age only. A very low proportion of participants answered that all men and women should take it.

Fortunately, a large majority of respondents (81.35%) have suggested Folic Acid to be taken by women of childbearing age (Fig. 2). A large majority of respondents (35.51%) took multivitamins as shown in Fig. 3. Tab Folic Acid is taken by just 23.87% of participants.

Table 1. Demographic Profile of Study Population (N = 842)

Variable		No. of subjects	Percentage
Nationality	Saudi	829	98.5
	Non-Saudi	13	1.5
Age	18-20	180	21.4
	21-25	232	27.6
	26-30	87	10.3
	31-35	84	10.0
	Above 36	259	30.8
	Marital Status	Single	470
Married		331	39
Widowed		29	3.4
Divorced		12	1.4
Area of Residence	Ha'il	668	79.3
	Suburbs of Ha'il	51	6.1
	Area other than Ha'il	123	14.6
Level of Education	Primary School	16	2
	High School	134	16
	Undergraduate	677	80
	Postgraduate	15	1.8
Monthly Income of Household in Riyals	< 1000	42	5
	1000 - 5000	195	23.2
	5000 – 10,000	213	25.3
	> 10,000	392	46.6
State of Pregnancy	Pregnant	35	4.2
	Not Pregnant	807	95.8

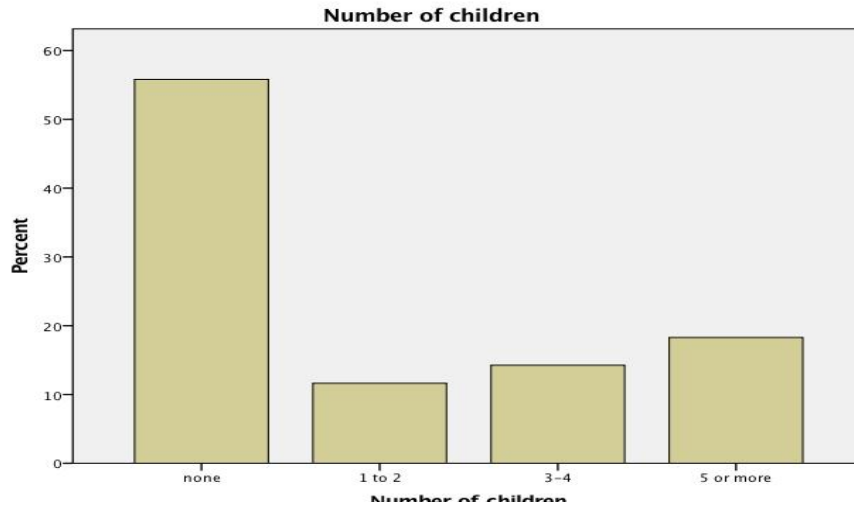


Fig. 1. Parity of Study Participants

Table 2. Relationship of knowledge on Folic Acid with demographic profile

Variable		Vitamin	Drug	I don't know	P-value
Age (years)	18-20	136 (76%)	25	16	0.002
	21-25	198 (85%)	15	18	
	26-30	72 (82%)	11	4	
	31-35	71 (84%)	11	2	
	Above 36	219 (85%)	28	8	
Marital Status	Single	331 (85%)	39	37	0.096
	Married	329 (85%)	45	10	
	Widowed	26 (81%)	3	3	
	Divorced	10 (71%)	2	2	
Number of Children	None	380 (81%)	47	39	0.018
	1 to 2	83 (83%)	14	3	
	3 – 4	96 (81%)	17	5	
	5 or more	137 (90%)	11	3	
Level of Education	Primary School	10 (52%)	4	5	0.000
	High School	11(73%)	2	2	
	Undergraduate	570 (43%)	70	30	
	Postgraduate	111 (83%)	12	10	
Monthly Income of Household in Riyals	< 1000	31 (73%)	6	5	0.047
	1000 - 5000	152 (77%)	28	15	
	5000 – 10,000	187 (87%)	17	9	
	> 10,000	326 (85%)	38	19	
	Not Pregnant	664 (83%)	83	51	

Health professionals were the main source of imparting knowledge to study participants as revealed by Fig. 4.

Fig. 5 shows that green leafy vegetables and liver are the source of folic acid as answered by 66% and 35.51% respectively. However, 29.57% considered supplements as the only source of getting Folic Acid.

Fifty-eight percentage of study participants answered that Folic Acid deficiency causes hair loss while 41% percentage considered muscular weakness as symptom of folic acid deficiency (Fig. 6). Irritability is the main sign of Folic Acid toxicity, was answered by half of the respondents (Fig. 7). Majority of study participants knew that Folic Acid deficiency has bad effect on fetus as shown in Table 6.

