REVIEW ARTICLE

A Systematic review of factors affecting compliance toward oral iron-folic acid supplementation among pregnant women in India.

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Abstract | Introduction | Methodology | Results | Conclusion | References | Citation | Tables / Figures

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Abstract

Background: Iron-folic acid deficiency is the most common complication during pregnancy. Iron deficiency is responsible for various health complications among pregnant women. Compliance with IFA supplementation is variable across India several factors are associated with compliance with IFA supplementation. **Objective**: The objective of this systematic review is to assess the factors affecting compliance toward oral iron-folic acid supplementation among pregnant women in India. **Methods**: The primary search was carried out using PubMed, Google scholar, the WHO website, and Research Gate which provide access to full-text research articles from January 2012 to 25th January 2022 published data were searched. **Result**: A total of 74 studies were identified, and 20 were included in this review. Out of the 20 studies, sixteen were cross-sectional, two mixed methods, and two randomized control trials. knowledge of IFA, education, socioeconomic status, the timing of registration and number of antenatal visits, type of family, and age of the pregnant women were the factors that affect the compliance of IFA supplementation. **Conclusion**: Knowledge of iron-folic acid supplementation, Timing of registration and number of Antenatal Care visits, educational level of the pregnant women, and age of the pregnant women were factors associated with the compliance of IFA supplementation among pregnant women in India.

Keywords

Iron Folic Acid; IFA Supplementation; Anemia; Pregnant Women; India

Introduction

Anemia is a condition marked by the low value of hemoglobin in the blood and resulting in reduced capacity of oxygen in the blood. The World Health Organization (WHO) defines anemia as a hemoglobin concentration of less than 11.0gm/dl for pregnant women. This is categorized as 10.9-10 g/dl mild, 9.9 - 7 g/dl moderate and < 7.0 g/dl severe anemia.(1)

Iron is required for hemoglobin synthesis in the body. Iron deficiency is responsible for various health complications among pregnant women, whereas it can lead to the risk of mortality, morbidity, postpartum hemorrhage, poor birth outcomes, preterm births, and low birth weight (LBW).(2) Many nutritional and non-nutritional aspects are responsible for low hemoglobin levels and anemia. iron deficiency is one of the most common causes of nutritional anemia, especially among pregnant women. It is either low in diet or there is low absorption of iron in the body which leads to iron deficiency anemia therefore to increase the iron level, iron tablets along with folic acid tablets are required.(3) WHO estimates anemia

prevalence as 41.8% of pregnant women worldwide.(4) In India, there is some variation in the anemia prevalence among pregnant women as per the regional and socioeconomic factors. The National Family Health Survey (NFHS-5) 2019-2021 reported the prevalence of anemia among pregnant women is extremely high (52%) it is also reported that pregnant women who lived in rural areas (54.3%) have a high prevalence rate as compared to urban pregnant women (45.7%).(5) Worldwide about 32 million women are affected by Iron deficiency and more than half of the pregnant women are among low- and middle-income group countries (LMICs) including India.(6) The National Family Health Survey (NFHS-5) 2019-2021, reported 44.1% of pregnant women did not take IFA supplementation for 100 days during their pregnancy. (5)

The reduction of anemia is a global health challenge that is a more challenging task in India and other developing countries. Ministry of Health and Family Welfare (MoHFW) was envisaged to control and prevent iron deficiency anemia. Firstly, MoHFW implemented a National nutritional anemia prophylaxis program in the year 1970 later this program was renamed as National nutritional anemia control program in the year 1991. In the year 2013 National iron plus initiative program has started to prevent anemia. later Ministry of Health and Family Welfare (MoHFW), later in 2018 Anemia Mukt Bharat (AMB) program was launched to control anemia. Some other strategies can help to reduce anemia prevalence such as fortification, biofortification, dietary diversification, community awareness. Iron folic acid supplementation is a larger impact on pregnant women's health by reducing maternal mortality. Different nutrition intervention program has been implemented as community-based nutrition to prevent the occurrence of iron-folic acid deficiencies during pregnancy.(7) Currently Anemia Mukt Bharat Program (AMB) has prescribed 60mg iron 500 mcg folic acid among pregnant women from the second trimester onwards, and to continue six months postpartum for 180 days, to control anemia.(8)

