

**KNOWLEDGE, ATTITUDE & PRACTICE ABOUT IRON AND FOLIC
ACID SUPPLEMENTATION AMONG PREGNANT WOMEN IN
PRIVATE AND PUBLIC TERTIARY CARE HOSPITAL AT KARACHI,
PAKISTAN**

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Author Details
Keywords: Pregnant women, Knowledge, Attitude, Practice, IFAS, LMICs, NTD
Received on 05 Dec, 2025 Accepted on 20 Jan, 2026 Published on 04 Feb, 2026
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Abstract

Introduction:

Folic acid (vitamin B9) is a vital nutrient that safeguards the body's cells and plays a key role in DNA production and fetal growth; however, a deficiency during pregnancy may result in Neural Tube Defects (NTDs), occurring in approximately 300,000 cases worldwide each year, particularly in Low and Middle-Income Countries (LMICs).

Objective:

To assess the prevalence of Knowledge, Attitude & Practice (KAP) and the factors associated with the rise of iron and folic acid deficiency among pregnant women attending private and public

tertiary care hospitals in Karachi, Pakistan.

Methodology:

A cross-sectional analytical study was carried out in both private and public hospitals from September 2024 to February 2025, utilizing convenient sampling techniques involving 400 pregnant women aged 17 to 45 years who volunteered to participate. The research tools were approved by the Institutional Review Board (IRB) of Kharadar General Hospital and evaluated by a panel of three experts in maternity hospitals for content analysis, along with a pilot study to assess reliability, yielding a Cronbach alpha of 0.798 for Knowledge, 0.701 for Attitude, and 0.731 for Practice. Furthermore, a one-way ANOVA was employed to determine the association among the variables.

Results:

The findings indicated that women between the ages of 26 and 35 (46%), secondary gravida (39%), matriculated (44%), and were primarily housewives (78%), had poor; knowledge (77.7%), attitude (74%), and practice (73.8%) of taking IFAS supplements during pregnancy. In addition, the majority of women were informed that IFAS are necessary for all expectant mothers (272 (68.0%), (180 (45%) should be taken before planning a pregnancy, 172 (43%) IFAS supplements are more effective when

combined with a healthy diet, 160 (40%) eating foods high in vitamin-C helps improve the absorption of IFAS, and (182 (45.5%) taking IFAS supplements regularly during pregnancy were strongly disagreed with regard to kAP for IFAS supplementation. Besides, one-way anova also used to identify the association of kAP regarding IFAS supplementation where matriculated, house wife, and age showed significantly association as ($p\text{-value} < 0.05$) whereas rest of the variable were not associated between the independent and dependent variables.

Conclusion

Iron and Folic Acid Supplementation (IFAS) is a critical public health intervention aimed at preventing and addressing iron deficiency anemia, particularly among pregnant women.

INTRODUCTION

Pregnancy is a significant life event that results in both physiological and psychological changes for the growing fetus, and it also changes the woman's organs and tissues throughout the pregnancy (Chandra, & Paray, 2024). To develop the fetus, Folic acid (folate, folacin, or vitamin B9), is also an important nutrient that provides protection for the body's cells and is necessary for many bodily processes to build DNA, repair, replicate, and methylate it, as this water-soluble vitamin is also abundant in citrus fruits and leafy green vegetables which is essential for the mother and the developing fetus respectively (Brown & Wright 2020).

However, according to the World Health Organization (2023), around 40% of pregnant women are suffering from two common types of anemia: Iron Deficiency Anemia (IDA) and megaloblastic anemia (WHO, 2023). Similarly, National Nutrition Survey 2018 and WHO, 2023, prevalence of anemia are also between the 29% to 50%, are identified within Pakistan such as; Lahore (73%), Karachi (64%), and Multan (76%) are suffering mainly from iron deficiency anemia (Khan et al., 2024; Furthermore, Medical Research Council Vitamin (1991), Reported that limited intake of folic acid from its diet and supplements during pregnancy leads to Neural Tube Defect therefore to overcome this complication recommended pregnant women to provide supplement of folic acid, though WHO has advised supplementing pregnant women's diets with iron and folic acid since

1989 in order to prevent and treat gestational anemia (MRC Vitamin Study Research Group, 1991). However, it reported 300,000 cases of NTDs occurring mainly in the Low Middle-Income Countries (LMIC), including the United States of America (USA), and Western European countries are also tumbling from this problem (Brown & Wright 2020; Garzon et al., 2020; Carter, Lane, Ryan, & Jayaratnam, 2023).