Table 3. Relationship of intake of Tab. Folic Acid with demographic profile

Do you take Folic Acid?		Yes	No	P-value
Age (years)	18-20	56 (31%)	124	0.000
	21-25	92 (39%)	140	
	26-30	66 (75%)	21	
	31-35	79 (87%)	5	
Marital Status	Above 36	251 (96%)	8	0.000
	Single	144 (34%)	268	
	Married	374 (96%)	15	
	Widowed	5 (17%)	24	
Number of Children	Divorced	4 (33%)	8	0.000
	None	180 (38%)	290	
	1 to 2	93 (94%)	5	
	3 – 4	110 (91%)	10	
Level of Education	5 or more	149 (96%)	5	0.000
	Primary School	12 (12%)	4	
	High School	66 (49%)	68	
	Undergraduate	453 (66%)	224	
Monthly Income of Household in Riyals	Postgraduate	12 (80%)	3	0.002
	< 1000	26 (61%)	16	
	1000 - 5000	106 (54%)	89	
	5000 – 10,000	139 (65%)	74	
State of Pregnancy	> 10,000	275 (70%)	117	0.000
	Pregnant	31 (88%)	4	
	Not Pregnant	511 (63%)	296	

Table 4. Relationship of knowledge on frequency of intake of Tab. Folic Acid with demographic profile

Variable		Once a day	Twice a day	Once/ week	Once/ six months	Once/year	P-value
Age (years)	18-20	87 (48%)	19	19	4	51	0.000
	21-25	147 (63%)	6	11	3	65	
	26-30	65 (74%)	4	4	3	11	
	31-35	69 (85%)	4	4	3	3	
Marital Status	Above 36	223 (86%)	11	3	3	19	0.000
	Single	225 (54%)	24	31	10	122	
	Married	347 (89%)	18	3	3	18	
	Widowed	17 (58%)	3	3	2	4	
Number of Children	Divorced	4 (33%)	2	2	2	2	0.000
	None	272 (33%)	28	33	10	127	
	1 to 2	86 (86%)	3	3	3	3	
	3 – 4	102 (85%)	5	3	3	7	
Level of Education	5 or more	134 (87%)	3	3	3	11	0.069
	Primary School	8 (50%)	2	2	2	2	
	High School	81 (60%)	9	11	4	29	
	Undergraduate	13(61%)	2	2	2	2	
Monthly Income of Household in Riyals	Postgraduate	490 (84%)	35	23	9	102	0.015
	< 1000	28 (63%)	2	4	3	7	
	1000 - 5000	124 (63%)	12	15	5	39	
	5000 – 10,000	148 (69%)	13	6	4	42	
State of Pregnancy	> 10,000	299 (76%)	18	9	4	62	0.014
	Pregnant	30 (79%)	2	2	2	2	
	Not Pregnant	565 (70%)	44	35	13	150	

Table 5. Relationship of demographic profile with person who should take folic acid

Variable		Pregnant women	Women of childbearing age	All women	Only men	All
Age (years)	18-20	49	75	51	2	2
	21-25	60	100	68	2	2
	26-30	14	37	32	2	2
	31-35	17	40	22	2	2
	Above 36	49	140	74	2	2
Marital Status	Single	100	171	126	3	4
	Married	79	212	97	2	2
	Widowed	4	10	11	2	2
	Divorced	4	2	2	2	2
Number of Children	None	118	200	145	3	4
	1 to 2	17	52	25	2	2
	3 – 4	20	55	41	2	2
	5 or more	35	81	34	2	2
Area of Residence	Hail	134	337	192	2	3
	Suburbs of Hail	12	15	20	2	2
	Area other than Hail	43	43	33	2	2
Level of education	Primary School	5	5	2	2	2
	High School	31	67	32	2	2
	Undergraduate	144	321	207	2	3
	Postgraduate	3	6	2	2	2
Monthly Income of Household in Riyals	< 1000	8	16	14	2	2
	1000 - 5000	47	103	45	0	0
	5000 – 10,000	45	106	60	1	1
State of Pregnancy	> 10,000	90	174	124	2	2
	Pregnant	10	12	9	2	2
	Not Pregnant	180	383	236	4	4