Compliance is defined by the WHO as "the degree to which a patient correctly follows medical advice"(9). Compliance with IFA supplementation among pregnant women plays an important role in the prevention and treatment of iron-folic acid deficiency anemia. The World Health Organization recommends IFA supplementation to all pregnant women in a standard dose of 30 mg–60 mg iron and 400µg folic acid daily throughout pregnancy.(10) According to WHO's compliance with IFA cut off a pregnant woman is expected to take ≥90 IFA tablets on daily basis.(11) Compliance towards IFA supplementation is variable across India several factors are associated with the compliance of IFA supplementation. Reason for low compliance with IFA supplementation includes demand (Pregnant women) such as side effects of IFA tablets, forgetfulness, poor knowledge of iron-folic acid Supplementation, as well as supply such as (unavailability of IFA, health system challenges in providing adequate supply).(12) A number of studies have been published on compliance towards IFA supplementation among pregnant women in India but there is no systematic review conducted to determine the factors affecting compliance towards oral iron-folic acid supplementation among pregnant women in India.

Aims & Objectives

To assess the factors affecting compliance toward oral iron-folic acid supplementation among pregnant women in India.

Material & Methods

Study design and search strategy: This systematic review was designed to determine the factors affecting compliance toward IFA supplementation among pregnant women in India. The primary search was carried out using PubMed. Other internet searches like Google scholar, WHO website, and ResearchGate which provide access to full-text research articles from January 2012 to 25th January 2022 published data were searched. the search of the citations already identified articles was reviewed for findings of the studies.

Population: Pregnant women who have received IFA supplementation during the pregnancy period.

Exposure: Factors affecting compliance with IFA supplementation (Knowledge of IFA supplementation and anemia, timing of registration, and the number of ANC visits).

Comparison: The reported reference groups for each factor in each respective study such as compliances of oral IFA supplementation among pregnant women who had received information on the IFA supplementation versus those who have not received the information, who have knowledge about IFA supplementation versus those who do not know, and compliances among pregnant women who started ANC visit in the initial period versus who has started last trimester of the pregnancy.

Outcome: Factor affecting compliances of IFA supplementation among pregnant women in India. The Electronic search engine was searched with keyword searching and using title and abstract terms for each selected PECO component. The keyword searching includes "Iron-folic acid, iron-folic acid Supplementation, Compliance, Adherence, Pregnant women and India with "OR" and "AND" were used to combine the searching terms.

Eligibility criteria and study selection: This review included studies that reported the factor affecting compliance towards IFA supplementation among pregnant women in India. all studies conducted at the community level and hospital-based cross-sectional studies and randomized control trials were included in this review. Studies published in the English language were included. studies without full text and abstract,

commentaries, letters, duplicated studies, anonymous reports, case reports, and editorials were excluded.

Quality assessment and data extraction: After getting findings from all databases were exported to a Microsoft Excel spreadsheet. The author independently extracted the data and reviewed the searched studies. Any disagreement was handled by the third author. all the authors independently reviewed studies for inclusion in the review and finally, the agreement was reached through a discussion between the authors. The data extraction format included primary author, publication year, place of the study, sample size, compliance rate, determinants, factors, and barriers to compliance.

The outcome of interest: The primary outcome of this review was to assess the factors affecting compliance toward IFA supplementation among pregnant women in India and the secondary outcome of this review was to estimate the reason for low compliance with IFA supplementation among pregnant women. (Figure 1)

Results

Study Identification: This systematic review included studies on the factors affecting compliance towards IFA supplementation among pregnant women. A total of 74 published studies were identified for inclusion in the review and after the screening and evaluation of the abstract 50 studies were excluded from this review. The excluded studies could not meet our objective criteria as they had included non-pregnant women and the outcome variables were not reported. Of these 20 free full-text studies were assessed for eligibility based on the inclusion and exclusion criteria. Finally, 20 studies were included in this systematic review. Out of the 20 studies, 16 were cross-sectional studies, 2 were mixed-method studies, and 2 were randomized controlled trials (RCT).

