Original Article

Prevalence and factors associated with anemia among pregnant women attending antenatal clinic

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ABSTRACT

Objectives: Anemia during pregnancy is characterized by hemoglobin concentration <11 g/dl in pregnant women, which decreases oxygen carrying capacity of the blood to the body tissues. It is estimated that worldwide 41.8% of pregnant and 30.2% of non-pregnant women are anemic. This study aims to determine the prevalence and factors associated with anemia in pregnant women attending antenatal clinic at our tertiary care center.

Materials and Methods: A cross-sectional observational study was conducted among 500 pregnant women attending antenatal clinic for the 1st time in the Department of Obstetrics and Gynaecology, AIMSR, Bathinda, for a period of 1 year. The hemoglobin was measured using automated cell counter method and those with hemoglobin level <11 g/dl were considered as anemic and were investigated further to be assessed according to the Indian Council of Medical Research classification. Data were collected using predesigned and pretested structured questionnaire.

Results: The mean Hb concentration was 9.06 g/dl among the anemic group. Overall prevalence of anemia among pregnant women was found to be 408 (81.8%). Residence, educational status, monthly family income, occupation, gestational age, iron folic acid supplementation, dietary habits of not eating green leafy vegetables, meat and animal products, and drinking tea and coffee immediately after meal were the variables which had statistically significant association with the prevalence of anemia.

Conclusion: Anemia control program should be executed more resourcefully in this vital segment of population. Awareness of above said factors is more important to prevent anemia rather than early diagnosis and treatment.

Keywords: Anemia, Antenatal clinics, Pregnant women, Prevalence

INTRODUCTION

Anemia is a severe public health problem affecting both developed and developing countries with major consequences for human health as well as socioeconomic development. It occurs at all stages of life but is more prevalent in pregnant women and young children.

It is estimated worldwide that 41.8% of pregnant and 30.2% of non-pregnant women are anemic.[1] The WHO has estimated that the prevalence of anemia in pregnant women is 14% in developed and 51% in developing countries. It is painful to mention that India contributes to about 80% of the maternal deaths due to anemia in South Asia.[2]

Anemia is considered as a major cause of maternal and fetal morbidity and mortality in developing countries.[3] It may lead to premature birth, low birth weight, fetal cognitive

impairment, and fetal death.[4] Maternal complication includes preeclampsia, antepartum hemorrhage, puerperal sepsis, and thromboembolic complications leading to subinvolution of the uterus, failure of lactation, and delayed wound healing.

Iron deficiency anemia is the most common nutritional disorder in the world affecting 2 billion people worldwide.[5] Total iron demand in pregnancy is about 900 mg (with a range of 700–1400 mg), of which about 500–600 mg is accounted by the uterus and its contents. Around 150–200 mg are lost in the blood loss at delivery and a similar amount is expended in lactation. Pregnant mothers do not give priority to health because most of them are engaged in different works keeping them busy throughout the day. Therefore, identification of the risk factors contributing to anemia in pregnant mothers is vital for its prevention and control.

India became the first developing country to take up the National Nutritional Anaemia Control Programme to prevent anemia among pregnant women. The Government of India recommends 100 mg of elemental iron+500 ug of folic acid for prophylactic supplementation for minimum of 100 days starting in the second trimester and double this dose for the treatment of anemia, that is, 200 mg of elemental iron+1000 ug of folic acid.[6] Despite these efforts, the prevalence of anemia is 65–75% in India.

Thus, this study was taken up to establish evidence-based information on the prevalence of anemia and its associated risk factors in pregnant women in the study area.

Objectives

The aims of the study were as follows:
1. Prevalence of anemia among pregnant women attending antenatal clinic at tertiary care hospital
2. To determine the magnitude and severity of anemia in pregnant women attending ANC
3. To assess socioeconomic and obstetric-related factors associated with anemia in pregnant women
4. To determine the association of anemia with a dietary habit of pregnant women.

MATERIALS AND METHODS

This was a cross-sectional observational study carried over a period of 1 year after getting approval from Research Committee and Ethical Committee, Adesh University, Bathinda. A total of 500 pregnant women attending antenatal clinic for the 1st time in the department of obstetrics and gynecology were included in the study after proper written consent excluding follow-up cases. The hemoglobin was measured using automated cell counter method and those with hemoglobin level <11 g/dl were considered as anemic

and were investigated further to be assessed according to the Indian Council of Medical Research (ICMR) classification. Data were collected using predesigned and pretested structured questionnaire. The questionnaire contains detailed social demographic profile of the women, that is, age, religion, family size, family income, residence, and education level of women. Obstetric history includes gestational age, parity, interpregnancy interval, h/o of iron and folic acid supplements, h/o abortions, and dietary habits. Questionnaire was both in English and local language. All the questionnaires were checked for completeness and consistency in daily basis.

