Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 10, 2023

A study on prevalence of anaemia and compliance to iron and folic acid tablets among pregnant females in a rural population of Gurugram, Haryana

Dr. Manisha Singh1, Dr. Manish Kundu1, Dr. Vaibhav1, Dr.Seema Choudhary2

1Assistant Professor, Department of Community Medicine, Maharaja Agrasen Medical College, Agroha, Hisar–125047, Haryana, India
2Professor and Head, Department of Community Medicine, Maharaja Agrasen Medical College, Agroha, Hisar–125047, Haryana, India

Correspondence: Dr. Manisha Singh
Email: manisha090916@gmail.com
Address: Maharaja Agrasen Medical College, Agroha, Hisar–125047, Haryana, India.
Contact number: 8368281026

Abstract

Introduction: Anaemia is the commonest medical disorder in pregnancy. Anemia during pregnancy is a major public health problem throughout the world, particularly the developing countries. Anaemia in pregnancy leads to premature births, low birth weight, fetal impairment, and infant deaths**. Objectives**: To find out the prevalence of anaemia and to estimate the compliance to Iron and Folic acid tablets among among pregnant females in rural population of Gurugram, Haryana.**Methods:** A cross sectional study was conducted in villages under PHC Garhi Harsaru in Gurugram, Haryana among 452 females of age group 10-45 years by two stage random sampling technique. Out of 452 females, 123 were found to be pregnant. **Results:** The prevalence among pregnant females was found to be 49.59%. The prevalence of anaemia was thus found to be highest among women in first trimester of pregnancy(73.33%). On assessing the severity of anaemia, it was found that the prevalence of severe anaemia was 8.13% among pregnant females as compared to only 4.86% among non pregnant females. About 74.37% were compliant i.e. taking IFA tablets as advised, 21.61% were non compliant and 4.02% of the subjects were over compliant. **Conclusion:** The comparatively lower prevalence of anaemia in the second trimester could be due to the role of iron and folic acid supplementation. Despite numerous preventive and promotive efforts from the Government, anemia in pregnancy still stands as a major health problem in India.

Keywords: Anaemia, Compliant, Pregnancy, Prevalence, Trimester.

INTRODUCTION

Anaemia is the commonest medical disorder in pregnancy. Anemia during pregnancy is a major public health problem throughout the world, particularly the developing countries. Despite the fact that most of the anemia's seen in pregnancy is largely preventable and easily treatable if detected in time, anemia still continues to be a common cause of mortality and morbidity in India. Diminished intake and increased demands of iron, disturbed metabolism, prepregnant health status and excess iron demands as in multiple pregnancies, women with rapidly recurring pregnancies, blood loss during labour, heavy menstrual blood flow, inflammation and infectious diseases are important factors which lead to development of anemia during pregnancy. [1,2] Anemia is one of the most common nutritional deficiency disorders affecting the pregnant women; the prevalence in developed countries is 14%, in developing countries 51%, and in India, it varies from 65% to 75%. [3,4] Anemia is the second most common cause of maternal death in India and contributing to about 80% of the maternal deaths caused by anemia in South East Asia. [4,5,6,7] World Health Organization (WHO) definitions for anemia differ by age, sex, and pregnancy status as follows: in children 6 months to 5 years, anemia is defined as a Haemoglobin level < 11 g/dl; in children 5–11 years, Haemoglobin < 11.5 g/dl; in adult males, Hemoglobin < 13 g/dl; in non-pregnant women, Haemoglobin < 12 g/dl and in pregnant women Hemoglobin < 11 g/dl . [8] Haemoglobin value <11g/dl is defined as anemia in pregnancy by WHO. [9] Anemia can be further divided as mild, moderate and severe anemia for hemoglobin level 10-10.9g/dl, 7-9.9 g/dl and severe < 7g/dl. [10] Anaemia could be classified as mild, moderate, and severe. The Haemoglobin 10.0 g/dl for each class of anemia in pregnancy is considered mild. The haemoglobin level from 7 to 9.9 g/dl is considered as moderate and if < 7 g/ dl, it is considered as severe. Anaemia is considered as an indicator of both poor nutrition and health status. [11] Anaemia in pregnancy leads to premature births, low birth weight, fetal impairment, and infant deaths. It also reduces the productivity of women. The reduction in women's productivity places an economic burden on families, communities, and societies. Anaemia is also an established risk factor for intrauterine growth retardation, leading on to poor neonatal health and perinatal death. [12,13,14,15,16] Pregnancy is a period of a significant increase in iron requirement over and above the non-pregnant state. [17] Although iron requirements are reduced in the first trimester because of the absence of menstruation, they rise steadily thereafter from approximately 0.8 mg per day in the first month to approximately 10 mg per day during the last 6 weeks

