International Journal of Medical and Health Research
ISSN: 2454-9142, Impact Factor: RJIF 5.54
www.medicalsciencejournal.com
Volume 3; Issue 1; January 2017; Page No. 05-09

Anemia in pregnancy: Epidemiology and it's determinants

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Abstract

Background: Determinants are nutritional, biological & social which contribute poor pregnancy outcomes both for mother & her infant. With this background the present study was designed to assess severity of anemia in rural area depending on hemoglobin &epidemiological determinants in Indore (Madhya Pradesh).

Methodology: All pregnant women visiting at Ob. Gynac OPD in Index Medical College, Hospital and Research Centre from 1 June 2015 to 31 December 2015 were studied by recording predesigned & structured history of pregnant women with total hemoglobin concentration. Haemoglobin estimation was done by Sahli's method & anaemia was graded according to WHO criteria and statistical analyses were done.

Result: Percentage of anemia was 82.9 with more prevalence of moderate anemia in 2nd & 3rd trimester. Epidemiological determinants studied, predominantly severity of anaemia was seen in 26 years of age, from nuclear families, educated upto secondary level, having vegetarian diet, parity two or more & those in third trimester with two or more abortions, although statistically not significant. However, anaemia prevalence was significantly higher among those subjects from below Class IV socioeconomic status, those with less than two years of spacing between previous and index pregnancies & with less than two months IFA tablet consumption.

Conclusion: A very high prevalence of anaemia in pregnancy needs mandatory regular supply of IFA tablets to adolescent and pregnant women from 4th month onwards till 3-6 months post-partum along with correction of other nutritional deficiencies and timely intervention for reducing the burden of related diseases.

Keywords: Anemia, Pregnancy, India

1. Introduction

Anemia is frequently observed nutritional disease recognized by abnormal screening laboratory tests where haemoglobin concentration < 11 gm% & haematocrit < 33% are diagnostic values in pregnancy. Classification of anemia according to ICMR is Mild anemia– Hemoglobin concentration 10–10.9gm%, Moderate anemia- Hemoglobin concentration 7–9.9gm% and Severe anemia- Hemoglobin concentration < 7 gm%.

Anaemia is directly responsible for 20% maternal death and is an associated cause in another 20% [1]. Current knowledge indicates that iron deficiency anaemia in pregnancy is a risk factor for preterm delivery and subsequent low birth weight and possibly for inferior neonatal health. In World Health Organization / World Bank rankings, iron deficiency anaemia is the third leading cause of disability-adjusted life years lost for females aged 15- 44 years [2]. Margaret Balfour was credited as the first to draw the attention of anaemia in pregnancy in India [3]. The weight of evidence supports advisability of routine iron supplementation during pregnancy [4]. Distribution of Iron - Folic Acid (IFA) tablets from 4th month onwards to 3 months [5] (or even 6 months) [6] of delivery will help in preventing anaemia. 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 anaemia to 25% [7]. 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. Prevalence of anaemia in pregnancy shows great variations in different parts of the world. Studies from industrialized countries show that 2.0% - 45.0% of pregnant women are having anaemia which is generally higher in developing countries (5.0% - 90.0%) [8]. According to WHO report, the global prevalence of anaemia among pregnant women is 55.9%. In India, this prevalence has been reported to be in the range of 33.0% - 89.0 % [9].

Several types of anemia developed during pregnancy are:

A. **Physiological anemia:-** shows normocytic normochromic dilution picture.
B. **Nutritional anemia:-** Iron deficiency anemia:- Due to deficient intake of iron rich diet. Less absorption and deficient iron store from adolescent to post-partum stage due to multiple pregnancies & increased demand of iron loss of iron by haemorrhage during delivery and chronic blood loss due to inflammation and various infections like malaria & worm infestation. Folate & vitamin B12

deficiency anemia Folate is the water soluble vitamin which is used to synthesize & repair DNA. It is nutritional deficiency of folate.

C. **Protein deficiency anemia:-** Caused due to malnutrition & less dietary protein intake.

D. **Thalassemia & E) Sickle cell anemia:-** Regional anemia rarely observed during pregnancy caused due to genetic disorder.

Aplastic anemia: Hypoproliferative anemia caused due to marrow hypoplasia.

In pregnant women to see the impact of various Socio demographic determinants studies are carried out like family type, socio-economic status, education, occupation, diet. Obstetric determinants like age factor, duration between two successive pregnancies, number of abortions & parity.