Statistical analysis

A Chi-square test was applied using binary logistic IBM SPSS 22 version for qualitative analysis of various factors for anemia with $P < 0.05$.

RESULTS

Characteristics of the study participants

A total of 500 pregnant women were included in the study. Majority, 237 (47.4%) of the study participant were in the age group of 26–30 years. It was observed that 372 (65.4%), 317 (63.4%), and 277 (55.4%) were rural dwellers, employee by occupation, and had attended secondary level of education, respectively. Furthermore, 260 (52%) were Sikh by religion, 421 (84.2%) had average monthly income <10,000, and 418 (83.6%) were living in the family size >2, as shown in [Table 1].

Concerning the obstetric history, majority of them 360 (72%) were multigravida, 219 (43.8%) were in the second trimester. On the contrary, 251 (50.2%) with interpregnancy interval of >2 years and 277 (77%) had no history of abortion. Assessment of comorbid condition during pregnancy revealed that 282 (56.4%) had no illness and 309 (65.9%) had BMI >24.9, as shown in [Table 2].

According to the dietary habits, it was observed that 197 (39.4%) and 293 (58.6%) did not have a habit of eating green leafy vegetables and meat and animal products, respectively. Furthermore, 249 (49.8%) and 392 (78.4%) have a habit of drinking tea and coffee immediately after meal, respectively. Maximum number of subjects 374 (74.8%) had no intake of iron folic acid tablets and 315 had no history of pica in the current pregnancy, as shown in [Table 3].

Prevalence of anemia

The mean Hb concentration was 9.06 g/dl among the anemic group and 11.86 g/dl among non-anemic group. Overall prevalence of anemia among pregnant women was found to be 81.8% (408). Out of these, 0.2% (1), 91% (372), and 8.8%

Table 1: Prevalence of anemia with associated sociodemographic factors.

Sociodemographic factors	Anemia (%)	Non-anemia (%)	Total (%)	*P*-value
Age (years)				
<20	10 (2.4)	0	10 (2)	0.26 (NS)
20–25	120 (29.3)	29 (31.9)	149 (29.8)	
>25	279 (68.3)	62 (68.1)	341 (68.2)	
Residence				
Urban	131 (32)	42 (46.1)	173 (34.6)	0.010 (S)
Rural	278 (68)	49 (53.9)	327 (65.4)	
Income				
<10,000	350 (85.6)	71 (78)	421 (84.2)	0.016 (S)
10,000–20,000	34 (8.3)	12 (13.2)	46 (9.2)	
>20,000	25 (6.1)	8 (8.8)	33 (6.6)	
Occupation				
Housewife	137 (33.5)	1 (1)	138 (27.6)	0.0001 (S)
Laborer	45 (11)	0	45 (9)	
Employee	227 (55.5)	90 (99)	317 (63.4)	
Level of education				
Illiterate	45 (11)	0	45 (9)	0.0001 (S)
Primary	137 (33.4)	1 (1.1)	138 (27.6)	
Secondary	199 (48.7)	78 (85.8)	277 (55.4)	
Tertiary	28 (6.9)	12 (13.1)	40 (8)	
Religion				
Sikh	214 (52.3)	46 (50.5)	260 (52)	0.51 (NS)
Hindu	173 (42.3)	40 (44)	213 (42.6)	
Christian	7 (1.8)	0	7 (1.4)	
Muslim	15 (3.6)	5 (5.5)	20 (4)	
Family size				
≤2	70 (17.1)	12 (13.1)	82 (16.4)	0.36 (NS)
>2	339 (82.9)	79 (86.9)	418 (83.6)	

Table 2: Prevalence of anemia with associated obstetric factors.