Moreover, one of the developing countries, India women are suffering from anemia (52%) due to inadequate knowledge of the consumption of iron and folic acid supplementation during pregnancy (Nahrisah, Somrongthong, Viriyautsahakul, Viwattanakulvanid, & Plianbangchang, 2020; Ramachandran et al., 2023).

Furthermore, a study also conducted in Bangladesh herein result showed that women (60%) did not have information about IFAS because of lack of knowledge about taking supplements at the time of conception (Kraemer et al., 2023).

Related to, District Head Quarter (DHQ) Hospital in Faisalabad, Pakistan where around 350 married women were had limited knowledge and practice of folic acid consumption during pregnancy, and result showed that majority 85 (23.9%) women in the third trimester were no knowledge of folic acid, and NTD 303 (85.4%) which has the complication for less intake of folic acid consumption as p-value <0.05 showed highly significantly association. Herein, results also indicated that the practice and the majority of 272 (76.7%) women were not taking folic acid during their entire pregnancy as p-value <0.001 (Yasmin, Siddiq, Rockcliffe, & Miyan, 2022).

Similarly, reported from the Ministry of Public Health and UNICEF in 2013, women in Afghanistan are also suffering from IFAS because of the cultural influence of taking micronutrient supplementation, and (40.4%) women had anemia in their reproductive age due to a deficiency of taking IFAS during pregnancy (Kim et al., 2020).

The importance of this study as related to the literature review, women in developing countries, India, Afghanistan, Bangladesh, and Pakistan are the noticeable countries where women are identified with iron and folic acid deficiencies.

Moreover, cultural influences also contributing towards the fake information of using supplementation in Islamic countries.

Besides, multiple barriers such as lack of financial support, limited resources, bed rest, lack of knowledge were also the factors for avoiding taking medication. Therefore, the importance of this study is to assess the prevalence of KAP of IFAS supplementation and its related factors in our underprivileged areas, which leads to complications like anemia and NTDS in Karachi, Pakistan. Secondly, the importance of this study as it's done in Lahore instead of Karachi and other cities within Pakistan.

RESEARCH METHODOLOGY:

Study Design

The Descriptive Analytical Cross-sectional study was conducted in both private and public tertiary care hospitals residing in Karachi, Pakistan from Sept, 2024 to Feb, 2025.

Sample size

The sample size was calculated based with an assumed on the limited Knowledge, Attitude and Practices (KAP) (70 %) of IFAS amongst pregnant women (Aboud, El Sayed, & Ibrahim, 2019) at 5% Level of significance and 80% power. The minimum sample size calculated was 400. Open-Epi software version 3.0 was used to calculate the sample size. As, this sample size was recruited from both private and public tertiary care hospitals in Karachi, Pakistan.

Data Collection Technique

Data was collected through the Self-Structured Questionnaire and convenience sampling technique was used by visiting the selected hospitals, and formal permissions were granted through official correspondence.

Inclusion & Exclusion Criteria

All pregnant women who were between the age of 17 to 45 years, and were willing to participate, were included, whereas women who were not willing to give consent were excluded from this study.

Ethical Consideration

- Ethical approval was obtained from the Ethical Review Committee of the Kharadar General Hospital.
- Participants were informed about the purpose of the Study and written informed consent was also taken.
- They were also informed that each participant has the right to withdraw from the study at any time without any consequences.
- Anonymity and confidentiality were assured throughout the study.

Validity And Reliability

Validity and Reliability of the tools were checked through the IRB of the Kharadar General Hospital and the panel of three experts in maternity hospitals who analyze the content validity of the tools before using it to ensure that all questionnaire were consistently convey and carry the anticipated meaning of the content along with a pilot study to assess reliability, yielding a Cronbach alpha of 0.798 for Knowledge, 0.701 for Attitude, and 0.731 for Practice. Furthermore, a one-way ANOVA was employed to determine the association among the variables.