2. Materials and methods

A study was conducted among 228 pregnant women in three trimesters visiting at Ob. Gynecology O.P.D. in Index Medical College, Hospital and Research Centre, Indore. Data was collected by using pre-designed & pre-structured schedule by taking history of the pregnant women for epidemiological determinants:-

a) Age-years, b) Height – cm,
c) Weight – kg., d) Age at 1st pregnancy,
e) Pregnant characteristic (parity),
f) Gestational age (weeks)–1st, 2nd & 3rd trimester
g) Family type
h) Education
i) Occupation j) Dietary habit
k) Personal habits l) Socio economic status
m) Iron-Folic acid supplementation

2-3 ml. of Venous blood was collected by taking aseptic precaution using EDTA or citrate (anticoagulant) containing bulb. Total hemoglobin analysis was carried out using fully automated analyzer. As –

1. Lab life Noble 3 (DIRGNOOR) automated hematology analyzer.
2. Lab life H3d (DIRGNOOR) premier automated hematology analyzer

The women categorized as anemic if the Hb< 11 gm%.

3. Observations

Table 1: General Profile of Study Subjects

S. No	Variable	Minimum	Maximum	Mean	S.D
1	Age (years)	18	34	23.44	03.35
2	Age at marriage (years)	16	27	19.25	04.18
3	Age at first pregnancy (years)	17	29	21.27	02.60
4	Parity	00	04	0.82	00.89
5	Gestational age (weeks)	13	39	28.01	06.38
6	Interval between previous and present pregnancy (months)	06	120	30.68	16.54
7	No of abortions	00	02	00.17	00.45
8	Weight (kilograms)	34	84	47.19	06.09
9	Height (centimetres)	129	169	151.88	05.64
10	Haemoglobin %	05.1	12.4	09.62	01.62

SD= Standard Deviation

The general profile of study subjects is shown in Table1. The present study included 228 pregnant women having an average age of 23.44 ± 3.35 years ranging from 18 to 34 years. More than half (53.1%) of the study subjects were from nuclear families and 109 (47.8%) were studied up to primary level only. 162 (71.1%) were housewives and majority (83.3%) were having mixed dietary habits. As per modified B G Prasad classification based on Consumer Price Index of December 2009, 47.4% were from below Class IV socio-economic status. The mean age at marriage was 19.25 ± 4.18 years and that at first pregnancy was 21.27 ± 2.60 years. The mean gestational age at the time of examination was 28.01 ± 6.38 weeks. Average interval between previous and index pregnancies was 30.68 ± 16.54 months. Mean weight and height observed were 47.19 ± 6.09 Kgs and 151.88 ± 5.64 Cms respectively. Majority (44.7%) had consumed Iron–Folic Acid tablets for less than two months. Mean haemoglobin level was found to be 9.62 ± 1.62 gm/dl. A very high prevalence (82.9%) of anaemia was observed among pregnant women. Normocytic hypochromic and microcytic hypochromic type of blood picture, a classical picture of iron deficiency anaemia were commonly observed types of anaemia.

Table 2: Distribution of study subjects by Socio-demographic profile and severity of Anemia

Variables		Degree of Anaemia					
		Normal N=39 (%)	Mild N=58 (%)	Moderate N=115 (%)	Severe N=16 (%)	Total N=228 (%)	P value
Age in Years	18-21	18(46.1)	30(51.7)	33(28.7)	02(12.5)	83(36.4)	P<0.01
	22-25	20(51.3)	14(24.1)	58(50.4)	10(62.5)	102(44.7)	
	>26	01(02.6)	14(24.1)	24(20.9)	04(25.0)	43(18.9)	
Type of Family	Nuclear	19(48.7)	32(55.2)	61(53.0)	09(56.3)	121(53.1)	P>0.5
	Joint	20(51.3)	26(44.8)	54(47.0)	07(43.7)	107(46.9)	
Education	Illiterate	03(07.8)	08(13.8)	09(07.8)	03(18.7)	23(10.1)	
	Primary	20(51.3)	29(50.0)	54(46.9)	06(37.5)	109(47.8)	
	Secondary	06(15.40	12(20.7)	33(28.8)	05(31.3)	56(24.6)	

	Higher secondary	07(43.8)	05(08.6)	13(11.3)	02(12.5)	27(11.8)	
	>graduate	03(07.7)	04(06.9)	06(05.2)	00	13(05.7)	P>0.5
Occupation	House wife	22(56.4)	41(70.8)	88(76.5)	11(68.7)	162(71.1)	
	Labor	03(07.7)	03(05.2)	09(07.8)	01(06.3)	16(07.0)	
	Service	05(12.8)	03(05.2)	00	00	08(03.5)	P>0.5
	House maid	08(20.5)	08(08.6)	13(11.3)	04(25.0)	33(14.5)	
	Others	01(02.6)	03(05.2)	05(04.4)	00	09(03.9)	
Dietary habits	Vegetarian	05(12.8)	06(10.3)	26(22.6)	01(06.2)	38(16.7)	P>0.05
	Mixed	34(87.2)	52(89.7)	89(77.4)	15(93.8)	190(83.3)	
Socio- Economic Status	Class –I	06(15.4)	02(03.4)	01(00.9)	00	09(03.9)	
	Class-II	12(30.8)	05(08.6)	04(03.5)	01(06.3)	22(09.6)	
	Class-III	11(28.2)	28(48.3)	42(36.5)	08(50.0)	89(39.1)	P<0.01
	Class-IV	09(23.1)	20(34.5)	39(33.9)	06(37.6)	74(32.5)	
	Class-V	01(02.6)	03(05.2)	29(25.2)	01(06.3)	34(14.9)	

