

## Women's Knowledge and Perception about Benefits of Folic Acid Intake Before and During Pregnancy According to Health Belief Model in Beni-Sueif City

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### Abstract:

Over the past 5 decades, there has been a rapid growth of knowledge about folic acid (FA) and its role in the prevention of Neural Tube Defects (NTDs). The present study **aimed to** assess women's knowledge and perception regarding benefits of FA intake before and during pregnancy according to the health belief model (HBM). **Study design:** descriptive cross - sectional. **Sample and settings:** carried on a total of 500 pregnant women in antenatal care units which affiliates to 5 settings in Beni-Sueif city. **Tool:** semi structured interview questionnaire included the MBM. **Results** of this study indicated Just 19.6% had adequate knowledge about FA, while 70.8% of women take FA currently, also majority of women don't take it currently as they need prescription to take it. And (84%) of women had positive perception of importance of FA. **Conclusion and Recommendations:** education, pregnancy planning, and residence were statistically significant factors affecting women's knowledge and perception related to FA intake behavior. Based upon findings of the current study, a well-organized periconceptional FA supplementation program is required, and application of HBM is recommended to improve women& health care provider about perception related to FA intake benefits.

**Key words:** Folic acid- neural tube defects -health belief model.

### Introduction:

Over the past 5 decades, there has been a rapid growth of knowledge about FA and its role in the prevention of NTDs. (**Bastian, 2008**). Nowadays, FA deficiency is one of the most common vitamin deficiencies among women. The different NTDs types, including spina bifida, anencephaly and encephalocele lead to lifelong disability and premature death. Neural tube defects are caused by the failure of the open neural tube to close by the 29<sup>th</sup> day post-conception. In order to prevent these defects, a daily supplement of 0.4mg FA is recommended from a month before conception to the end of first trimester (**Allen, 2006**).

Adequate macronutrient supply during the entire pregnancy is necessary. Moreover, supplementation should continue after pregnancy into the period of lactation (**Goh, 2010**). Circulating folate concentrations decline in pregnant women who are not supplemented with FA due to: increased folate demand for the fetus, increased folate catabolism, increased folate clearance and excretion, decreased folate absorption, hormonal influence on folate metabolism as a physiological response to pregnancy and low folate intake (**Herrera& Ortega, 2008**).

No representative folate intake data are available for Egypt, but it was estimated that cereal foods could contribute to 60% of the daily folate intake (**Hefni et al., 2010**). Recently in 2010, Egypt introduced

mandatory FA and iron fortification of the flour used for the production of subsidized pita bread (**GAIN, 2009**) to reduce incidence of both NTDs and anemia. Egyptian pita bread with enhanced folate content of 50 mg/100 g (compared to 30 mg/100 g using native wheat flour) could be produced by adding 50% sieved Germinated Wheat Flour (GWF). Consumption of this bread would increase the average daily folate intake by approximately 75 mg (**Hefni et al., 2012**).

A significant gap between awareness, knowledge, and the actual consumption of FA appears to be universal. In the United States, a national survey showed that although 84% of women have a general awareness of FA, only 31% reported taking it daily (**Green-Raleigh et al., 2006**).

The health belief model suggests that the likelihood of an individual taking action for a given health problem is based on the interaction between four types of beliefs. The model predicts that individuals will take action to protect or promote health if: they perceive themselves to be susceptible to a condition or problem, they believe it will have potentially serious consequences, they believe a course of action is available which will reduce their susceptibility, or minimize the consequences, and they believe that the benefits of taking action will outweigh the costs or barriers (**Maggie, & Wendy, (2006)**).

Since education about folate consumption is an important component of NTDs prevention, nurses are

in a key position to carry out health education, because they are the health care provider, who have continuous contact with women, and are usually most accessible source of information for patient. To facilitate this process, nurses can act as teacher and educators concerning dietary intake, weight management, and potentially harmful nutritional practices (Houghton, 2009).

