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FACTORS AFFECTING ADHERENCE TO IRON AND FOLIC ACID SUPPLEMENTATION DURING ANTENATAL CARE: A CROSS-SECTIONAL STUDY.

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ABSTRACT.

Background:
Iron deficiency anemia in pregnancy persists despite Ministry of Health efforts. Pregnant women, needing more iron for the growing foetus, benefit from iron-folic acid supplementation, a cost-effective intervention. Adherence to Iron and folic acid (IFAS) is crucial for anemia prevention and management. The objective is to estimate the level of adherence to assess the factors affecting adherence to IFAS tablets among pregnant women and to study the social factors influencing it.

Methodology:
The cross-sectional study was carried out on a convenient sample of 135 pregnant women attending the Anganwadi Center for Antenatal check-ups. Data collection was done by pre-tested case record form based on the Medication Adherence Rating Scale (MARS) questionnaire. Qualitative data was analyzed by manual content analysis. Results are presented as percentages.

Results:
A total of 135 pregnant women were included, and the adherence to IFAS among the antenatal mothers was 91.12%. A high level of adherence was found among pregnant women in the age group of 21-25 years (65 out of 69, 94.20%) and in women who are homemakers (83 out of 95, 87.37%). Primigravida (92 out 104, 88.46%) were associated with a higher level of adherence with IFAS.

Conclusion:
Adherence to IFAS among pregnant mothers was good. Adherence is directly influenced by age, occupation, gravida status, regularity in ANC visits, and no. of dosage taken.

Recommendations:
High adherence to IFAS among pregnant women, is influenced by factors like age, occupation, gravidity, ANC visits, and dosage intake. Targeted interventions for younger, homemakers, and primigravida can enhance adherence and reduce anemia. Education, counseling during ANC, and community outreach can promote adherence and ensure maternal-fetal health.

Keywords: *Antenatal care, Adherence, Iron-folic acid supplementation, Pregnancy*
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INTRODUCTION.

Iron deficiency is one of the most common forms of micronutrient malnutrition across the world.[1] According to WHO, anemia in pregnant women is defined as blood hemoglobin <11gm/dL.[2] The global burden of anemia among pregnant women is 41.8%[3] According to NFHS-5 (2021) in India, a higher prevalence i.e., 52.2% of anaemia is among antenatal women.**[**4] Iron is an essential nutrient, required for hemoglobin synthesis and its demand increases highly during pregnancy, which many times does not get supplied through the regular diet. Increased demand during pregnancy and lactation along with menstrual blood loss leads to poor iron stores in women. Maternal anemia is associated with mortality and morbidity in the mother and baby, including the risk of miscarriages, stillbirths, prematurity, and low birth weight. [5] Being aware and conscious of the ground realities the Ministry of Health and Family Welfare (MoHFW) thought of a policy decision to start the National Iron+ Initiative (iron and folic acid {IFA} supplementation for pregnant and lactating women; and children of age 6-60 months). Under the Reproductive and Child Health Program, IFA tablets are being given to all pregnant women and lactating mothers through sub-centers, primary health centers, community health centers, and District hospitals.[6] The MoHFW has launched the Anaemia Mukt Bharat (AMB) program with a special focus on the health and nutrition needs of children, adolescents, women in the reproductive age group, antenatal women, and lactating mothers.[7] IFA supplementation is composed of 100mg of elemental iron and 500mcg of folic acid every day for at least 3 months (100 days), starting from the 2nd trimester, at 14-16 weeks of gestation followed by the same dose for another 100 days after delivery. Along with this, all women in the reproductive age group (15-45 years) during the pre-conception period and up to 1st trimester of pregnancy are advised to take 400mcg of folic acid tablets to prevent the incidence of neural tube defects in the foetus.[6]

There were only limited studies that explored the reasons for adherence/non-adherence to IFAS among pregnant women in India. This study will enable us to have a better approach to managing antenatal mothers by understanding their facilitators and barriers to IFAS adherence.

Objectives.

• To estimate the level of adherence to IFAS among antenatal women.
• To assess the factors affecting adherence.

METHODOLOGY.

Study design.

A cross-sectional study was used for the study.

Study setting.

The study was carried out across the Anganwadi center under the Urban Healthcare and Wellness Centre of MKCG Medical College and Hospital, Berhampur from 1st December 2022 to 31st December 2022, where IFAS have been given free of cost every month.

Inclusion and exclusion criteria.

Pregnant women who were in their second trimester and third trimester and who had taken medication (IFAS) for at least 1 month were included. Those women who didn't give their consent were excluded from the study. A total number of 135 antenatal women were included in the study, through purposive convenient sampling.

Bias.