Characteristics of the included studies: All included studies have reported the factor affecting compliance on IFA supplementation among Pregnant women in India. A District level cross-sectional survey was conducted with a large sample size of 2905 study participants in the state of Bihar in 2015. (13) The maximum number of studies were conducted in the South and north zone. 8 studies were conducted in the south zone, 7 studies were conducted in the North zone, 3 studies were conducted in the East zone and 2 studies were conducted in the West zone all studies were published. The majority of studies used a semi-structured, structured, and pretested questionnaire to assess the factor affecting compliance and some of the studies used pre-design the questionnaire, however, most of the studies used a random sampling method to assess the factor affecting compliance towards IFA supplementation among pregnant women. Most of the studies considered missing two or more doses of IFA in the last 7 days was considered as non-compliance. All the studies used A P-0.05 value was considered statistically significant.

Compliances of IFA supplementation among pregnant women: Ulaganeethi et al in 2021, reported the maximum compliance of IFA supplementation 91.3% in two selected urban Primary Health Centre (PHC) of Puducherry, South India. Information on obstetric characteristics and details regarding antenatal and to understand the perceived challenges in availing of health services were collected through telephonic interviews during the lockdown period.(14) In 2018, Ahamad F et al conducted a community-based open-labeled parallel block randomized controlled trial among 400 pregnant women in a rural area of Haryana north India. In the intervention group, the first time IFA supplementation was given by ASHA workers every week and after being given the first dose pregnant women were counseled to take the remaining tablets during the week as per the advice by a health professional. In the control group, IFA supplementation was given to take without direct supervision of health professionals. Compliances were reported 60.4% in the control group and 69.1% in the intervention group. there was a statistically significant difference between the control and intervention groups (P = 0.001).(15) A single-blinded randomized controlled trial was conducted among pregnant women during the second trimester to receive iron supplementation either as a capsule or tablet during pregnancy. Compliance was reported 22% in the Capsule group and 16.8% in the tablet group and there was no statistically significant difference between the capsule group and tablet group.(16) Verghese JS et al in 2019, conducted an in-depth survey to understand the demand side risk factors of anemia specifically related to IFA intake among 436 pregnant women in 50 villages and wards of the Sirohi district of Rajasthan, India. The analysis of medical information and diet of pregnant women was obtained by health care workers in this survey. The minimum compliance of IFA supple1mentation reported (12%) and the majority of those who did not consume and did not receive IFA supplementation (88%) were reported in this survey. Among pregnant women who did not receive IFA, 'no provision' from the health worker was the most common reason.(17) In 2015, Wendt A et al conducted a cross-sectional survey using District Level Household Survey (DLHS-3), from 2007 to 2008, from the state of Bihar. IFA supplementation compliance was reported 37% of women who had received IFA tablets of those 24% women who had consumed IFA tablets. Women were more likely to receive any IFA when they received additional ANC services and counseling, and attended ANC earlier and more frequently.(13)

Factors affecting compliance of Iron Folic Acid (IFA) supplementation among pregnant women

Knowledge of iron-folic acid supplementation (IFA) and anemia: Five studies showed the association between knowledge of IFA supplementation and compliance with IFA supplementation. Pregnant women who had a good

knowledge of oral IFA supplementation were remarkably associated with good compliance. Women who were counseled by health care professionals about IFA supplementation, its correct dosage, time of administration, benefits, and its importance were more likely to be associated with good compliance. (18,14,19–21) Six studies also showed the association of history of anemia and knowledge about anemia with the compliance of IFA supplementation. Most of the studies showed that pregnant women who knew about anemia were significantly associated with good compliance. Non-anemic pregnant women showed better compliance compared to anemic pregnant women beside an improvement in Hb levels showed increased compliance to IFA supplementation.(18,14,22–25)