#### Significance of the study

The incidence of NTDs is higher with younger and older mothers, maternal diabetes, history of miscarriages, maternal folate deficiency, and maternal exposure to drugs such as valproic acid (Kenner & Lott, 2008). Each year, 300,000 to 400,000 infants worldwide are born with spina bifida and anencephaly (Christianson, 2006). In Egypt the frequency of congenital malformations (CMs) among children aged 0–18 years was 2%. The estimated incidence of CMs of the Central Nervous System (CNS) is 26.92%. Frequency of NTDs is (29.57%) of that of the CNS (Shawky *et al.*, 2011). Anomalies of CNS are considered the most common anomalies in live births and still births in Egypt as well as in other countries (Tomatir *et al.*, 2009).

Findings of this study will provide a description about the knowledge and perception of the women about FA as well as to what extent the knowledge and perception of FA benefits affect the women's intake. Also the HBM can be used to guide examination of the women's folate attitudes, behaviors and beliefs, and detect appropriate educational techniques.

#### Aim of the study:

To assess women's knowledge and perception regarding benefits of FA intake before and during pregnancy according to the HBM.

#### Research questions:

1. Are the women attending the antenatal care clinics have knowledge and perception about FA and its benefits?
2. Are women's knowledge and perception about FA benefits affect their intake?

#### Subjects and Methods:

##### Research design:

Descriptive cross-sectional study design was chosen for this study.

##### Settings:

The study was conducted in antenatal care units which affiliates to 5 settings in Beni-Suef city. These settings include; Three Primary Health care Centers (PHCs), Beni-Suef University and General Hospital.

##### Sample:

A convenient sample of 500 pregnant women who were registered in PHCs, Beni-Suef University and General hospital seeking antenatal care.

#### Tools:

A semi structured interview questionnaire was utilized to collect data. This semi structured interview questionnaire was developed and modified from version of a FA quiz from the CDC (found at <http://www.cdc.gov/ncbddd/folicacid/quiz.html>). (CD C, 2010)".

##### The first part was to obtain:

- 1- Socio demographic data covers the following areas As, age, consanguinity, level of education, type of family, and occupation.
- 2- Medical history: history of chronic illness as hypertension, diabetes mellitus, anemia...etc.
- 3- Obstetric History (such as history of previous pregnancy complication as: abortion, stillbirth, and congenital malformations among her children and in the closer family, number of parity, gravidity, and period from past pregnancy).

##### The second part involved questions about:

- 1- Awareness of FA among women in child bearing age: Awareness is measured based on the "yes" response to the question, "Have you ever heard about Folate and FA?"
- 2- Knowledge of FA among women in child bearing age. To assess participants' FA knowledge. The questions covered the main points about folate and health. For purpose of the study "general Knowledge" is indicated if the respondent mentioned the prevention of birth defects in her response.

**Scoring system** of women's knowledge was developed by the researcher. The total score of knowledge equal 18 grades, each correct answer took 2 grades; incomplete answer took 1 grade, while wrong one took zero. The total knowledge score was classified as:

- ✓ Below 60% was regarded as inadequate knowledge.
  - ✓ 60% and above was regarded as adequate knowledge.
- 2- Practice of FA usage (Preconception and during pregnancy). Consumption of a vitamin containing FA included questions about present history of FA intake.

##### Folic acid use was recorded into 3 categories:

- A. Adequate use – reported use before and during pregnancy.
- B. Sub-adequate use – reported use before or during pregnancy only.
- C. Never used – reported not taking supplements before and during.

**The third part: Health belief model:** The health belief model is constructed using a likert scale which consists of several declarative items that designed to

assess participants' beliefs about folate. The questionnaire developed was a modified version of the HBM questionnaire used in a study by **Kloeblen and Batish (1999)**, which was found to be predictive of intention to permanently follow a high folate diet in low-income pregnant women and found that perceived benefits was the most predictive of intention to follow a high folate diet (folate intention).

**Scoring system** of women's perception of women's perception was designed by the researcher. The total score of perception equal 108 grades. The total perception score was classified as:

- Below 60% was regarded as negative perception.
- 60% and above was regarded as positive perception.