There was a chance that bias would arise when the study first started, but it was avoided by giving all participants identical information and hiding the group allocation from the nurses who collected the data.

Sample size determination.

Patients who were enrolled after filling the inclusion criteria. For calculating sample size, the following formula was used.

$$N\Delta = \frac{2(Za+Z1-\beta)2\sigma 2}{2}$$

Where, N= sample size, Z is a constant
Za is set by convention according to an accepted error of 5% as 1.649 Z1-β is set by convention according to accepted 1-β or power of study of 80% as 0.8416Σ is the standard deviation estimated Δ is a difference in the effect between two interventions (estimated effect size).

METHODOLOGY.

For the present study, Medication Adherence was defined by WHO as " the extent to which the person's behavior (including medication-taking) corresponds with agreed recommendations from a healthcare provider".[8] It includes the initiation of the treatment, implementation of the prescribed regime, and discontinuation of the pharmacotherapy.

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Pregnant Women said to adhere to IFAS who took the medication at least 4 days per week in the preceding 1 month of the survey.

Pre-designed and pretested Case Record Form was used to collect the data on participant's demographic parameters, and clinical and medication details.[9]

Medication Adherence Rating Scale (MARS) was used in vernacular (odia) language to find out the adherence.[10] Adherence was also assessed using direct parameters like pill count, made by the participants.

Data Collection and Analysis.

After obtaining written informed consent, participants were enrolled as per inclusion and exclusion criteria. Data regarding clinical profile, Adherence, and MARS Questionnaire were collected and entered in a predesigned case record form by principal investigators. Data entry and Data Analysis was done by manual content analysis (Microsoft Excel sheet 2007) and SPSS software version 22.

Ethical Consideration.

Written informed consent was taken from willing participants. Prior ethical clearance was obtained from the Institutional Ethics Committee, MKCG Medical College and Hospital, Berhampur, for conducting the study. The confidentiality of the participants was maintained and the data was used for the study only.

RESULTS.

Table 1: - Socio-demographic Factors Affecting Adherence to Iron-Folic Acid Supplementation. (IFAS)

Characteristics	n	Adherence (%)	Chi-square	p-value
Age: -				
21 – 24	69	65 (94.20%)	1.666	p=0.197
>24	66	58 (87.88%)		
Education: -				
1. Illiterate	0	0%	46.732	p =0.000
2. Primary School	0	0%		
3. Middle School	12	12 (100%)		
4. High School	63	58 (92.06%)		
5. Intermediate	49	49 (100%)		
6. Graduate	11	4 (36.37%)		
7. Professional/Honors	0	0%		
Occupation: -				
1. Unemployed	95	83 (87.37%)	5.546	p =0.236
2. Elementary	0	0%		
3. Plant and Machine Operators	0	0%		
4. Craft-related Trade Workers	10	10 (100%)		
5. Skilled Agricultural & Fishery workers	10	10 (100%)		
6. Skilled workers & shop market sales workers	10	10 (100%)		
7. Clerk	10	10 (100%)		
8. Technician & Associate Professionals	0	0%		
9. Professionals	0	0%		
10. Legislators, Senior Officials & Managers	0	0%		

The total number of participants was 135. The mean age was 25 ± 3.68 years. Participants were between 21 and 34 years old. All the participants resided in urban areas. Out of 135 participants, 103 (76.29%) were primigravida & 32 (23.70%) were multigravida, 101 (74.81%) were regular in ANC visits & 34 (25.18%) were irregular, 86 (63.70%) visited private institution as a place of ANC visits, 37 (27.40%) visited public health care institute and 12 (8.89%) visited other institution. The dosage form used was a Tablet, place of dispensing was the Anganwadi center for all the participants. 99 (73.34%) participants received 30 tablets, 15 (11.11%) took 30-60 tablets, 11(8.15%) took 60-90 tablets & 10 (7.40%) took 90-120 tablets from the center. 123 (91.11%) participants took 100% of tablets, 7 (5.18%) took 75-99% of tablets & 5 (3.70%) took 50-74% of tablets. Constipation occurred in 110 (81.48%) of participants, followed by gastritis in 17 (12.59%) and black stools in 8 (5.9%). 123 (91.11%) participants said they improved their health after

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IFAS but 12 (8.89%) forgot to take medication. The results were expressed in a tabular form in Table 1.

The associations between the factors and the number of doses taken are expressed in Table 2.

Table 2: - Clinical Factors Affecting Adherence to Iron-Folic Acid Supplementation (IFAS).