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 10, 2023

of pregnancy. [18] The increased iron requirement is due to expansion of maternal red blood cell mass for increased oxygen transport, including transfer of iron, to both the growing foetus and the placental structures, and as a needed reserve for blood loss and lochia at parturition. [19] Due to increased iron requirements, pregnancy is also a period of increased risk for anemia. Thus, a high proportion of women become anemic during pregnancy. Anaemia is directly responsible for 20% maternal death and is an associated cause in another 20%.[1] Current knowledge indicates that iron deficiency anemia in pregnancy is a risk factor for preterm delivery and subsequent low birth weight and possibly for inferior neonatal health. Margaret Balfour was credited as the first to draw the attention of anemia in pregnancy in India. [20] The weight of evidence supports advisability of routine iron supplementation during pregnancy. [16] Distribution of Iron - Folic Acid (IFA) tablets from 4th month onwards to 3 months [21] (or even 6 months [22]) of delivery will help in preventing anemia.

In view of its public health importance, the Government of India sponsored National Nutritional Anemia Prophylaxis Programme during 4th Five Year Plan in 1970 with the aim to reduce the prevalence of anemia to 25%. [23] This programme consists of distribution of IFA tablets containing 100 mg of Ferrous Iron and 500 mcg of Folic Acid to pregnant women through Urban Family Welfare Centers in urban areas and Primary Health Centers in rural areas. ICDS Projects are engaged in implementation of this programme. [21] Under this programme, the expectant mother is given a pack of 100 IFA tablets with an instruction to take one tablet a day after food as a prophylactic measure and if mother has visible signs of anemia, she is advised two tablets a day as a therapeutic measure. [24] The optimum dose of elemental iron is 120mg daily for better response. [21] Current AMB program guidelines recommend prophylactic supplementation of one IFA tablet with 60 mg of elemental iron and 500 microgram of folic acid, every day for 180 days from the second trimester onwards and to continue six months postpartum.

The National Family Health Survey-5 (NFHS-5) data reported that anemia (Hb<11 gm/dl) in pregnant women aged 15-49 years in India is 52.2% and it is more in rural (54.3%) than in urban India (45.7%). [25]. Data also shows that prevalence of anemia in Haryana is 56.5% which is quite high. It is more in rural area of Haryana(57.2%) than in urban area(54.6%). However, according to NFHS 5, the proportion of antenatal mothers who consumed IFA tablets for 100 days or more was only 44.1% (Rural – 40.2% and Urban – 54.0%) [25] in India. Proportion of antenatal mothers who consumed IFA tablets for 180 days or more was only 26.0% (Rural- 40.2% and Urban- 34.4%). Reasons for low consumption of IFA by pregnant women include factors both from the demand (women) as well as the supply (health system challenges in providing adequate supply). [26] Pregnant women's compliance to IFA tablets is one of the important factors that affects IFA consumption. Compliance may be defined as the dose taken in relation to what was prescribed. Studies conducted in rural, urban and tertiary healthcare contexts shows different amount of compliance to IFA tablets by pregnant women. [27,28,29,30]

In view of the above, this study was carried out to estimate the prevalence of anaemia among pregnant females in rural population of Gurugram, Haryana and to estimate the compliance to Iron and Folic acid tablets among beneficiaries of this group.

MATERIAL AND METHODS

This cross-sectional observational study was conducted in villages under PHC Garhi Harsaru which is situated in district Gurugram of Haryana State. The study area comprises of 45729 individuals distributed across 14 villages. The study was conducted among females of age group 10-45 years residing in rural area under PHC Garhi Harsaru of Gurugram district Haryana.

Sample size estimation was done by taking prevalence of anemia among 10-45 years females as 50% [31] at 95% confidence interval and 5% desired level of precision. The sample size came out to be 384. However, 452 females participated in this study. Among this study sample, 123 females were found to be pregnant. Out of 14 villages under PHC Garhi Harsaru, 7 villages were selected using simple random sampling (lottery method). A complete list of 4975 households in these seven villages was obtained and serially numbered. This was served as a sampling frame. Out of which 220 households were selected by probability proportional to size (PPS) sampling method which was expected to give sample size of 452 females for the study. A random number of 20 was selected which was less than the sampling interval (23). This number gave the location of first household in the first village. Then second household was selected by adding the sampling interval i.e. 23 to the first household. If the next household was found to be locked, then household adjacent to it was taken. From the selected households all females who were in the age group of 10-45 years and gave their consent to participate in the study were enrolled for the study. Females below 10 years and above 45 years of age, suffering from chronic diseases, and not willing to participate in the study were excluded from the study.