A higher HBM total score reflects greater support for a women's likelihood to follow a high folate diet.

**Content validity:**

It was established by panel of experts from obstetrics and gynecological nursing and obstetrics and gynecological medicine and review of related literature for clarity, relevance, comprehensiveness, understanding, applicability and easiness.

**Pilot study:**

A pilot study was implemented on 10% of women included in the study which was equal to 50 to ascertain the relevance of the tools, and estimate the length of the time needed to fill the sheet. Analysis of the pilot study revealed that minor modifications are required. These modifications were done and women included in the pilot study were included in the total sample.

**Ethical considerations:**

A written or oral consent accordingly to conduct the study was taken from each studied women to protect their rights before the start of the study. They were informed that they could withdraw at any time. A unique identifying number (subject ID) was assigned to the data collected from each woman to maintain confidentiality.

**Statistical Analysis:**

All the statistical analysis was performed using SPSS package version 20. Collected data were coded and analyzed. Descriptive statistics for the variables were calculated.

**Inferential Statistics:**

After completion of data analysis, data were presented in frequency tables. The student t-test was used for comparison of means of two independent groups. Chi-square was used for comparison of frequency and percentages of qualitative variables. Regression analysis was run to assess the effect of the independent variables (women characteristics) on the dependent variables (knowledge, perception, intake of FA). This test used because there is more than one

independent variable and three dependent variables.

The variables significance was classified as:

N.S= Non-significant at  $p>0.05$

\*Mild significant at  $p<0.05$

\*\* Moderate significant at  $p<0.01$

\*\*\* highly significant at  $p<0.001$

**Results:****Table (1):** Distribution of the studied women according to their sociodemographic characteristics.

Variable	No.(500)	%
<b>Age groups</b>		
18-24	213	42.6 %
25-34	243	48.6 %
35-45	44	8.8 %
<b>Mean <math>\pm</math>SD = 26.115 <math>\pm</math> 5.515</b>		
<b>Consanguinity</b>		
Yes	175	35.0 %
No	325	65.0 %
<b>Residence</b>		
Urban	115	23 %
Rural	385	77 %
<b>Mother educational level</b>		
Illiterate	154	30.8 %
Read and write	108	21.6 %
Secondary education	197	39.4 %
University education	37	7.4 %
Post graduate education	4	0.8 %
<b>Occupation</b>		
House wives	467	93.4 %
Employed	33	6.6 %
<b>Type of family</b>		
Nuclear	204	40.8 %
Extended	296	59.2 %

**Table (2):** Distribution of the studied women according to their knowledge about FA.

<b>Total =(500)</b>		
Variable	No.	%
<b>knowledge level</b>		
Adequate	98	19.6 %
Inadequate	402	80.4 %
<b>#knowledge of FA Benefits during pregnancy</b>		
Helps ensure women have a	163	32.6 %
Decreases the risk of NTDs	117	23.4 %
Help your body create RBCs	136	27.2 %
Don't know	160	32.0 %

#More than one option was checked.

**Table (3):** Distribution of the studied women according to their current pattern of fa intake

Variable	Total =500	
	No.	%
<b>Current intake of FA supplement(n=500)</b>		
Yes	354	70.8 %
No	146	29.2 %
<b>Time of intake(n=354)</b>		
Before pregnancy	2	0.6 %
During pregnancy	339	95.8 %
Before and during pregnancy	13	3.6 %
<b>Time of intake during pregnancy</b>		
1 <sup>st</sup> trimester	280	79.1 %
2 <sup>nd</sup> trimester	39	11 %
3 <sup>rd</sup> trimester	8	2.2 %
During all stages	11	3.1 %
Preconception and at early pregnancy	13	3.6 %
1 <sup>st</sup> and 2 <sup>nd</sup> trimester	2	0.5 %
1 <sup>st</sup> and 3 <sup>rd</sup> trimester	1	0.3%
<b>Dosage</b>		
1 tab	292	82.4 %
2 tab	20	5.7 %
3 tab	3	0.8 %
Don't remember	1	0.3 %
In combination with iron 1 CAP	38	10.8 %

**Table (4):** Distribution of the studied women according to their perceptions related to FA-taking behavior by using the HBM constructs total score.