Characteristics	n	Adherence (%)	Chi-square	p-value
Gravida Status: - 1. Primigravida 2. Multigravida	 104 31	 92 (88.46%) 31 (100%)	3.926	p = 0.048
Adverse Drug Reaction: - 1. Nausea 2. Gastritis 3. Constipation 4. Black Stools 5. Others	 0 17 110 8 0	 0% 10 (58.82%) 110 (100%) 3 (37.5%) 0%	61.005	p = 0.000
No. of Dose Taken (%): - 1. 100% 2. 99 – 75% 3. 74 – 50%	 123 0 0	 123 (100%) 0 0	135.000	p = 0.000

The socio-demographic and educational factors affecting adherence to IFAS are expressed in Table 3

Table 3: - Socio-demographic and Educational Factors Affecting Adherence to Iron-Folic Acid Supplementation (IFAS).

Characteristics	**n**	**Adherence (%)**	**Chi-square**	**p-value**
Age: 1.21 - 24	69	100% - 65 (94.20%) 99% - 75% - 0% 74% - 50% - 4 (5.80%)	9.136	=0.010
>24	66	100% - 58 (87.88%) 99% - 75% - 7 (10.60%) 74% - 50% - 1 (1.52%)		
Education: 1. Illiterate 2. Primary School 3. Middle School	 0 0 12	 100% - 12 (100%) 99% - 75% - 0 74% - 50% - 0	88.777	=0.000
4. High School	63	100% - 58 (92.06%) 99% - 75% - 0 74% - 50% - 5 (7.94%)		
5. Intermediate	49	100% - 49 (100%) 99% - 75% - 0 74% - 50% - 0		

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6. Graduate	11	100% - 4 (36.37%) 99% - 75% - 7 (63.63%) 74% - 50% - 0		
7. Professional/Honors	0			

The occupational factors affecting adherence to IFAS are expressed in Table 4.

Table 4: - Occupational Factors Affecting Adherence to Iron-Folic Acid Supplementation (IFAS).

Characteristics	n	Adherence (%)	Chi-square	p-value
Occupation: -				
1. Unemployed	95	100% - 83 (87.37%) 99% - 75% - 7 (7.37%) 74% - 50% - 5 (5.26%)		
2. Elementary	0			
3. Plant & Machine Operators	0			
4. Craft related Trade workers	10	100% - 10 (100%) 99% - 75% - 0 74% - 50% - 0		
5. Skilled Agricultural & Fishery workers	10	100% - 10 (100%) 99% - 75% - 0 74% - 50% - 0	5.546	=0.698
6. Skilled workers & shop market sales workers	10	100% - 10 (100%) 99% - 75% - 0 74% - 50% - 0		
7. Clerk	10	100% - 10 (100%) 99% - 75% - 0 74% - 50% - 0		
8. Technician & Associate Professionals	0			
9. Professionals	0			
10. Legislators, Senior Officials & Managers	0			

The associations between no. of Dosage taken affecting adherence to Iron-Folic Acid Supplementation (IFAS) were expressed in Table 5.

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Table 5: No. of Dosage taken affecting adherence to Iron-Folic Acid Supplementation (IFAS).

Characteristics	n	Adherence (%)	Chi-square	p-value
Gravida: -				
1. Primigravida	104	100% - 92 (88.46%) 99% - 75% - 7 (6.73%) 74% - 50% - 5 (4.81%)	3.926	=0.140
2. Multigravida	31	100% - 31 (100%) 99% - 75% - 0 74% - 50% - 0		
Adverse Drug Reaction: -				
1. Nausea	0			
2. Gastritis	17	100% - 10 (58.82%) 99% - 75% - 7 (41.18%) 74% - 50% - 0		
3. Constipation	110	100% - 110 (100%) 99% - 75% - 0 74% - 50% - 0	133.386	=0.000
4. Black Stools	8	100% - 3 (37.5%) 99% - 75% - 0 74% - 50% - 5 (62.5%)		
5. Others	0			
Regularity in ANC visits*: -				
1. Regular	100	100% - 89 (89%) 99% - 75% - 7 (7%) 74% - 50% - 4 (4%)	2.730	=0.255
2. Irregular	35	100% - 34 (97.14%) 99% - 75% - 0 74% - 50% - 1 (2.86%)		
Associated influencing factors: -				
1. Complain of poor taste of medication	0			
2. Forgetfulness/lack of interest in medication	12	100% - 0 99% - 75% - 7 (58.34%) 74% - 50% - 5 (41.66%)	135.000	=0.000
3. Taboo (big baby, etc.)	0			
4. Anticipates health problems post-medication	0			
5. Improved Health	123	100% - 123 (100%) 99% - 75% - 0 74% - 50% - 0		

DISCUSSION.