The approval from the Institutional Ethical Committee of SGT University was obtained before commencing the study. A written informed consent was obtained from each subject for their participation after the nature of the study was fully explained to them in their local languages. The primary tool in this study was a predesigned and pretested interview

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 10, 2023

schedule for recording of pregnancy stage and intake of number of IFA tablets among study subjects. The tool was administered by the investigator herself. Another tool used in this study was Sahli´s Haemoglobinometer for estimation of hemoglobin concentrations of eligible subjects. Haemoglobin estimation was done by trained laboratory technician and public health nurse of the community medicine department. In Sahli's acid hematin method[32] blood was mixed with an acid solution so that hemoglobin is converted to brown-colored acid hematin. This was then diluted with water till the brown color matched that of the brown glass standard. The hemoglobin value was read directly from the scale. Grades of anaemia for various age groups were classified as per WHO.[33]

Compliance is defined as a total number of tablets consumed to the total number of tablets advised multiplied by 100. Women taking 80% of given tablets are considered as compliant. Compliance to IFA tablets is calculated by the formula, [29] Those pregnant women who followed the instructions, took the iron tablets as advised were considered as compliant. Over compliance refers to intake of drug by the pregnant women more than prescribed, even increasing the dose by 50%.

Compliance percentage was calculated by the formula:

Compliance = {(Number of tablets given - Number of tablets remaining)/ Number of tablets given} × 100

Collected data was first entered in the MS Excel spreadsheet and coded appropriately. Prevalence of anemia was estimated in terms of percentage and association between socio-demographic factors with anemia was analyzed using Pearson's Chi-square test of significance. The level of significance was considered at $p< 0.05$. All statistical analyses were performed using Epi info 7.2 software.

RESULTS

Table 1 shows the distribution of study participants according to different stages of reproductive period. Out of 452 females,123 were found to be pregnant. Total prevalence of anaemia among 452 females was 62.39% i.e 282 females were found to be anemic.

Figure 1 shows that out of 123 pregnant females, about 61 (49.59%) females were anemic and out of 329 non pregnant females, 221(67.17%) were anemic. The reasons for lower percentage of anemia prevalence in pregnant females could be due to better iron and folic acid intake in the study area.

Figure 2 shows the prevalence of anaemia in different trimesters among pregnant women. The prevalence of anaemia among pregnant women was found to be 49.59%. The prevalence varied in different trimesters. About 73.33% pregnant women in first trimester(<12 weeks) were found to be anemic, 36.36% in second trimester(12-28 weeks) and 53.13% in third trimester(>28 weeks). The prevalence of anemia was thus found to be highest among women in first trimester of pregnancy.

Table 2 shows the association between duration of pregnancy (trimester) and anaemia. The prevalence of anaemia was highest 73.33% among subjects in first trimester, followed by 53.13% in third trimester and 36.36% in second trimester. The association between trimester of pregnancy and anaemia was found to be statistically significant (p=0.03). The comparatively lower prevalence of anaemia in the second trimester could be due to the role of iron and folic acid supplementation. In this study, 90.48% of the pregnant females who were not taking IFA supplementation were found to be anaemic as compared to 41.18% anemic of those who reported of intake of IFA supplementation and this difference was found to be statistically significant.(p value< 0.001). It was found that 61.54%, 40.82%, 22.22% of the pregnant females were anaemic who consumed < 50 tablets, 50-100 tablets and > 100 tablets respectively. This difference was found to be statistically significant (p value= 0.0146). Hence the prevalence of anaemia decreased with increase in the number of IFA tablets consumption in pregnancy.

Figure 3 shows the association between pregnancy status and severity of anaemia. On assessing the severity of anaemia, it was found that the prevalence of severe anaemia was 8.13% among pregnant females as compared to only 4.86% among non pregnant females. However it was also found that the prevalence of mild to moderate anaemia was higher among non pregnant females 62.31% when compared to pregnant females 41.47%.This difference was found to be statistically significant(p=0.01).Thus a positive association between pregnancy status and severity of anaemia was found in the above study.

Figure 4 shows the association of IFA consumption in pregnancy and severity of anaemia. In the present study 14.29%, 23.81% and 52.38% of subjects who did not take IFA supplementation were found to have severe, moderate and mild anaemia respectively as compared to 6.86% severe, 13.73% moderate,20.59% mild anaemia among subjects taking IFA supplementation. This difference was found to be statistically significant (p =0.0006). Hence the severity of anemia is more in the pregnant females who did not report of intake of IFA supplementation

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 10, 2023

Table 3 shows the compliance in relation to IFA supplementation among antenatal and lactating women. About 74.37% were compliant i.e. taking IFA tablets as advised, 21.61% were non compliant and 4.02% of the subjects were over compliant i.e. the women increased the dose to have additional benefits.

Table 4 shows the reasons of non compliance among antenatal and lactating women regarding IFA supplementation. Majority of the subjects 79.06% stopped taking medication due to side effects, 48.83% due to long term taking of IFA tablets, 27.90% due to forgetfulness , 20.93% due to not liking due to poor quality of tablet supplied by government and 9.30% due to suffering from pregnancy complications.