Data Analyzed

Data was entered and analyzed using SPSS version 26. Descriptive statistics (mean $\pm$ SD, frequencies, and percentages) summarized participants' demographic characteristics and their Knowledge, Attitude, and Practice (KAP) scores regarding iron and folic acid supplementation. To examine associations between socio-demographic variables and KAP scores:

RESULTS:

An independent samples t-test was used for comparisons between two groups (e.g., religion, profession). One-way ANOVA was applied for comparisons across more than two groups (e.g., age, education, income) A p-value < 0.05 was considered statistically significant.

Table 1: Social Demographic Data

S#	Variable	Characteristics	Frequency	Percentage
1.	Age	18-25Y	172	43.0
		26-35Y	186	46.5
		36-45Y	42	10.5
2.	Education	Non educated	83	20.8
		Matriculation	177	44.3
		Intermediate	97	24.3
		Graduation	43	10.6
3.	Religion	Islam	373	93.3
		Hinduism	11	2.0
		Christian	15	1.7
		Otherr	1	3
4.	Ethnicity	Pashton	129	32.3
		Balochi	59	14.8
		Sindhi	79	19.8
		Punjabi	65	16.3
		Memon	30	7.5
		Others	38	9.3
5.	Type of Family	Nuclear Family	166	41.5
		Extended Family	234	58.5

S#	Variable	Characteristics	Frequency	Percentage
6.	Profession	House wife	312	78.0
		working women (part time)	58	14.5
		Working women (Full time)	30	7.5
7.	Family Income	Less than 20K	65	16.3
		20k-40k	217	54.2
		More than 40K	118	29.5
8.	Gravidity	Primi gravida	150	37.5
		secondary gravida	154	38.5
		Multi gravida	96	24.0

A total of 400 respondents participated in the study. Nearly half of the participants were aged 26–35 years (46.5%), followed by those aged 18–25 years (43.0%), while only 10.5% were between 36–45 years. Regarding educational status, 44.3% had attained matriculation, 24.3% had intermediate education, and 10.6% were graduates, whereas 20.8% had no formal education. The majority of respondents were Muslim (93.3%), with smaller proportions identifying as Hindu (2.0%), Christian (1.7%), or other religions (0.3%).

In terms of ethnicity, Pashtun (32.3%) constituted the largest group, followed by Sindhi (19.8%), Punjabi (16.3%), Balochi (14.8%), Memon (7.5%), and other ethnicity (9.3%). More than half of the participants (58.5%) were living in extended family systems, while 41.5% resided in nuclear families. Most respondents were housewives (78.0%), with 14.5% working part-time and 7.5% employed full-time. Concerning monthly family income, 54.2% reported an income of 20,000–40,000 PKR, 29.5% earned more than 40,000 PKR, and 16.3% had an income below 20,000 PKR. Regarding gravidity, 38.5% were second gravida, 37.5% were primigravida, and 24.0% were multigravida accordingly.

Table 2: Factors contributing Of Knowledge, Attitude and Practice Regarding Iron and Folic Acid Supplementation Among Pregnant Women.

S #		Variable	Characteristics	Frequency	Percentage
1.	Knowledge	Does IFAS is required for all expectant mother?	Strongly Disagree	272	68.0
			Disagree	104	26.0
			Neutral	11	2.8
			Agree	3	0.8
			Strongly Agree	10	2.4
2.		Does IFAS should be taken before planning pregnancy to ensure proper health?	Strongly Disagree	180	45.0
			Disagree	164	41.0
			Neutral	24	6.0
			Agree	15	3.8
			Strongly Agree	17	4.2
3.		I am aware that IFAS Supplementation is more effective when combine with a healthy diet?	Strongly Disagree	172	43.0
			Disagree	148	37.0
			Neutral	37	9.2
			Agree	13	3.3
			Strongly Agree	30	7.5
4.		I know that consuming vitamin-C rich foods helps improve the absorption of IFAS?	Strongly Disagree	160	40.0
			Disagree	159	39.8
			Neutral	27	6.8
			Agree	13	3.3
			Strongly Agree	41	10.1