Obstetric factors	Anemia (%)	Non-anemia (%)	Total (%)	*P*-value
Gestational age (weeks)				
1st trimester (12)	90 (22)	12 (13.2)	102 (20.4)	0.0001 (S)
2nd trimester (13–28)	192 (47)	27 (29.7)	219 (43.8)	
3rd trimester (>28)	127 (31)	52 (57.1)	179 (35.8)	
Parity				
Primigravida	121 (29.6)	19 (20.9)	140 (28)	0.09 (NS)
Multigravida	288 (70.4)	72 (79.1)	360 (72)	
Interpregnancy interval				
Primigravida	121 (29.6)	19 (20.9)	140 (28)	0.08 (NS)
≤2 years	92 (22.4)	17 (18.7)	109 (21.8)	
>2 years	196 (48)	55 (60.4)	251 (50.2)	
H/o abortion				
Yes	43 (15)	40 (55.6)	83 (23)	0.059 (NS)
No	245 (85)	32 (44.4)	277 (77)	
Comorbid condition				
Present	215 (52.6)	3 (3.2)	218 (43.6)	0.001 (S)
Absent	194 (47.4)	88 (96.8)	282 (56.4)	
BMI				
<18.5	36 (8.8)	2 (0.4)	38 (2.2)	0.09 (NS)
18.5–24.9	124 (30.3)	29 (5.8)	153 (31.9)	
>24.9	249 (60.9)	60 (12)	309 (65.9)	

(36) of them were identified as severely, moderately, and mildly anemic. Hence, the prevalence of moderate anemia was high in comparison to other degree of anemia [Table 4].

High prevalence of anemia was observed in subjects of 26–30 years of age range 48.4% (198), Sikh by religion 52.3% (214), rural residents 68% (278), had secondary level of education 48.7% (199), living in family size >282.9% (339), employee by occupation 55.5% (227), and with monthly income <10,000 85.6% (350) [Table 1].

Based on obstetric history and dietary habits, rate of anemia was found to be higher in multigravida 70.4% (288), who were in the second trimester 47% (192), with interpregnancy interval >2 years 48% (196), and had no history of abortion 85% (245) [Table 2].

Anemia was more prevalent among those who had habit of drinking tea 57% (233) and coffee 76.5% (313) immediately after meal and did not have habit of eating meat and animal products 62.1% (254) and green leafy vegetables 44.8% (183) in the present pregnancy. About 85.9% (351) of subjects did not take iron folic acid and 62.6% (256) of subjects had no history of pica, which were found to be anemic [Table 3].

Thus, it was found that residence, educational status, monthly family income, occupation, gestational age, iron folic acid supplementation, dietary habits of not eating green leafy vegetables, meat and animal products, and drinking tea and coffee immediately after meal were the variables which had statistically significant association with anemia.

DISCUSSION

Prevalence of anemia during pregnancy

In this study, the overall prevalence of anemia among pregnant women was 81.8%. A study by Nutrition Foundation of India[7] and ICMR Task Force[3] observed the prevalence of anemia as 84% and 84.9% among pregnant women, respectively. Similar results were obtained in a study by Gautam *et al.*[8] (96.5%), Lokare *et al.*[9] (87.2%), and Mangla and Singla[10] (98%). The high prevalence of anemia in this study was mostly related to low sociodemographic factors, obstetrical history, and dietary habits.

On the contrary, in developed countries, the prevalence of anemia was only 18% among pregnant women as reported

Table 3: Prevalence of anemia with associated dietary habits.

Dietary habits and nutritional supplementation	Anemia (%)	Non-anemia (%)	Total (%)	*P*-value
Iron and folic acid intake				
Yes	58 (14.1)	68 (74.8)	126 (25.2)	0.0001 (S)
No	351 (85.9)	23 (25.2)	374 (74.8)	
No pica				
Yes	153 (37.4)	32 (35.2)	185 (37)	0.68 (NS)
No	256 (62.6)	59 (64.8)	315 (63)	
Green leafy vegetable intake				
Never	183 (44.8)	14 (15.3)	197 (39.4)	0.0001 (S)
Daily	30 (7.3)	67 (73.7)	97 (19.4)	
<Week	31 (7.6)	4 (4.4)	35 (7)	
>Week	165 (40.3)	6 (6.6)	171 (34.2)	
Meat and animal products intake				
Never	254 (62.1)	39 (42.9)	293 (58.6)	0.0001 (S)
<Week	73 (17.9)	42 (46.2)	115 (23)	
>Week	82 (20)	10 (10.9)	92 (18.4)	
Tea intake immediately after meal				
Yes	237 (57)	16 (17.6)	249 (49.8)	0.0001 (S)
No	176 (43)	75 (82.4)	251 (50.2)	
Coffee intake immediately after meal				
Yes	313 (76.5)	79 (86.8)	392 (78.4)	0.031 (S)
No	96 (23.5)	12 (13.2)	108 (21.6)	

Table 4: Statistical analysis of severity of anemia.