Total = 500		
The HBM constructs total score	No.	%
<b>Perceived susceptibility (range 4-24)</b>		
• Negative	267	53.4%
• Positive	233	46.6%
<b>Perceived benefits (range 1-6)</b>		
• Negative	46	9.2%
• Positive	454	90.8%
<b>Perceived severity (range 3-18)</b>		
• Negative	3	0.6%
• Positive	497	99.4%
<b>Perceived barriers (range 5-30)</b>		
• Negative	137	27.4%
• Positive	363	72.6%
<b>Self – efficacy (range 2-12)</b>		
• Negative	89	17.8%
• Positive	411	82.2%

Total = 500		
<b>Cues to action (range 2-12)</b>		
• Negative	138	27.6%
• Positive	362	72.4%
<b>The HBM total score (levels of perception) (range 18-108)</b>		
Positive	420	84 %
Negative	80	16 %

**Table (5):** The Relationship between the Studied Women Knowledge about FA and Their Characteristics

Variable	Knowledge level						P. value
	Adequate=98		In adequate=402		Total=500		
	No	%	No	%	No	%	
<b>Age groups</b>							
18-24	36	36.7	175	43.5	211	42.2	0.443 N.S
25-34	51	52.1	191	47.5	242	48.4	
35-45	11	11.2	36	9	47	9.4	
<b>Mother educational level</b>							
Illiterate	10	10.2	144	35.8	154	30.8	0.001**
Read and write	21	21.4	87	21.6	108	21.6	
Secondary education	47	48.0	150	37.3	197	39.4	
University education	18	18.4	19	4.7	37	7.4	
Post graduate education	2	2.0	2	0.6	4	0.8	
<b>Occupation</b>							
House wife	387	96.7	80	81.6	467	93.4	0.000***
Employed	15	3.7	18	18.4	33	6.6	
<b>Type of family</b>							
Nuclear	145	36.2	58	59.2	203	40.7	0.000***
Extended	256	63.8	40	40.8	296	59.3	
<b>Previous history of pregnancy complications</b>							
Yes	34	34.7	166	41.2	200	40.0	0.140 N.S
No	64	65.3	236	58.7	300	60.0	
<b>Last pregnancy</b>							
Planned	86	88	290	72.1	376	75.2	0.001**
Unplanned	12	12	112	27.8	124	24.8	
<b>Residence</b>							
Urban	40	40.8	75	18.6	115	23.0	0.001**
Rural	58	59.2	327	81.3	385	77.0	

\*\* Moderate significant at  $p < 0.01$ \*\*\* highly significant at  $p < 0.001$ 

N.S=

Non -significant

**Table (6):** The Relationship between Perceptions of FA and the Studied Women Characteristics.

Variable	Levels of perception						P. value
	Positive =420		Negative =80		Total=500		
<b>Age groups</b>							
18-24	175	41.7	36	45.0	211	42.2	0.622 N.S
25-34	207	49.3	35	43.8	242	48.4	
35-45	38	9.0	9	11.3	47	9.4	
<b>Mother educational level</b>							
Illiterate	117	27.9	37	46.3	154	30.8	0.015*
Read and write	91	21.7	17	21.3	108	21.6	
Secondary education	175	41.7	22	27.5	197	39.4	
University education	33	7.9	4	5.0	37	7.4	
Post graduate education	4	1.0	0	0.0	4	0.8	
<b>Previous history of pregnancy</b>							
Yes	164	39.0	36	45.0	200	40	0.191 N.S
No	256	61.0	44	55.0	300	60	
<b>Previous history of fetal</b>							
Yes	11	2.6	2	2.5	13	2.6	0.654 N.S
No	409	97.4	78	97.5	487	97.4	
<b>Last pregnancy</b>							
Planned	315	75.0	61	76.3	376	75.2	0.468 N.S
Unplanned	105	25.0	19	23.8	124	24.8	
<b>Residence</b>							
Urban	103	24.5	12	15.0	115	23	0.040*
Rural	317	75.5	68	85.0	385	77	