S #		Variable	Characteristics	Frequency	Percentage
5.	Attitude	I know that taking IFAS with certain foods can reduce its effectiveness.	Strongly Disagree	139	34.8
			Disagree	167	41.8
			Neutral	37	9.3
			Agree	18	4.3
			Strongly Agree	39	9.8
6.		I am aware that IFAS supplementation are available at most pharmacies and drugstore.	Strongly Disagree	26	6.4
			Disagree	154	38.5
			Neutral	25	6.3
			Agree	13	3.3
			Strongly Agree	182	45.5
7.		IFAS should only be taken if a person has symptoms of anemia.	strongly disagree	124	31.0
			disagree	57	14.3
			neutral	166	41.5
			agree	29	7.2
			strongly agree	24	6.0
8.		Does coffee/Tea/ Milk help to decrease iron absorption?	strongly disagree	87	21.8
			disagree	136	34.0
			neutral	87	21.8
			agree	33	8.1
			strongly agree	57	14.3
9.		ANC provide an opportunity to receive iron and folic acid supplements	strongly disagree	155	38.8
			disagree	168	42.0
			neutral	35	8.8
			agree	14	3.4
			strongly agree	28	7.0

S #		Variable	Characteristics	Frequency	Percentage
10.		Proper Birth spacing allows the mothers body to recover and re build iron stores, reducing the risk of anemia.	strongly disagree disagree neutral agree strongly agree	129 168 54 16 33	32.3 42.0 13.5 4.0 8.2
11.		I think that taking IFAS could harm the fetus.	strongly disagree disagree neutral agree strongly agree	68 80 123 88 41	17.0 20.0 30.8 22.0 10.2
12.		Does IFAS supplements taking regularly in pregnancy	strongly disagree disagree neutral agree strongly agree	182 152 32 15 19	45.5 38.0 8.0 3.8 4.7
13.	Practice	Reason for not taking IFAS because of getting side effects like; nausea, constipation, rashes, teeth and tongue discoloration	strongly disagree disagree neutral agree strongly agree	69 35 100 46 150	17.3 9.0 25.0 11.2 37.5

S #	Variable	Characteristics	Frequency	Percentage
14.	It increases absorption while taking IFAS with Lemon juices	strongly disagree	72	18.0
		disagree	110	27.5
		neutral	122	30.5
		agree	31	7.8
		strongly agree	65	16.2
15.	While taking IFAS absorption is it good for taking with meal?	strongly disagree	68	17.0
		disagree	154	38.5
		neutral	96	24.0
		agree	34	8.0
		strongly agree	48	12.5
16.	Best way of taking IFAS with water.	strongly disagree	120	30.0
		disagree	17	4.5
		neutral	49	12.3
		agree	20	4.7
		strongly agree	194	48.5
17.	Does IFAS is good while taking with coffee or tea.	strongly disagree	34	8.5
		disagree	69	17.3
		neutral	140	35.0
		agree	102	25.5
		strongly agree	55	13.7

The findings of Table # 2 revealed that 68% patients were strongly disagreed, and 26% disagree that IFAS is not required for all expectant mothers which Indicated a major misconception about universal IFAS recommendations during pregnancy. Patients also had low level of awareness of preconception folic acid importance and 45.0% strongly disagreed for not taking at the time of preconception, Knowledge of absorption and dietary factors 43.0% patients disagreed that IFAS is

not effective while taking with food, 40% were strongly disagreed about Vitamin C improved iron absorption and also 41.8% disagreed that IFAS is not effective while taking with certain food. As, the results showed poor nutritional knowledge related to IFAS, especially regarding absorption enhancers and inhibitors. related to the Availability and access 45.5% women were strongly agreed while 41.5% women were had no knowledge for IFAS should only be taken if symptoms of anemia are present, 38.8%women were not getting awareness about IFAS during ANC period, 42.0% women were disagreed about Birth spacing which helps rebuild iron store and prevent from anemia, 10.0% women were agreed that taking IFAS could harm the fetus, 45.5% were disagree of taking IFAS during pregnancy, 37.5%women were strongly agreed about side effect of taking IFAS, 30.5%women also had no awareness of taking IFAS with lemon juice, 38.5% women were disagree about IFAS with meal, 48.5% women were taking IFAS with water mostly, and 35.0% women were had no knowledge and awareness about IFAS with coffee and tea.