Timing of registration and number of Antenatal Care (ANC) visits: Based on a systematic review nine studies reported the timing of ANC registration and the number of ANC visits was significantly associated with compliance with IFA supplementations. Women who had started their ANC visit in the initial period of pregnancy were more likely to show good compliance in comparison to those who started their visit in the last period of pregnancy. This review also showed that pregnant women who had more than 3 visits to the antenatal clinic adhered to the recommended supplementation of IFA compared to those who had visited 1 or 2 times.(14,22,17,19,13,24,26,27,21)

Socioeconomic status and educational status of the pregnant women: Based on this systematic review socio-economic status was remarkably associated with the compliance of IFA supplementation. Five studies reported that Pregnant women who belong to lower socioeconomic status had better compliance compared who belonged to high socioeconomic status. The reason for poor compliance among pregnant women who had from higher socio-economic status needs more exploration and is up for interpretation.(14,23,25,27,28) One study showed slightly better compliance in pregnant women who had belonged to high socioeconomic status as compared to who belonged to middle and lower socioeconomic status 45.38% versus 29.77% versus 24.85% respectively.(21) Six studies reported that pregnant women who had a high level of education can show better compliance on IFA supplementation. Educated women were more likely to understand anemia and the importance of IFA supplementation during pregnancy.(13,19,22,24,26)

Type of family and Age of the Pregnant women: Based on this systematic review type of family was remarkably associated with the compliance of IFA supplementation. Studies reported that pregnant women who had belonged to joint families can better comply than nuclear families. women who were directly monitored by the family was significantly showed better compliance to IFA supplementation.(18,14,16,24,26,21)

Five studies reported better compliance among pregnant women in older age groups. older age groups pregnant women were more likely to be concerned about their antenatal period and more knowledge about the importance of IFA supplementation and anemia in compared to younger age group women. [13,17,18,21,24,27,27,28]

Reasons for low compliance of IFA supplementation in the included studies: In this systematic review, the most common reason for low compliance was observed as Forgetfulness and associated side effects such as abdominal pain, nausea, vomiting and diarrhea, constipation gastritis).(13,14,17–20,22,23,25–29) Other reasons such as socio-economic factor cost of IFA Supplement is significantly associated with low compliance of IFA supplementation because low- income group women not able get IFA within that Non-availability of IFA tablets, inability to visit the hospital to get IFA, not liking taste due to poor quality of IFA supplement given by the government, suffering from pregnancy complication taking multiple drugs, frustration during pregnancy was observed among pregnant women in this systematic review.(13,16,21,24,27,28)(Table 1)

Discussion

Compliance with iron-folic acid supplementation plays a most important role in the prevention and treatment of iron deficiency anemia among pregnant women. This review was an attempt to understand the factor affecting compliance towards IFA supplementation among pregnant women in India. The range of Compliance with iron-folic acid supplementation was reported from 12% to 91.3% among pregnant women in India.(17,14) Other countries reported the range of Compliance with iron-folic acid supplementation was from 22.9% to 92.7% among pregnant women. Studies from other countries had reported high compliance towards IFA supplementation among pregnant women in Sudan 92.1%, Sri Lanka 80%, Nepal 73.2%, Ethiopia 63.6%, Pakistan 63.1%, Nepal 55.7%, Ethiopia 55.3% & Mozambique 53%.(30–44) The reason for higher compliance of IFA supplementation could be pregnant women's early registration for ANC clinic, visits 4 times or more frequent visits to ANC clinic during pregnancy, Knowledge of IFA supplementation, Nutrition counseling, education about access to health service & IFA supplementation. Age was also one of the factors which reported to increase the IFA supplementation.(34,41)The highest compliance of IFA supplementation among antenatal mothers was reported in Sudan in the year 2014 as 92%. This study reported significantly higher compliance of IFA supplementation due to the reasons of education, living in the city, and more than 4-time ANC visits.(34) The result of this study was similar to the study done in Shri Lanka in the year 2020 where compliance of IFA supplementation was reported as 80%. This compliance was reported based on the response captured in terms of Yes or No from the participants. In a specified timeframe, if the participants responded as Yes, then it was considered as intake of IFA,

irrespective of its frequency. (35) The lowest compliance towards IFA supplementation among pregnant women was reported in Uganda 44%, Ethiopia 38.3%, Kenya 32.7%, & Ethiopia 22.9%. The observed variation might be due to the differences in socio-demographic characteristics and lack of knowledge and information about IFA supplementation and benefits of IFA supplement during pregnancy, paucity of information on causes of anemia, absence of ANC visits, late registration for antenatal care, Unavailability of nutritional counseling, and family support to take the tablets. (42–44)