\*significant at  $p < 0.05$ 

N.S= non-significant

**Table (7):** The Relationship between FA Intake and the Studied Women Knowledge and Perception.

Variable	current intake of FA supplement						P. value
	Yes		No		Total		
	No.	%	No.	%	No.	%	
<b>Levels of perception.</b>							
Positive	303	85.6	117	81.1	420	84.0	0.001**
Negative	51	14.4	29	19.5	80	16.0	
<b>Levels of Knowledge.</b>							
Adequate	93	26.3	7	4.8	100	20	0.100 N.S
In adequate	261	73.7	139	95.2	400	80	

\*\* High Significant at  $< 0.01$  N.S= non-significant



**Table (8):** Multiple Regressions Analysis between Dependent Variable (Knowledge & Perception) and Independents Factors (The Studied Women Characteristics).

Items	R	R <sup>2</sup>	ANOVA test		Beta	T-test	
			F	P. value		T	P. value
<b>Factors affecting women's knowledge</b>							
Constant	0.356	0.126	17.870	0.000***	-	7.6	0.001**
Mother educational					0.18	4.1	0.012*
Residence					-0.15	-3.5	0.001**
Last pregnancy					-0.14	-3.3	0.001**
Occupation					0.189	-3.745-	0.000***
Type of family					-0.151-	4.289	0.000***
<b>Factors affecting women's perception</b>							
Constant	0.23	0.053	14.0	0.000***	-	30.0	0.001**
Mother educational					-0.185	-4.2	0.001**
Residence					0.122	2.8	0.006**
Type of family					-0.122-	-2.789-	0.005**
Occupation					0.098	2.162	0.031*

\*\* Moderately Significant at p <0.01      \*\*\* High Significant at p<0.001      \*significant at p<0.05

**Table (9):** Binary Logistic Regression between Dependent Variable (FA Intake) and Independents Factors (the Studied Women Characteristics).

	Sig.	Odd ratio	Accuracy
<b>Factors affecting intake of FA</b>			
Knowledge of complications associated with FA	0.925 N.S	1.007	87.9%
Knowledge of time of intake	0.009**	1.715	
Knowledge of other ways to get FA	0.766 N.S	0.971	
Source of information about FA	0.155 N.S	0.781	
Levels of knowledge	0.147 N.S	1.971	
Levels of perception	0.570 N.S	1.288	
Age groups	0.166 N.S	1.435	
Mother educational level	0.507 N.S	1.133	
Residence	0.398 N.S	0.719	
Occupation	0.323 N.S	0.348	
Constant	0.053*	0.025	

\*\* High Significant at <0.01      \*significant at<0.05      N.S= non-significant

**Table (1)** : shows that about half of the studied women age were ranged from 25-34 years and their mean age was 26.115 ± 5.515, while 65% had no consanguinity with their husbands. According to the place of residence 77% of women were from rural areas, and 39.4% of them had secondary education, more than 50% were either illiterate or read and write. The majority of them (93.4%) were house wife, and 59.2% were of extended family type.

**Table (2)** : demonstrates that (80.4%) of the studied women had inadequate level of knowledge about FA. Regarding knowledge of benefits of FA

approximately one third of women didn't know anything about FA benefits during pregnancy, while only (23.4 %) had a general knowledge that " FA decreases the risk of NTDs". There is more than one option for benefits of FA during pregnancy as [have a healthy baby and create RBCS, have a healthy baby and decrease birth defects, decrease risk of birth defects, and create RBCs].

**Table (3)** : shows that more than two thirds of the studied women took FA during the current pregnancy, almost of them took it when they found out they were pregnant "sub adequate use", while



only (3.6%) took it pre and during pregnancy "adequate use" and great majority of them reported doing so in 1<sup>st</sup> trimester, and (82.4%) of them took the recommended dose.