Table 03: Association of Socio-Demographic Characteristics with Knowledge, Attitude and Practice Regarding Iron and Folic Acid Supplementation Among Pregnant Women

Variable	Mean ± SD	P-value	Mean ± SD	P-value	Mean ± SD	P-value
Age Group (Years)						
18-25Y	2±0.72	0.206	2.22±0.69	0.08	2.58±0.71	0.07
26-35Y	1.92±0.69		2.1±0.64		2.47±0.72	
36-45Y	1.79±0.72		2.01±0.6		2.33±0.66	
Religion						
Islam	1.92±0.69	0.41	2.14±0.67	0.8	2.49±0.72	0.79
Others	2.09±1.01		2.17±0.61		2.58±0.63	

Variable	Mean $\pm$ SD	P-value	Mean $\pm$ SD	P-value	Mean $\pm$ SD	P-value
Education						
Non educated	2.14 $\pm$ 0.71	0.029	2.32 $\pm$ 0.66	0.03	2.66 $\pm$ 0.69	0.006
Matriculation	1.88 $\pm$ 0.72		2.03 $\pm$ 0.63		2.4 $\pm$ 0.69	
Intermediate	1.92 $\pm$ 0.73		2.23 $\pm$ 0.68		2.6 $\pm$ 0.72	
Graduation	1.84 $\pm$ 0.64		2.07 $\pm$ 0.66		2.34 $\pm$ 0.71	
Ethnicity						
Pashtoon	1.81 $\pm$ 0.65	0.09	2.1 $\pm$ 0.66	0.88	2.52 $\pm$ 0.69	0.86
Balochi	1.91 $\pm$ 0.67		2.14 $\pm$ 0.57		2.43 $\pm$ 0.67	
Sindhi	2.09 $\pm$ 0.90		2.20 $\pm$ 0.70		2.55 $\pm$ 0.71	
Punjabi	2.04 $\pm$ 0.70		2.19 $\pm$ 0.72		2.53 $\pm$ 0.79	
Memon	1.99 $\pm$ 0.71		2.08 $\pm$ 0.54		2.41 $\pm$ 0.73	
Other	1.89 $\pm$ 0.53		2.15 $\pm$ 0.7		2.44 $\pm$ 0.74	
Type of Family						
Nuclear family	1.94 $\pm$ 0.75	0.88	2.12 $\pm$ 0.64	0.61	2.50 $\pm$ 0.74	0.9
Extended family	1.93 $\pm$ 0.69		2.16 $\pm$ 0.68		2.49 $\pm$ 0.7	
Profession						
House wife	1.87 $\pm$ 0.62	0.001	2.12 $\pm$ 0.62	0.23	2.49 $\pm$ 0.7	0.85
Working women	2.18 $\pm$ 0.94		2.22 $\pm$ 0.78		2.51 $\pm$ 0.77	
Income						
Less than 20K	1.84 $\pm$ 0.56	0.36	2 $\pm$ 0.57	0.082	2.43 $\pm$ 0.67	0.65
20K-40K	1.94 $\pm$ 0.68		2.14 $\pm$ 0.64		2.50 $\pm$ 0.7	
More than 40K	1.99 $\pm$ 0.84		2.23 $\pm$ 0.74		2.53 $\pm$ 0.76	

Variable	Mean ± SD	P-value	Mean ± SD	P-value	Mean ± SD	P-value
Gravida						
Primary gravida	1.87±0.65	0.12	2.06±0.66	0.1	2.43±0.74	0.32
secondary gravida	1.94±0.71		2.17±0.69		2.54±0.7	
Multi gravida	2.06±0.80		2.23±0.61		2.5±0.71	

Table # 3 showed the comparison of mean scores across socio-demographic variables showed varying patterns of association. With respect to age group, no statistically significant differences were observed across any of the three mean score domains ($p = 0.206, 0.08$, and 0.07), indicating that age did not significantly influence respondents' scores. Similarly, religion showed no significant association with mean scores, as differences between Muslim and other religious groups were not statistically significant across all domains ($p > 0.05$).