Table 1: Distribution of study participants according to different stages of reproductive period(N=452)

Pregnancy status	Number	Percentage
Pregnant	123	27.21%
Non pregnant non lactating	198	43.80%
Lactating	76	16.81%
Adolescents	55	12.16%

Figure 1: Prevalence of anaemia according to pregnancy status(N=452)

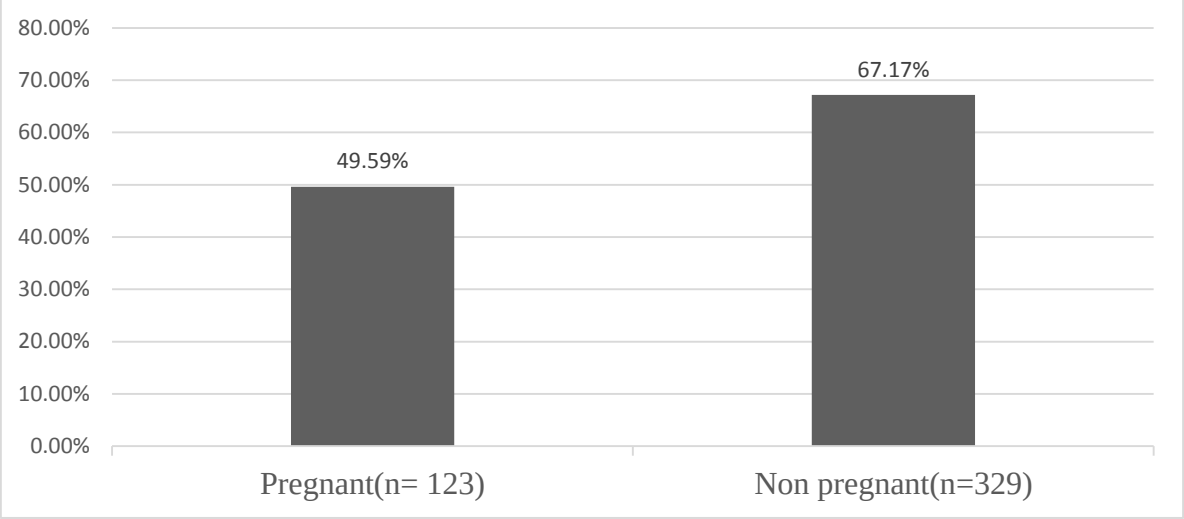

Figure 2: Prevalence of anaemia according to duration of pregnancy (trimester)(N=123)

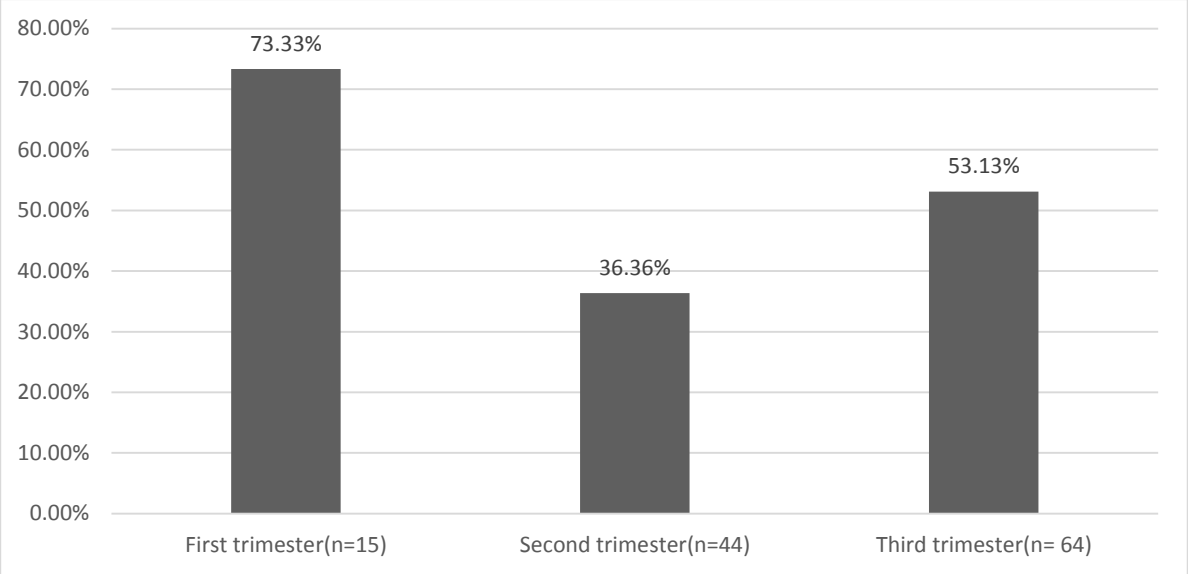

Table2: Association of anaemia with duration and pattern of IFA consumption in pregnancy (N= 123)