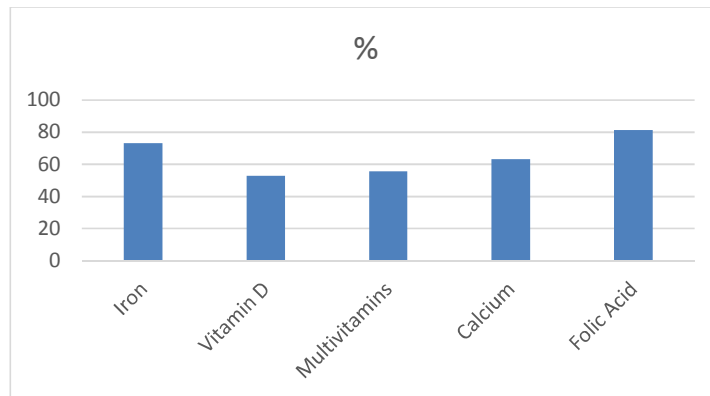


Fig. 2. Knowledge on important supplements for a woman of childbearing-age (Respondents have chosen more than one option)

Thirty-four percentage of participants did not know if there is any bad effect of Folic Acid deficiency on fetus. Spinal defects are produced in fetus due to Folic Acid deficiency, were known by 33% of study participants but same percentage of participants labeled congenital heart defects also (Fig. 8).

4. DISCUSSION

According to the goals of vision 2030 of Kingdom of Saudi Arabia, female literacy, female employment and improvement in health delivery system have given due consideration. The results of which could be seen in our study where

those women who were educated and belonged to sound socioeconomic status gave most of the correct answers regarding Folic Acid. Further,

information regarding folic acid was given mostly by health care providers [14,15,16].

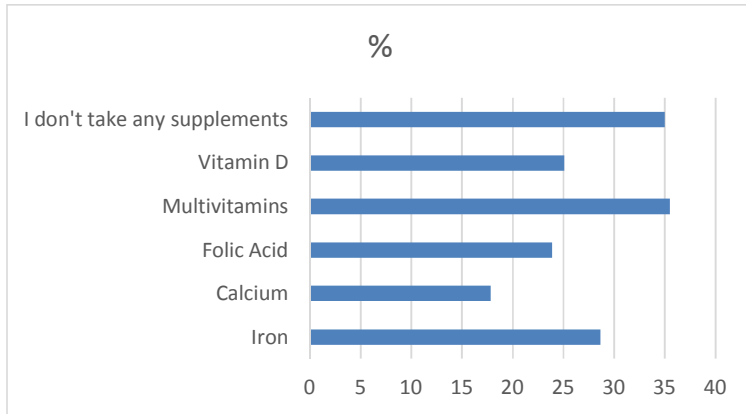


Fig. 3. Information on supplement that the respondents take on daily basis (Respondents have chosen more than one option)

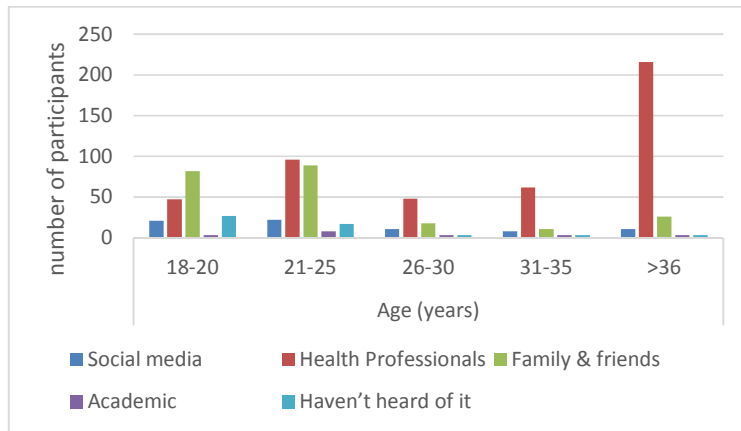


Fig. 4. Relationship of source of information on Folic Acid

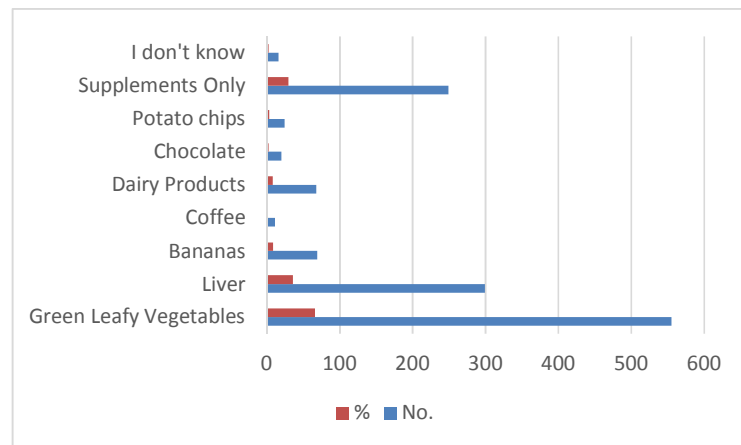


Fig. 5. Different sources of Folic Acid (Respondents have chosen more than one option)