This review reported better compliance among pregnant women who had knowledge about the benefits of IFA supplementation showed compared to those who did not have knowledge of IFA supplementation. This statement is supported by studies done in other countries Shri Lanka, Uganda, Kenya, Ethiopia, Sudan, Nepal, & Pakistan.(34,35,37,42–44) Similarly, Pregnant women who registered early in antenatal care clinics showed good compliance to IFA supplementation. This revelation was supported by other studies conducted in different parts of the world. From this, it can be interred that pregnant women who registered early for ANC clinic and took more visits during Pregnancy and got had repeated counseling on health education, the benefit of IFA supplementation, and nutrition knowledge.(34,35,37,42,43) Pregnant women who had altered education up to secondary level and got health education about IFA supplementation from health care workers had shown good compliance to IFA supplementation than those who were illiterate and did not get health education on IFA supplementation. The possible explanation was supported by other countries.(37–39)

This systematic review reported the reasons for Low compliance of IFA supplementation such as side effects and forgetfulness of IFA supplements. These reasons can be attributed due to the lack of knowledge and importance of IFA supplementation and lack of ANC visits. These findings were supported by studies done in Iran and Pakistan which showed forgetfulness was one of the common reasons for low compliance to IFA supplementation. Another reason stated that those who consumed a less diversified diet had an increased risk of metabolic disturbance among pregnant women leading to poor compliance with IFA supplementation. (34–44)

Conclusion Recommendation

Knowledge of iron-folic acid and anemia supplementation, Timing of registration and number of Antenatal Care visits, Socioeconomics status educational level of the pregnant women, and type of family and type of family and age of the pregnant women were factors associated with the compliance of IFA supplementation among pregnant women in India. Iron and folic acid deficiency anemia can be prevented by adequate intake of iron and folic acid-rich diet, and IFA supplementation. In addition, addressing the reason for low compliance of IFA such as side effects and forgetfulness to take IFA supplementation through nutrition counseling, health education from health care workers, and family support is required along with other delivering and implementing strategies to improve the compliance of iron and folic acid supplementation. The government of India should reform the individualized education and nutrition counseling.

Limitation of the study

This review had included only studies that were written in the English language, missing out on other national language studies, and also included studies that were available in the free full text also thus restricted some papers from being included. Moreover this review was quality of the study was not graded and most of the included studies were cross-sectional; as a result, the outcome variables might be affected by other confounding variables.

Authors Contribution

All authors have contributed equally.