Parameters	Non anemic (N=62)	Anemic (N=61)	chi square	p value
Trimester (Duration of pregnancy)				

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 10, 2023

First trimester	4(26.67%)	11(73.33%)	6.7817	0.0337
Second trimester	28(63.64%)	16(36.36%)		
Third trimester	30(46.88%)	34(53.13%)		
IFA consumption in pregnancy				
Yes	60(58.82%)	42(41.18%)	16.9314	<0.00001
No	2(9.52%)	19(90.48%)		
No. of IFA tablets				
< 50	10(38.46%)	16(61.54%)	8.4579	0.0146
50-100	29(59.18%)	20(40.82%)		
>100	21(77.78%)	6(22.22%)		

Figure 3: Association between pregnancy status and severity of anaemia(N=452)

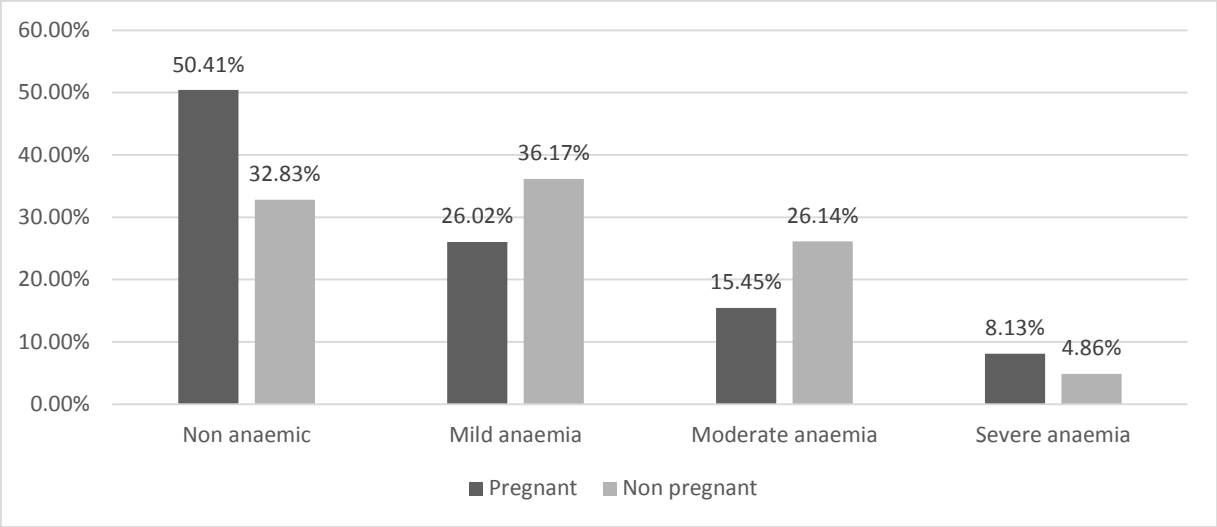

Figure 4: Association of IFA consumption in pregnancy and severity of anaemia(N=123)

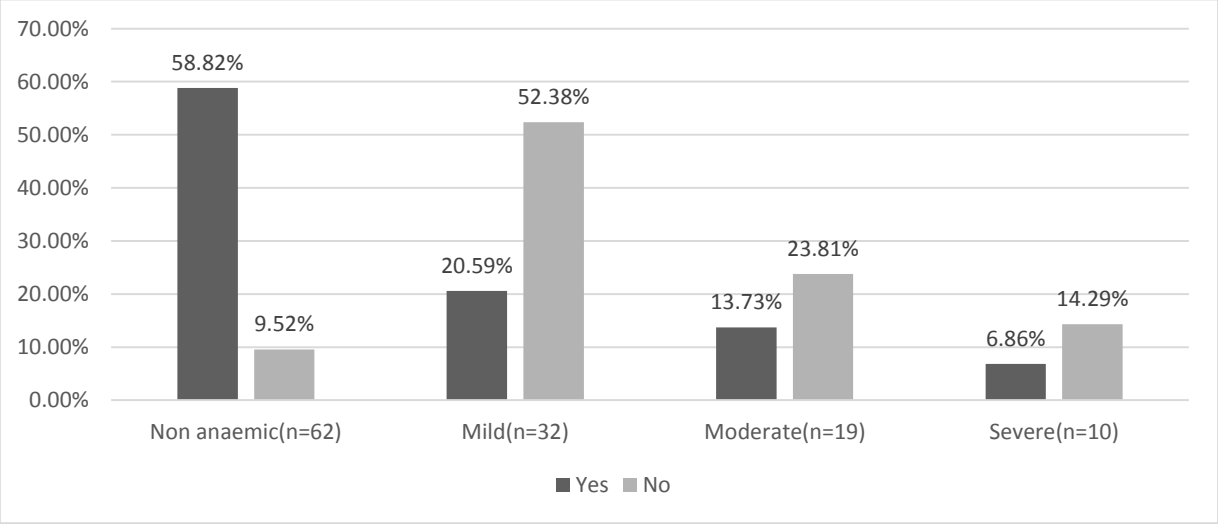

Table 3: compliance in relation to IFA supplementation among antenatal and lactating women