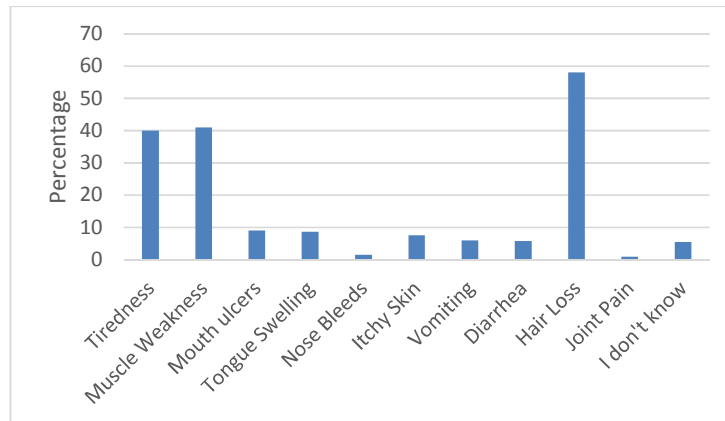


Fig. 6. Different symptoms of Folic Acid deficiency (Respondents have chosen more than one option)

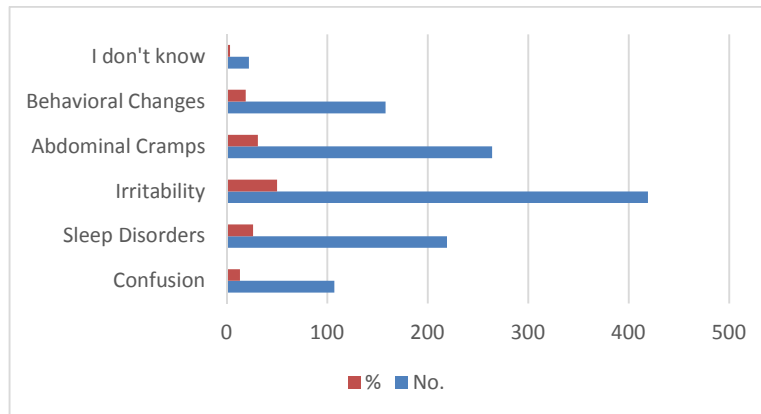


Fig. 7. What do you think are the signs of Folic Acid toxicity? (Respondents have chosen more than one option)

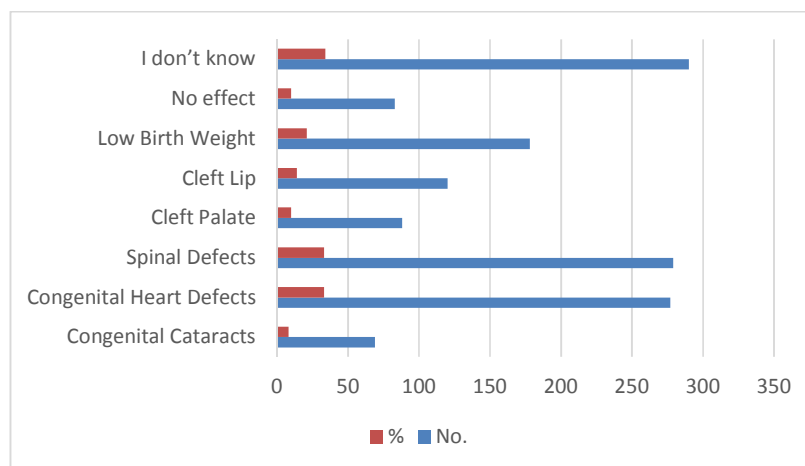


Fig. 8. Different effects on fetus due to Folic Acid deficiency (Respondents have chosen more than one option)

Table 6. Relationship of knowledge on the effect of Folic Acid deficiency on fetus with demographic profile of respondents