**Table (4):** reveals that ranks for perceived susceptibility indicate that 53.4% of the studied women had positive perception of risk for having a baby with birth defects. The perceived benefits as shown above represent 90.8% which indicates that a higher perceived advantage to follow diet high in folate. Almost of the studied women (99.4%) were more likely to agree with statements stating the risks of not consuming adequate folate are severe. Regarding the perceived barriers 72.6% of the studied women were more likely to disagree with statements regarding perceived barriers to follow a high folate diet as costs, dislike high folate diet, etc..... Self-efficacy constructs positively indicated by 82.2% of women to agree with statements regarding positive beliefs about ability to follow a high folate diet. The cues to action positively represent 72.4% and indicate the presence of external and internal factors to trigger FA intake.

At all a great majority of the studied women had positive perceptions regarding FA -taking behavior according to HBM total score.

**Table (5) :** reveals that a highly statistically significant difference between women's knowledge about FA, their level of education, pregnancy planning, and residence, occupation, and type of family ( $p=0.001, 0.001, 0.001, 0.000, 0.000$ ) respectively.

**Table (6) :** reveals that there is no statistically significant difference between women's perception and their age, previous history of pregnancy complications, previous history of fetal anomalies, and their last pregnancy. On the other hand there is statistically significant difference between women's perception, level of education and residence ( $p=0.015, 0.040$ ) respectively.

**Table (7) :** illustrates that there was a highly statistical significant difference between women's intake of FA and their perception ( $p=0.001$ ).

Regarding effect of the studied women characteristics on their knowledge,

**Table (8) :** revealed that there was weak correlation between independent variables and dependent variable ( $r=0.356$ ) and the model is significant as ANOVA test used ( $p<0.000$ ). The occupation ( $\beta=0.196$ ) had more effect on the dependent variable (knowledge), then residence, mother education level ( $\beta=0.113$ ) and finally type of family ( $\beta=-0.111$ ).

Concerning factors affecting women perception as the table shows there was weak correlation between independent variables (women's characteristics) and

dependent variable (perception) ( $r=0.288$ ) and the model is significant as ANOVA test used ( $p<0.000$ ). Residence has more effect on the dependent variable ( $\beta=-0.185$ ), then mother education level ( $\beta=0.122$ ), type of family ( $\beta=-0.122$ ), and occupation ( $\beta=-0.098$ ).

**Table (9) :** demonstrates that levels of knowledge, knowledge of time of intake, age groups, levels of perception, mother educational level, and knowledge of complications associated with FA deficiency had more effect on dependent variable (FA intake) as the odd ratio=(1.971, 1.715, 1.435, 1.288, 1.333, and 1.007) respectively and the accuracy of prediction about 87.9%.

## Discussion:

As discussed by **Cowart (2003)**, nearly 50% of pregnancies are unintended. The neural tube section of the fetus' spinal cord closes by the end of the 28<sup>th</sup> day following conception, which is approximately 14 days following a missed period. If women are not aware of the need to take FA prior to becoming pregnant, it is less likely they will begin taking FA until directed to do so by a health care provider, which could be at their first prenatal visit. This first prenatal visit often occurs well after the neural tube has closed. This is why it is crucial for health care providers to get the message to women of childbearing age before they even plan to become pregnant. Nurses may have the opportunity and exposure to clients of childbearing age and thus, are able to educate women about their need for FA (**March of Dimes Gallup Survey, 2004**).

According to the studied women sociodemographic characteristics, the result of present study showed that about half of the studied women age were ranged from 25-34 years and their mean age was ( $26.115 \pm 5.515$ ), while 39.4% of them had secondary education, and the majority of them were house wives. These findings are not consistent with **Riazi et al., (2012)** in Iran who studied awareness of pregnant women about FA supplementation and found that 32.9% of the studied women age ranged from 20-24 years old, while the majority of individuals (42.9%) had elementary education, and in the line with the same investigator regarding occupation who stated that most of respondents (95.7%) were housewives.