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Tables

TABLE 1 CHARACTERISTICS OF THE INCLUDES STUDIES, INDIA

S.N	Author Name & Publication Year	Place of the study	Study Type	Sample size	Compliance Non-compliance	Reason of low compliance		Factors of Compliance
1.	Palivela D et al(30) 2021	Puducherry	Cross-sectional survey	250	66% 34%	Side effect Forgetfulness Inability to visit the hospital to get IFA Unnecessary	44.2% 43% 12.8% 4.7%	
2.	Deori TJ et al(18) 2021	Haryana	Cross-sectional study	484	77.1% 22.9%	Forgetfulness Side effects	63% 49.5%	Knowledge of IFA supplementation and anemia Type of family and age of pregnant women
3.	Ulaganeethi, et al(14) 2021	Puducherry	Mixed method study	150	91.3% 8.7%	-	-	Knowledge of IFA supplementation and anemia Timing of registration and number of ANC visit Socioeconomic status and educational status of the pregnant women Type of family and age of pregnant women
4.	Basu S et al(19) **2021**	Delhi	Cross-sectional study	211	83% 17%	Forgetfulness Side effect Lack of availability of IFA	20.4% 3.3% 13.2%	Timing of registration and number of ANC visit Socioeconomic status and educational status of the pregnant women
5.	Debi S et al(28) 2020	West Bengal	Cross-sectional study	208	81.74% 18.26%	Forgetfulness	73.7%	Socioeconomic status of the pregnant women Type of family and age of pregnant women
6.	Lavanya, P et al(22) 2020	Puducherry	Mixed method study	340	63.82% 36.18%	Forgetfulness Side effect	32% 27.5%	Knowledge of IFA supplementation and anemia Timing of registration and number of ANC visit Socioeconomic status and educational status of the pregnant women Type of family and age of pregnant women
7.	SG Chandra Kumar et al(20) 2019	Karnataka	Cross-sectional study	192	71% -	Forgetfulness Side effect Cost of IFA Ignorance	-	
8.	Varghese JS et al(17) 2019	Rajasthan	Community-based survey	436	12% 88%	Lack of knowledge Lack of availability Palatability Unnecessary	-	Timing of registration and number of ANC visit
9.	Srivastava R et al(16) 2019	Haryana	Randomized control trial	204	Intervention group 22% Control group 16.8%	Forgetfulness Gastrointestinal disorder	-	Type of family and age of pregnant women
10.	Ahamed F et al(15) 2018	Haryana	Randomized control trial	400	Control group 60.4% Intervention group 69.1%	Forgetfulness Side-effects	39.3% 30%	
11.	Kumar PS et al(31) 2018	Tamil Nadu	Cross-sectional study	162	69% 31%	Side effect Taste Forgetfulness Unavailability	38% 6% 20% 18%	
12.	Selvaraj K et al(23) 2017	Puducherry	Cross-sectional study	148	77% 23%	dislike the taste late registration side effects	70.6% 14.7% 14.7%	Knowledge of IFA supplementation and anemia Socioeconomic status of the pregnant women
13.	Singh V et al(32) 2017	Uttar Pradesh	Cross-sectional study	523	55.1% of women consumed 71% of women received	-	-	
14.	Wendt, Amanda et al(13) 2015	Bihar	Cross-sectional survey	2905	37% of women received 24% consumed	-	-	Timing of registration and number of ANC visit Educational Status of pregnant women

S.N	Author Name & Publication Year	Place of the study	Study Type	Sample size	Compliance Non-compliance	Reason of low compliance		Factors of Compliance
15.	Dutta AJ, et al(24) 2014	Gujarat	Cross-sectional study	239	61.7%	Forgetfulness Ignorance Big size Palatability Frustration	24.9% 22% 31.75% 16% 9.9%	Knowledge of IFA supplementation and anemia Timing of registration and number of ANC visit Socioeconomic status and educational status of the pregnant women Type of family and age of pregnant women
16.	Kumar S, et al(26) 2014	Tamil Nadu	Cross-sectional study	132	25.9% consumed 90 days 5.9% consumed more than 100 days	Side Effect		Timing of registration and number of ANC visit Type of family and age of pregnant women
17.	Mithra P et al(29) 2013	Karnataka	Cross-sectional study	192	58.7% consumed 66.8% received	Forgetfulness Side effect Gastritis Constipation	48.8% 47.6% 13.8% 21.5%	Age of the pregnant women
18.	Roy P et al(25) 2013	Uttar Pradesh	Cross-sectional study	352	83.5% received 36.9% Consumed			Knowledge of IFA supplementation and anemia Socioeconomic status and educational status of the pregnant women
19.	Pal et al(27) 2013	Darjeeling	Cross-sectional study	50	62% -			Timing of registration and number of ANC visit Socioeconomic status of the pregnant women
20.	Godara S et al(21) 2013	Haryana	Cross-sectional study	840	80.47% -	Side effects Taste Taking Multiple drugs	29.3% 16.9% 9.4%	Timing of registration and number of ANC visit Type of family of the pregnant women

Figures

FIGURE 1 FLOW DIAGRAM GRAPHIC SELECTION OF ARTICLES IN REVIEW