Table 2 shows correlation between different socio-demographic parameters and severity of anaemia. The study observed significantly higher prevalence of anaemia among those pregnant women above 26 years of age (97.7%), & those from below Class IV socio-economic status (90.7%) (P< 0.01). The prevalence of anaemia was relatively more in those from nuclear families (84.3%), those who studied upto secondary level (89.3%), housewives (86.4%), having vegetarian diet (86.8%). However, this observed difference was statistically not significant**.**

Table 3: Distribution of study subjects by Obstetric profile and severity of Anemia

Variables		**Degree of Anaemia**					
		Normal N=39 (%)	**Mild N=58 (%)**	**Moderate N=115 (%)**	**Severe N=16 (%)**	**Total N=228 (%)**	**P value**
Age in Years	<18	08(20.5)	16(27.6)	30(26.1)	05(31.2)	59(25.9)	
	18-21	23(59.0)	34(58.6)	62(53.9)	09(56.3)	128(56.1)	P>0.5
	>21	08(20.5)	08(13.8)	23(20.0)	02(12.5)	41(18.0)	
Age at first pregnancy	<18	02(05.1)	02(03.4)	06(05.2)	03(18.8)	13(05.7)	
	18-21	17(43.6)	35(60.4)	77(67.0)	07(43.7)	136(59.6)	
	22-25	12(30.8)	15(25.7)	22(19.10	05(31.3)	54(23.7)	P>0.05
	>26	08(20.50	06(10.3)	10(08.7)	01(06.20	25(11)	
Parity	0	25(64.1)	22(37.9)	44(38.3)	06(37.5)	97(42.5)	
	1	10(25.6)	22(37.9)	45(39.1)	08(50.0)	85(37.3)	
	>2	04(07.7)	14(24.2)	26(22.6)	02(12.5)	46(20.2)	P>0.1
Interval between previous and index pregnancy	<1	01(02.6)	08(13.8)	07(06.1)	01(06.3)	17(07.5)	
	1-2	05(12.8)	04(06.9)	35(30.4)	05(31.2)	48(21.5)	
	2-3	13(33.3)	14(24.1)	20(17.4)	02(12.5)	49(21.5)	P<0.01
	>3	04(10.2)	05(08.6)	07(06.1)	02(12.5)	18(07.8)	
	NA	16(41.0)	27(46.6)	46(40.4)	06(37.50	95(41.7)	
Gestational Age	2nd trimester	23(59.0)	22(37.9)	61(53.0)	11(68.8)	117(51.3)	P>0.05
	3rd trimester	16(41.0)	36(62.1)	54(47.0)	05(31.2)	111(48.7)	
No of abortions	0	30(76.9)	49(84.5)	106(92.2)	14(87.4)	199(87.3)	
	1	08(20.5)	07(12.1)	06(05.2)	01(06.3)	22(09.6)	P>0.1
	>2	01(02.6)	02(03.4)	03(02.6)	01(06.3)	07(03.1)	
IFA tablets Consumption (months)	Nil	08(20.5)	10(17.2)	29(25.2)	03(18.8)	50(21.9)	
	<2	10(25.7)	16(27.6)	64(55.7)	12(75.0)	102(44.70	P<0.01
	2-3	08(20.5)	12(20.7)	16(13.9)	01(06.2)	37(16.30	
	>3	13(33.3)	20(34.5)	06(05.2)	00	39(17.1)	
NA: not applicable (primigravida)							

As shown in Table 3, the study found higher prevalence of anaemia among those pregnant woman whose age at marriage was less than 18 years (86.4%), and age at first pregnancy was between 18-21 years (87.5%), parity two or more (91.3%), those in third trimester (85.6%) and with two or more abortions in the past (85.7%). However, this difference was statistically not significant. There was significantly higher prevalence of anaemia among those cases with less than two years of spacing between previous and index pregnancies (90.9%) and those who received IFA tablets for less than two months in the recent past (88.15%).