Variable		Yes	No
Age (years)	18-20	160 (88%)	20
	21-25	201 (86%)	31
	26-30	79 (90%)	8
	31-35	79 (94%)	5
	Above 36	240 (92%)	19
Marital Status	Single	359 (87%)	53
	Married	363 (98%)	26
	Widowed	26 (89%)	3
	Divorced	9 (75%)	3
Number of Children	None	413 (87%)	57
	1 to 2	94 (95%)	4
	3 – 4	110 (91%)	10
	5 or more	142 (92%)	12
Area of Residence	Hail	595 (89%)	73
	Suburbs of Hail	47 (92%)	4
	Area other than Hail	117 (95%)	6
Level of Education	Primary School	14 (87%)	2
	High School	126 (94%)	8
	Undergraduate	604 (91%)	73
	Postgraduate	12 (80%)	3
Monthly Income of Household in Riyals	< 1000	34 (80%)	8
	1000-5000	172 (86%)	23
	5000 – 10,000	196 (92%)	17
	> 10,000	357 (91%)	35
State of Pregnancy	Pregnant	32 (91%)	3
	Not Pregnant	724 (89%)	83

In our study, majority of respondents knew that Folic Acid should be taken pre-conceptionally, which reflects that awareness on folic acid during the last 7 years has increased more than 70% as compare to a study done in Hail region 2013, when it was just 10% [5]. Our result findings reveals higher level of awareness as compared to what was reported from Jeddah, Saudi Arabia, where only (33.7%) knew that Folic Acid must be taken pre-conceptionally or in early pregnancy. However, the awareness level has increased but it's mainly the educated, married cohort of respondents who belonged to high socioeconomic status.

Hence regarding correct knowledge on this vitamin and its association with educational level, our results are consistent with the findings of similar studies done in Makkah Al-Mokarramah, Saudi Arabia (72.2%), Tabuk, Saudi Arabia (48.5%), Lebanon (24.7%), [19,20,21,22], and in Qatar (41.3%), where most of women who knew and used Folic acid before the pregnancy and during the first trimester, were those having higher education level [23]. Likewise, similar study in Texas (USA) showed a significant

association ($p \leq 0.001$) of level of awareness with education level [24]. On the contrary, study done in Libya revealed that awareness has no association with educational level, as there was no significant difference in awareness level between the women who got basic education and formal education, there the significant difference among them was due to better health delivery system [25]. Hence this reflects that sound health delivery system is also a strong predictor of increasing level of awareness.

This noticeable change between the two Hail studies over these 7 years could be a result of the improvement of the medical facilities in Hail and its suburbs in spreading awareness as shown in this study health professionals were the person to impart awareness to public.

Unfortunately, in this study, only 33% knew that FA deficiency causes spinal defects in fetus. A study done in Tabuk showed 49.5% of women apprehended FA deficiency would lead to NTDs [19]. In the same context, another study showed 81.5% of women knew that FA intake prevents birth defects in fetus [26]. However, they didn't

specify what kind of birth defects FA prevents. Similarly, a study done in Nigeria showed that 25.9% were aware that FA hindered the development of NTDs [27]. Similar results were obtained from research done in Ha'il in 2013, which revealed that 81% of women knew that FA has a role in preventing NTDs [5]. This high level of awareness may be due to the fact that researchers of that study interviewed married pregnant women who worked at Ha'il University and who visited maternity hospital, there the respondents preexisting knowledge acted as a confounder.

Most of the pregnant women took multivitamin but they were unaware that Folic Acid supplement is more important to take pre-conceptually as in the early phase of pregnancy its deficiency has hazardous effect on fetus [21,22,23].

Regarding source of information on folic acid, other national and international studies revealed that it mostly the health care provider who imparts information either in the antenatal clinics or in Gynae- OPD [22-24]. These finding is similar to our result.

Results of our study showed that those who were aware of the dosage of FA and regularly took folic acid were married, multipara or grand multiparas. Hence there is a need to discuss the importance of FA intake with unmarried women of childbearing age as the hazardous effect of its deficiency occurred in fetus in the very early phase of pregnancy when mother herself could not realize that she is pregnant.

5. CONCLUSION

It's concluded that in Ha'il and its suburb area, women of childbearing age do not possess adequate knowledge on Folic Acid. Most of the pregnant women took multivitamin but they were unaware that Folic Acid supplement is more important to take pre-conceptually as in the early phase of pregnancy its deficiency has hazardous effect on fetus. Neural tube defects in fetus due to folic acid deficiency were not known by a large majority of respondents. However awareness has a strong association with educational level and socio economic status, hence its recommended that female literacy and female employment should be promoted, encouraged and supported in Kingdom in order to improve our health indicators.

CONSENT

Authors declare that 'written informed consent was obtained from the respondents'.

ETHICAL APPROVAL

Authors have obtained all necessary ethical approval from Ethical Board Committee of University of Ha'il.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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