Antenatal + lactating women	**Number(n=199)**	**Percentage**
Compliance	148	74.37%
Non compliance	43	21.61%
Over compliance	8	4.02%

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 10, 2023

Table 4: Reasons for non compliance among antenatal and lactating women regarding IFA supplementation

Causes	Number (n= 43)	Percentage
Suffering from pregnancy complications	4	9.30%
Long term taking	21	48.83%
Iron tablet forgetfulness	12	27.90%
Not liking due to poor quality of tablet supplied by Government	9	20.93%
Side effects	34	79.06%

*****multiple responses

DISCUSSION

In the above study, the prevalence of anaemia among pregnant females was found to be 49.6%. This finding is almost similar to National Family Health Survey-5 (NFHS-5) [25] data in pregnant women aged 15-49 years in India which is 52.2%. According to NFHS-5 it is more in rural (54.3%) than in urban India (45.7%). The reason being low socioeconomic status, less dietary intake of iron and folic acid, short spacing of multiple pregnancies, excessive bleeding during labor, infections like malaria and hookworm infestations. [34] However, it was slightly lower than NFHS-5 data in Haryana in which total prevalence is 56.5%, 57.2% and 54.6% in rural area and urban area respectively. The reasons may be due to better socioeconomic conditions, literacy status and intake of IFA supplements during pregnancy in study area. The findings of the study were concordant with study done by Ritupanghal *et al* [35] on 5442 pregnant women of Hisar district to assess the prevalence of anemia in which overall fifty one per cent of the pregnant women were anemic in four blocks of Hisar district. Lilare RR *et al* [31] conducted a study in which prevalence of anemia in pregnancy was found to be 54.2%, i.e. higher than non pregnant women (48.7%). In the present study 64(52.03%) of the pregnant females were in third trimester, 44(35.77%) were in second trimester and 15 (12.20%) were in first trimester. The prevalence of anemia in the present study was higher in first and third trimester and this difference was statistically significant (p value<0.05). In the study it was highest in first trimester due to lesser intake of iron and folic acid. In a study done by H K Cheema *et al* [36], higher prevalence of anemia was observed in 3rd trimester. Demand of micronutrients is increased in last trimester which aggravates anemic status. This finding collaborate with study conducted among antenatal mothers in Uttar Pradesh by Singh R *et al* (2015). [37] Compliance with iron supplementation plays a major role in the prevention and treatment of iron deficiency anaemia particularly among pregnant women whose iron requirement starts at the second trimester and progresses until the third trimester. In the present study, 82.93% pregnant women were found to have consumed IFA tablets. About 17.07% reported no intake of IFA supplementation. The main reasons for non compliance among pregnant women in the present study were due to side effects and dislike due to long term taking of IFA tablets. The findings of the present study are in concordant with the study done by Godara *et al* [28] in Haryana where 80.47% of the pregnant women took the IFA tablets as advised. The main reasons for non compliance were side effects as found in the present study. The study done by Selvaraj K *et al* [38] in rural Tamil Nadu showed 77% compliance among pregnant women which is almost similar to the present study. However, the main reason of non compliance in this study was due to not liking the taste of IFA tablet. Studies conducted among pregnant women from other Indian settings (Calcutta: 62%, Mangalore: 64.7%) also reported similar compliance rate [30, 39]. Similarly in a study done by Sangwan K. *et al* [40] in rural area of Rohtak , the overall compliance to IFA tablets was 67.9%. In a study done by Deori TJ *et al* in 2021 [41], the overall compliance among the pregnant women was found to be 77.1% which is almost similar to this study. However in this study, the most common reason given by the pregnant women for non-compliance was "forgetfulness" (63.0%) followed by "side effects" (49.5%). Similarly in a study done by Pathirathna ML *et al* [42], the rate of IFA supplementation compliance during pregnancy was 80.1%. Forgetfulness (66.9%) was the major reason for non-compliance, followed by side effects (15.7%).

CONCLUSION

The prevalence among pregnant females was found to be 49.59%. The prevalence of anaemia was thus found to be highest among women in first trimester of pregnancy(73.33%). The comparatively lower prevalence of anaemia in the second trimester could be due to the role of iron and folic acid supplementation. On assessing the severity of anaemia, it was found that the prevalence of severe anaemia was 8.13% among pregnant females as compared to only 4.86% among non pregnant females. About 74.37% were compliant i.e. taking IFA tablets as advised, 21.61% were non compliant and 4.02% of the subjects were over compliant. Despite numerous preventive and promotive efforts from the Government, anemia in pregnancy still stands as a major health problem in India.