4. Discussion

In this pilot study we tried to estimate the overall anemia in the pregnant women visiting at Ob. Gynecology OPD. of Index hospital from Indore & rural area around it by reviewing the findings of available studies. The prevalence of anaemia among pregnant women in the present study was very high (82.9%), although similar to other studies like G.S. Toteja *et al* (84.9%) [9], V.P. Gautam *et al* (96.5%) [10]. Umesh Kapil *et al* (78.8%) [11]. However, lower prevalence of anaemia was reported by Panghal *et al* (51.0%) [12].

Significantly lower prevalence of anaemia among pregnant women has been reported by similar studies conducted in other countries like South-east China (39.6%) [13], Venezuela

(34.44%) [6], South Eastern Nigeria (40.4%) [14], Isparta Province (42.71%) [15], Tanzania (36.1%) [8] etc. The overall prevalence of severe anaemia (Haemoglobin < 7.0gm/dl) among the study subjects was 7.0%. In other similar studies in India severe anaemia was found in 13.1% by G.S Toteja *et al* [9], 8.3% by Raman L *et al* [16], 22.8% by V.P Gautam *et al* [10] and only 1.6% by Umesh Kapil *et al* [11].

Out of 82.9% anemic cases, the severe anemic cases observed in this study is 7.0% whereas mild anemia 25.4 %, moderate anemia 50.4%.

The prevalence of anaemia was significantly more in those above 26 years of age and those from below Class IV socio-economic status, similar to that reported by V.P Gautam *et al* [10].

Mean age of the subjects at the time of the study was found to be 23.44 + 3.35 years and 53.1% were from nuclear families. In a study by Taru Agarwal *et al* [17], half of the study subjects were between 22-24 years of age and 58.3% were from nuclear families, while 1/3rd were educated upto primary level only.

Mean haemoglobin level among the pregnant women was 9.6 + 1.63 gm/dl ranging between 5.1 to 12.4 gm/dl. Mengi Vijay *et al* [18] reported 10.19 + 1.5 gm/dl (ranging between 6.5 to 13.2gm/dl), while that in other countries was found to be 10.76 + 1.66 gm/dl in a study at Isparta Province [15] and 11.9 + 1.4gm/dl at Venezuela [6].

As in other studies, severity of anaemia was inversely related to educational status [10, 13, 19], socio-economic status [10].

Most of the cases studied were from rural area & having agricultural background & most of the women works in the field had various personal habits like eating soil which may facilitate the worm infections that eggs of helminthes may enter along with soil & when get matured cause gastro-intestinal bleeding.

The low level of educational status reduces the maternal awareness like regular ANC visits & to maintain personal hygiene.

Severity of anaemia was more often seen when first pregnancy occurred before 18 years of age and those aged more than 25 yrs, from nuclear families educated till high school or less and parity two or more [10, 19-20]. So epidemiological determinants including the parity 42.5% of women were not having previous baby that is current pregnancy and 57.5% from more than 1-2 children were anemia observed in multipara women. This observation maybe due to blood loss during successive deliveries hence reduced hemoglobin & so there is depletion of iron storage. Out of anemic women 29 (12.7%) cases were found to have abortions in previous pregnancies but 199(87.3%) women were not having abortions. So these determinants were not significant according to anemia epidemiology.

These factors could be taken care by timely health education to adolescent girls regarding importance of literacy, delaying the age at marriage, family spacing, small family norm etc. Although statistically not significant, prevalence of anaemia was seen to increase with increase in parity and advancing gestational age [13-15, 18]. Lower anaemia prevalence was observed among women taking Iron Folic Acid supplements than those not consuming the same [18]. Thus, anaemia continues to be endemic among pregnant women in India, despite the intervention measures like distribution of IFA tablets. Some of the reasons that Iron supplementation programmes are ineffective may be that the health workers engaged in peripheral health institutions are not adequately motivated for effective distribution of IFA tablets and improving compliance by pregnant women. The low compliance is particularly due to the side effects associated with Iron preparations.

5. Conclusions

A very high prevalence of anaemia (82.9%), as also found in other similar studies in India in pregnant women is an indicator of the failure of National and WHO Programmes to address this problem. The health care system should not miss any health related opportunities afforded during the important years of adolescence before marriage and child bearing and strategic shift in the programme to mandatory regular supply of IFA tablets to adolescent girls and pregnant women from 4th month onwards till 3 months [5] (or even 6 months) [6] postpartum, food fortification, along with correction of other nutritional deficiencies and timely interventions for reducing the burden of malaria, worm infestations and other infectious diseases. All practitioners handling obstetrics cases should be motivated for prescribing iron preparations and balanced diet with good compliance. Monitoring haemoglobin levels in pregnant women could draw attention of policy makers towards anaemia as a major public health problem; facilitate health promotion related to improve dietary practices for adolescent girls and pregnant women.

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