In contrast, educational status demonstrated a statistically significant association with all three mean score domains. Respondents with no formal education had comparatively higher mean scores in the first domain (2.14 ± 0.71), while graduates showed lower mean scores (1.84 ± 0.64), with the difference being statistically significant ($p = 0.029$). Significant differences were also observed in the second domain ($p = 0.03$) and the third domain ($p = 0.006$), suggesting that education level plays an important role in influencing respondents' scores.

Regarding ethnicity, no statistically significant differences were found across Pashtun, Balochi, Sindhi, Punjabi, Memon, and other ethnic groups in any of the domains ($p > 0.05$). Likewise, type of family (nuclear versus extended) did not show any significant association with mean scores across all domains.

With respect to profession, a statistically significant difference was observed only in the first domain, where working women had a higher mean score (2.18 ± 0.94) compared to housewives (1.87 ± 0.62), and this difference was statistically significant ($p = 0.001$). However, no significant associations were noted in the second and third domains ($p > 0.05$).

Analysis of family income revealed no statistically significant differences across income categories in any of the domains, although a gradual increase in mean scores was observed with increasing income levels. Similarly, gravidity did not show a statistically significant association with mean scores across primigravida, secondary gravida, and multigravida groups in any of the domains ($p > 0.05$).

DISCUSSION:

The current study reveals significant knowledge gaps, persistent misunderstandings, and inconsistent practices regarding iron and folic acid supplementation IFAS among pregnant women, despite generally adequate supplement availability. These data indicate that inadequate nutrition knowledge and insufficient antenatal counselling, rather than socio-demographic variables like age or income, continue to be the key barriers to optimum IFAS utilization. Similar findings from a study have been observed in rural and low-resource areas, where national supplementation programs exist but information gaps remain (Seid et al., 2025). One finding was that was the low knowledge of IFAS ubiquitous and preventative role. Although many respondents rejected the notion that IFAS are unneeded for all pregnant women, their responses revealed confusion rather than a firm understanding of routine prophylactic use. Similar gaps in comprehension have been observed in research from Ethiopia and other LMICs, indicating the ineffective translation of policy recommendations into maternal knowledge (Seid et al., 2025; Alemayehu et al., 2021). Furthermore, misconceptions about preconception folic acid supplementation were widespread, corresponding with research from Saudi Arabia indicating low awareness of early folic acid beginning despite its recognized importance in avoiding neural tube abnormalities (Al Arifi et al., 2022).

Knowledge of dietary variables that influence iron absorption was likewise lacking. Many women were ignorant of the boosting effects of vitamin C and the inhibiting effects of tea and coffee. Similar findings from Bangladesh show that a lack of awareness of food-nutrient combinations hinders supplementation effectiveness, even when coverage is substantial (Sanin et al., 2023).

There were clear misconceptions regarding safety and indications, with some respondents thinking IFAS should only be used when anemia symptoms appear or that it could harm the fetus. These ideas

have been demonstrated to have a detrimental impact on adherence and birth outcomes (Khanal et al., 2024) and run counter to WHO recommendations that support regular daily supplementation for all pregnant women (WHO, 2022). Significantly, more than one-third of women stated that they did not receive IFAS therapy during ANC visits, supporting the idea that counselling quality—rather than just visit frequency—has a significant influence on supplementing (Khanal et al., 2024).

Educational status and profession were the only socio-demographic factors significantly associated with IFAS-related knowledge and practices, supporting previous research identifying maternal education as a critical determinant of adherence (Alemayehu et al., 2021). In contrast, age, income, and gravidity showed no significant association, underscoring missed opportunities during repeated pregnancies to reinforce nutrition education (Nguyen et al., 2021; Teshale et al., 2022). Overall, these findings reinforce the need for strengthened, structured, and culturally appropriate nutrition counselling within ANC to improve IFAS knowledge, adherence, and maternal health outcomes (WHO, 2020; de Castro Vasconcelos, 2023; WHO, 2022).

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