RECOMMENDATIONS

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 10, 2023

Prevention of anaemia in pregnancy will go a long way to help in preventing maternal complications in post-partum state and also will ensure a healthy baby and a healthy mother as an outcome. The high prevalence of anaemia in pregnant mothers need to be tackled seriously by the health care workers especially at the primary health care centres because of possible health implication to the mothers and babies. Adequate counselling and education should be given to mothers or perhaps with the supportive involvement of their partners about the beneficial effects of IFA tablets. Other interventional measures and programs to educate the mothers on the need to initiate antenatal care early should be instituted.

Acknowledgement
The researchers express their heartfelt gratitude to all the participants enrolled in the study.

Declaration:
Funding: None
Conflict of interest: None

REFERENCES

1. Dutta DC. Anaemia in pregnancy. Text book of Obstetrics including Perinatology & Contraception, 6th edition ISBN:81-7381-142-3,Published by New Central Book Agency (P) Ltd, Culcutta, India 2004; 262-67.
2. Tolentino K, Friedman JF. An update on Anaemia in Less Developed Countries. Am J Trop Med Hygiene & 2007; 77(1): 44-51.
3. Marahatta R. Study of anaemia in pregnancy and its outcome in Nepal medical college teaching hospital, Kathmandu, Nepal. Nepal Med Coll J 2007;9:270-4.
4. Kalaivani K. Prevalence & consequences of anaemia in pregnancy. Indian J Med Res. 2009;130(5):627-33.
5. Mbule MA, Byaruhanga YB, Kabahenda M, Lubowa A. Determinants of anaemia among pregnant women in rural Uganda. Rural Remote Health. 2013 Apr-Jun;13(2):2259.
6. Viveki RG, Halappanavar AB, Viveki PR, Halki SB, Maled VS. Prevalence of anaemia and its epidemiological determinants in pregnant women. Al Ameen J Med Sci 2012;5:216-23.
7. Ahmad N. The prevalence of anaemia and associated factors in rural Indian community. Australas Med J 2010;1:276-80.
8. Haidar JA, Pobocik RS. Iron deficiency anemia is not a rare problem among women of reproductive ages in Ethiopia: a community based cross sectional study. BMC Blood Disord 2009;9:7.
9. Breymann C; Anaemia Working Group. Aktuelle Aspekte der Diagnostik und Therapie der Eisenmangelanämie in der Schwangerschaft [Current aspects of diagnosis and therapy of iron deficiency anemia in pregnancy]. Praxis (Bern 1994). 2001 Aug 2;90(31-32):1283-91.
10. De Benoist B, McLean E, Egli I, Cogswell M. Worldwide Prevalence of Anaemia 1993-2005: WHO Global Database on Anaemia. Geneva: World Health Organization; 2008.
11. McLean E, Cogswell M, Egli I, Wojdyla D, de Benoist B. Worldwide prevalence of anaemia, WHO Vitamin and Mineral Nutrition Information System, 1993-2005. Public Health Nutr. 2009 Apr;12(4):444-54.
12. Sangeetha VB, Pushpalatha S. Severe maternal anemia and neonatal outcome. Sch J Appl Med Sci 2014;2:303-9.
13. Gautam VP, Bansal Y, Taneja DK, Saha R, Shah B, Marg Z, *et al*. Prevalence of anaemia amongst pregnant women and its socio-demographic associates in a rural area of Delhi. IJCM 2002;27:157-60.
14. Iyengar K. Early postpartum maternal morbidity among rural women of Rajasthan, India: a community-based study. J Health Popul Nutr. 2012;30(2):213-25.
15. Amel Ivan E, A M. Evaluation of anaemia in booked antenatal mothers during the last trimester. J Clin Diagn Res. 2013;7(11):2487-90.
16. Allen LH. Anemia and iron deficiency: effects on pregnancy outcome. Am J Clin Nutr. 2000;71(5 Suppl):1280S-4S.
17. Zavaleta N, Caulfield LE, Garcia T. Changes in iron status during pregnancy in peruvian women receiving prenatal iron and folic acid supplements with or without zinc. Am J Clin Nutr. 2000;71(4):956-61.
18. Bothwell TH. Iron requirements in pregnancy and strategies to meet them. Am J Clin Nutr. 2000 ;72(1 Suppl):257S-264S.
19. Beaton GH. Iron needs during pregnancy: do we need to rethink our targets? *American Journal of Clinical Nutrition* 2000; 72(1): 265S-271S.
20. Reddaiah VP, P. Prasanna Raj, Ramchandran K *et al*. Supplementary Iron Dose in Pregnancy. Anaemia Prophylaxis. Indian J Ped 1989; 56(1): 109-114.
21. Anaemia during pregnancy. Reproductive and Child Health, Module for Medical Officers. National Institute of Health and Family Welfare, New Delhi 2000; 285-287.
22. Arturo Marti-Carvaja AL, G.P – Marti, Comunian G and Munoz. Prevalence of anemia during pregnancy: Results of Valencia (Venezuela) anemia during pregnancy study. Archivos Latinoamericanos de Nutricion 2002; 52(1):1-13.
23. Agarwal DK, Agarwal KN, Roychoudhary S. Targets in National Anaemia Prophylaxis Programme for Pregnant Women. Indian Paediatr1988; 25: 319-22.