For the present study, adherence to IFAS was found in 91.12% of the participants. This finding is higher than Netra, *et al* (85.7%) [11], Debbarma, *et al* (69.7%)[12], Selvaraj, *et al* (77%)[13], and Lavanya, *et al* (63.8%)[14]. Adherence was found to be better in the study, which might be because all participants were from Anganwadi centers, and had

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better access to healthcare services provided by the center. Non-adherence to IFAS was also seen more in those having adequate knowledge about IFAS. A probable explanation is that participants with higher educational status or better knowledge may also be more concerned with the side effects. Mithra *et al* [15] found that lower age group women were more non-adherent whereas in our study upper age group women were more non-adherent. The reason might be that older females were being forgetful and tended to lose interest in medication, which might have led to non-adherence to IFA supplementation.

According to the present study, every participant faced some side effects due to IFA supplementation, but it did not affect the adherence status of the participants. The probable reason might be due to the counseling and guidance given by the Anganwadi workers during the dispensing of IFA supplementation to pregnant women during antenatal care given at UHWC. A study conducted by Singh *et al* [16] found that only 29.34% of antenatal women complained of any side effects after IFA supplementation intake. This resulted in overall better adherence and compliance with the IFA supplementation regimen.

Another study conducted by Ngamba Akham *et al* [17] observed that employed women had fewer chances of being adherent to IFAS. However, these may need to be evaluated further as in the study, 40 out of 135 participants were employed but they were adherent to medication and 95 out of 135 participants were unemployed. This evaluation can be done by increasing the number of participants.

It was found that the younger females were more adherent to medication. The education levels of the community were at least up to Middle School and were mostly homemakers (unemployed). However, it was found that many Primigravida were non-adherent, the reason for non-adherence might be due to alternative forms of IFAS (superfoods, food supplements, etc.), also seen in females having a graduate level of education. The most common Adverse Drug reaction that occurred was constipation followed by gastritis and black stools. Females who have encountered gastritis and black stools are non-adherent to IFAS. The reason may be due to cautiousness of the disease condition associated with the occurrence of gastritis and black stools. Pregnant females are said to be regular in ANC visits if they visit ≥ 4 times during their antenatal period and Irregular; if they visit < 4 times during their antenatal period. Regular females are non-adherent to medication. The reason might be due to a lack of interest in medication. Irregular females have better adherence. They might be seeking help from other ANC centers or might be visiting other ANC centers.

GENERALIZABILITY.

The findings of this study on adherence to iron-folic acid supplementation among pregnant women have implications for a larger population. Given the prevalence of iron deficiency anemia in pregnant women globally, the high adherence rate observed in this study suggests that effective strategies such as regular ANC visits, proper counseling, and easy access to supplementation can significantly improve adherence rates. These findings can be generalized to similar settings where antenatal care is provided through Anganwadi centers or similar community healthcare facilities. By identifying factors influencing adherence, such as age, gravidity, and occupation, healthcare providers can tailor interventions to enhance adherence among pregnant women, thereby reducing the burden of anemia and improving maternal and fetal health outcomes on a broader scale.

CONCLUSION.

To conclude the present study, the pregnant women who had participated in our study, had better levels of Adherence to Iron-Folic acid supplementation. The unique finding in the present study was that Multigravida mothers were more adherent than Primigravida mothers, which needs further evaluation. The strengths of assessing the study were good healthcare services and counseling provided by the Anganwadi health workers resulted in better adherence. Adequate availability of IFA supplementation, regular contact of pregnant women for ANC checkups during the pregnancy period, creating Awareness among pregnant women on common side effects of IFA supplementation and general misbelieves associated with the consumption of IFA tablets and advice about iron-rich food also added to adherence status of the participants. Socio-demographic factors such as education, economic factors like occupation, and other factors like regularity in ANC visits and initiation of IFA supplementation tablets significantly determine the adherence status.

LIMITATIONS.

The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of a comparison group also poses a limitation for this study's findings.

RECOMMENDATION.

High adherence to Iron and folic acid supplementation (IFAS) was found among pregnant women, influenced by factors such as age, occupation, gravidity, regular antenatal

care visits, and dosage intake. Healthcare providers should focus on targeted interventions tailored to the needs of pregnant women, particularly younger, homemakers, and primigravida, to further enhance adherence and reduce iron-deficiency anemia in pregnancy. Education, counseling during antenatal care visits, and community outreach programs can promote adherence and ensure optimal maternal and fetal health outcomes.

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LIST OF ABBREVIATIONS.

IFAS: Iron and Folic Acid Supplementation
MoHFW: Ministry of Health and Family Welfare
ANC: Antenatal Care
MARS: Medication Adherence Rating Scale
UHWC: Urban Healthcare and Wellness Centre

SOURCE OF FUNDING.

No funding was received.

CONFLICT OF INTEREST.

The authors have no competing interests to declare.

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