According to the studied women knowledge of FA, research supports the idea that knowledge influences behavior. Increased nutritional knowledge has been shown to contribute to increase changes in healthy eating habits as well as healthier lifestyles (**Fahlman et al., 2008**).

The present study findings revealed that more than three quarters of the studied women had inadequate

level of knowledge about FA. While only 19.6% of them had adequate knowledge. These results were contradicted with findings of **Riazi et al. (2012)** in Iran who reported that the knowledge of most respondents (43.8%) was in the intermediate level, and only a few of them (7.8%) had the high level of knowledge, as well as results of **Al-Hossani et al.(2005)** who studied knowledge and practices of pregnant women about FA in pregnancy in Abu Dhabi, United Arab Emirates and found that 46.6% had accurate/partially accurate knowledge. The present study results may be due to majority of women were complaining from lack of physician clarification of their instructions, so they didn't receive enough knowledge about FA even if large number of them demonstrated routine prescription of it.

As regard the relationship between the studied women knowledge about FA and their characteristics, the present study revealed that about half of those with adequate knowledge had secondary education, more than three quarters had planned their last pregnancy, and more than one third of them were from rural area. These results are consistent with previous research by **Riazi et al., (2012)** in Iran who denoted that there was a significant relationship between knowledge and education, no association was found between level of knowledge, planned pregnancy and receiving prenatal care. Also these results are in the same line with findings of **Al-Hossani et al., (2005)** in Abu Dhabi, and **Wu et al., (2007)** who investigated knowledge and use of FA for prevention of birth defects among Honduran women and reported a significant relationship between knowledge and education.

Regarding the studied women knowledge of FA benefits "general knowledge", according to **Reeves et al., (1998)** multivitamin use was defined as taking a FA-containing multivitamin or a FA supplement at least once a day. Knowledge of FA use was defined as having answered that women's aim of taking FA was to prevent birth defects. The present study revealed that only (23.4%) had a general knowledge "FA decrease the risk of NTDs". These result are in line with findings of **Nosrat et al. (2012) in Iran** who studied knowledge and practice of urban Iranian pregnant women towards FA intake for NTDs prevention who reported that (27.6%) of the studied women knew that folate was something important in the prevention of NTDs.

In relation to women's current pattern of FA intake, the use of FA is a critical component in preventing birth defects. It is the role of health care providers to take advantage of all health care visits to counsel not only women at high risk (i.e., those with a history of having an infant with NTDs) but all women regarding

the importance of FA use. Also the media may promote awareness about FA because of its wider coverage among the population.

To our knowledge no national epidemiological studies have been conducted on the possible use of FA among pregnant women. Egypt does not have any specific official recommendations about FA periconceptional use.

The key findings of the present study were that overall, more than two thirds of the studied women took FA during current pregnancy, while (29.2%) never use it, vast majority of those who reported intake of FA, took it when they found out they were pregnant "sub adequate use", while only (3.6%) took it pre and during pregnancy "adequate use" and (79.1%) of them reported doing so in 1<sup>st</sup> trimester. This result is in opposite direction with **Nosrat et al., (2012)** in Iran who reported that (20.1%) of the women took FA during the periconceptional period, and with findings of **Wilton& Foureur (2009)** in Dubai who reported that the majority (88.1%) of all respondents commenced taking FA at least 1 month or more prior to pregnancy, while (64.7%) commenced FA after conception and (10.5%) did not take FA at all. Also results of **Tarrant et al (2011)** who investigated maternal health behaviors during pregnancy and associations with socio-demographic and infant characteristics in Ireland and found that (88%) of women took FA during pregnancy and (44%) of them took supplement before conception/during the 1<sup>st</sup> month of pregnancy.