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 10, 2023

24. Suryakantha AH. Reproductive and Child Health, Demography. A text book of Community Medicine with recent advances, second edition, ISBN 978-93-80704-31-9 Published by Jaypee Brothers Medical Publishers (P) Ltd, Delhi, India 2010:539, 591.
25. International Institute for Population Sciences (IIPS). National Family Health Survey -5 (2019-21). India Factsheet. Mumbai: International Institute for Population Sciences; 2022. Available from http://rchiips.org/nfhs/NFHS5_FCTS/India.pdf [Last accessed on 01 January 2023].
26. Varghese JS, Swaminathan S, Kurpad AV, Thomas T. Demand and supply factors of iron-folic acid supplementation and its association with anaemia in North Indian pregnant women. PLoS One. 2019 Jan 30;14(1).
27. Gautam VP, Bansal Y, Taneja K, Devender IKG. A study on compliance to iron-folic acid therapy and its effects on anemia during pregnancy. Indian J Prev Soc Med 2005;36:17.
28. Godara S, Hooda R, Nanda S, Mann S. To study compliance of antenatal women in relation to iron supplementation in routine ante-natal clinic at a Tertiary health care centre. J Drug Deliv Ther 2013;3:71-5.
29. Dutta AJ, Patel P, Bansal RK. Compliance to iron supplementation among pregnant women: A cross sectional study in Urban Slum. Natl J Community Med 2014;5:457-62.
30. Mithra P, Unnikrishnan B, Rekha T, Nithin K, Mohan K, Kulkarni V, *et al*. Compliance with iron-folic acid (IFA) therapy among pregnant women in an urban area of South India. Afr Health Sci 2013;13:880-5.
31. Lilare RR, Sahoo DP. Prevalence of anaemia and its epidemiological correlates among women of reproductive age group in an urban slum of Mumbai. Int J Community Med Public Health 2017;4:2841-6.
32. Pal GK, Pal P. Textbook of Practical Physiology.2nd ed, Chennai: India Orient Longman;2005.
33. UNICEF. Adolescent Division Ministry of Health and Family Welfare Government of India. Guidelines for Control of Iron Deficiency Anaemia. National iron + initiative;2013.
34. Tolentino K, Friedman JF. An update on anaemia in less developed countries. Am J Trop Med Hyg 2007;77:262-7.
35. Panghal Ritu, Boora Pinky (2023). Prevalence of Anaemia Among Pregnant Women of Low Income Group Of Hisar District of Haryana. Asian Journal of Dairy and Food Research. 29(2).
36. H.K. Cheema, Baljit Singh Bajwa, Kulbir Kaur, Harshdeep Joshi. Prevalence and possible risk factors of anaemia in different trimesters of pregnancy. International Journal of Contemporary Medical Research 2016;3(4):1194-97.
37. Singh R, Singh A K, Gupta A C, Singh HK. Correlates of anemia in pregnant women. Indian journal of community health. 2015;27:351-355.
38. Selvaraj K, Arumugasamy P, Sarkar S. Compliance and patterns of iron-folic acid intake among adolescent girls and antenatal women in rural Tamil Nadu. CHRISMED J Health Res 2017;4:87-93.
39. Pal PP, Sharma S, Sarkar TK, Mitra P. Iron and folic acid consumption by the ante‐natal mothers in a rural area of India in 2010. Int J Prev Med 2013;4(10):1213‐6.
40. Sangwan K, Kumar N, Bhatt B. Socio Demographic Determinants of IFA Intake During Pregnancy Among Mothers in Rural Area of Rohtak, Haryana, India International Journal of Basic and Applied Medical Sciences 2014; 4 (3):49-56.
41. Deori TJ, Ramaswamy G, Jaiswal A, Loganathan V, Kumar R, Mahey R, Yadav K, Kant S. Compliance with iron folic acid (IFA) tablets and associated factors among pregnant women attending ante-natal care clinic at Sub District Hospital, Ballabgarh. J Family Med Prim Care. 2021 May;10(5):2006-2011
42. Pathirathna ML, Wimalasiri KMS, Sekijima K, Sadakata M. Maternal Compliance to Recommended Iron and Folic Acid Supplementation in Pregnancy, Sri Lanka: A Hospital-Based Cross-Sectional Study. Nutrients. 2020 Oct 25;12(11):3266.