The findings from the present study are both encouraging and discouraging. The fact that nearly (70.8%) of all women who took FA during current pregnancy is a positive indication that the FA message is beginning to get out. The gap between the percentage of women who knew about FA and the percentage who took it on a daily basis before pregnancy is disconcerting. Whereas (12%) of women who had heard about the benefits of FA, only about (0.6%) of them reported that they took it daily before pregnancy as recommended and (3.6%) of them reported taking it preconception and at early pregnancy. One likely explanation for this apparent gap between knowledge and use of FA is that many of the women in the present study probably learned about FA only after becoming pregnant, thus they would not have had a chance to alter their preconceptional behavior. Also the timing of FA use during the first trimester of pregnancy was not specified. So while three quarters of women reported FA use during the first trimester of pregnancy, many of them may have begun to take it too late.

In accordance to the relationship between the studied women intake of FA and their knowledge and perception, the present study illustrated that more

than three quarters of those who reported FA intake had positive perception. While (73.7%) had inadequate knowledge. These results are consistent with **Chacko et al., (2003)** who studied knowledge about NTDs and preconceptional prevention practices in minority young women in Texas who found that adequate folate diet was not associated with knowledge. While **Anzaku (2013)** in Nigeria reported that women who had knowledge of FA took it at some points during the periconceptional period.

According to the present study pregnant women adhere to instruction regardless of its rational. Incomplete knowledge or lack of knowledge transfer to women is not the only barrier, medical professionals at several health centers reported a shortage of FA tablets provided by the government. So that women were only given tablets at the start of pregnancy rather than beforehand. Also in poor settings, recommendations that all women of reproductive age take FA daily may not be realistic.

Regarding to women's perceptions related to FA - taking behavior, women of childbearing age must understand and perceive their risk of having a child with NTDs is real and applies to them and not just to other women. The goal is not to make them understand their actual risk of having a child with NTDs, but rather to raise their perception of the risk high enough that it motivates them to reduce that risk. Increasing this threat should be accomplished by increasing awareness of the severity of the disease, as well as increasing personal susceptibility of the disease.

The present study found that all the HBM constructs positively indicated a high perception related to FA intake behavior and the total HBM score positively represent 84%. This is in the same line with **Kloeblen& Batish (1999)** who investigated folate knowledge, intake from fortified grain products, and preconceptional supplementation patterns of a sample of low-income pregnant women according to the HBM in Atlanta and found that Perceived susceptibility, perceived severity, perceived benefits, self-efficacy and the HBM total score were positively correlated with folate intention. The perceived barriers construct was negatively correlated with folate intention.

Importantly, this high level of perception achieved after clarification of importance of FA in relevant information to them, its natural sources which already are available in our country, cost effective, and break down the barriers to daily use of FA by the women. This may increase the likelihood of engaging in this positive health behavior through using of media, showing pictures of an infant with NTDs or disability, and perhaps even joking about the myth that vitamins make you fat.

Regarding the relationship between perceptions of FA benefits of intake and the studied women characteristics, the present study revealed that more than one third of women with positive perception had secondary education, and exactly three quarters of them were from rural area. In contrast these results contradict studies by **Kloeblen & Batish (1999)** who found no correlations between the HBM constructs and parity or maternal ethnicity. It's clear that the HBM statement was clear, obvious, and easily understood, and majority of women respond after clarifications of the model positively and showed their predisposition to engage in this positive behavior regardless of their characteristics.

### Conclusions:

Despite the non-cost availability of FA and its routine prescription during pregnancy, in Egypt, more than three quarters of women had inadequate level of knowledge about FA. Also knowledge of the benefits of FA is less than expected. The present study revealed that only (23.4%) had a general knowledge "FA decrease the risk of NTDs". This can be seen as a failure of health professionals to pass on the information to women at the relevant time.

After implementing this study, its findings can answer the research questions, as this study cannot assume that women are knowledgeable about FA and its health benefits. Also perception related to FA taking behavior appeared just simply to significantly affect the studied women intake not their knowledge about it.

### Recommendations:

Based upon findings of the current study, a well-organized periconceptional FA supplementation program with high proportion of pregnancy planning, a successful functioning health system, social marketing, social mobilization, and advocacy efforts. Application of HBM is recommended to improve women& health care provider about perception related to FA intake benefits.

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