	Mild (10–10.9) (%)	Moderate (7–9.9) (%)	Severe (4–6.9) (%)	Very severe (<4) (%)	Total (%)	Mean	Standard deviation
Anemia	36 (8.8)	372 (91)	1 (0.2)	0	409 (81.8)	9.0579	0.65056
No anemia					91 (18.2)	11.8604	0.45311

by the WHO.[11] The socioeconomic developments, higher standard of living, and better utilization of health facilities along with increasing literacy rate are associated with low prevalence of anemia in developed countries.

Magnitude of anemia during pregnancy

In the present study, all patients were divided according to the magnitude of anemia. It has been found that mild, moderate, and severe anemia account for 8.8%, 91%, and 0.2%, respectively. The result is higher than a study conducted by the WHO,[11] Desalegn,[12] and Lokare *et al.*[9] where moderate anemia accounted for 68%, 74.3%, and 54.5%, respectively.

Sociodemographic factors associated with anemia in pregnancy

In the present study, majority of anemic patients belonged to the age group of 26–30 years (48.4%). It is comparable to the studies by Ayano and Amentie,[13] Obai *et al.*,[14] and Getahun *et al.*[15] This may be due to the recurrent pregnancies and poor birth spacing in reproductive age women which make them more prone to anemia in our study. Nearly 68% of anemic subjects belonged to rural population while 32% in the urban population which is similar to Mihiretie *et al.*[16] (62%) and Weldemariam[17] (65.9%). The reason for higher burden of anemia in the rural population may be related to inaccessibility of health-care centers.

However, lack of awareness about the factors causing anemia and possible strategies to prevent the risk factors of anemia plays a major role. Prevalence of anemia was more in subjects (85.6%) having monthly income <10,000 per capita, this may be due to the reason that the low socioeconomic class was likely to be poorly educated and often has financial constraints. It is also supported by the observation that women with low income tend to consume diets that are low in micronutrients, animal protein, and vitamins.[18] It closely correlates with a study by Okube *et al.*,[19] Singh *et al.*,[20] Javed *et al.*,[21] and Lokare *et al.*[9] where women of low socioeconomic group had higher prevalence of anemia.

The proportion of anemia was significantly more among employed participants which was noted to be 55.5%. Time constraint may be the reason for anemia in them. May be they do not get enough time for rest and to attend antenatal clinics. They tend to forget intake of iron quite frequently. Furthermore, most of these women would be considered underemployed, that is, employed but with jobs that were unsteady and low paying. Housewives, on the other hand, could have high family income which makes them remain in the house. Furthermore, it may be postulated that being housewife has an added advantage of having adequate resources such as good housing, clean water, and sanitation,

enough time to attend ANC clinic. Similar findings were suggested by Obai *et al.*[14] and Getahun *et al.*[15]

When distributed according to education levels, anemia was found to be more prevalent in secondary level of education (48.7%). However, another study done by Dutta *et al.*[22] showed a direct relationship between impact of literacy and anemia. The present study was in concurrence with the other studies conducted by Yadav *et al.*[23] (37%) and Obai *et al.*[14] (38.5%) who showed patients with anemia in same group. In the present study, maximum number of subjects who had anemia belonged to Sikh community, that is, around 52.3%, followed by Hindus (42.3%), Muslim (3.6%), and Christian (1.8%) in order. This may be due to the reason that the study has been carried out in Malwa region of Punjab where maximum number of subjects included in the study belonged to Sikh religion. Thus, an inclusion bias needs to be ruled out. Similar study has been conducted by Sharma *et al.*[24] (62%) who had anemia belonging to Hindu religion. A study in Karnataka showed that 67.6% were Hindu, 25.7% were Muslim, and 6.6% were from other religion.[25] Anemia was more prevalent among the subjects who have family size >2 (82.9%) as compared to patients who have family size ≤2 (17.1%). There may be a direct relationship of family size with anemia due to food insecurity for large family size; however, no significant relationship of anemia with family size could be derived in the present study. Similarly, Sharma *et al.*[24] also showed higher incidence of anemia in family size >2.

Obstetric factors associated with anemia

In the present study, majority of anemic subjects 47% belonged to the second trimester as compared to the first and third trimesters which had 22% and 31% of patients, respectively. Similar results were seen in a study conducted by Bekele *et al.*[26] (36.5%). Due to the physiological hemodilution which peaks during the second trimester, high prevalence of anemia during this period can be explained. It has been found in our study that 70.4% of patients of anemia were multigravida while 29.6% were primigravida. This may be explained by the fact that repeated childbirths make the patients more prone to malnutrition resulting in anemia and reducing maternal iron reserves at every pregnancy by causing blood loss at each delivery. Other study by Ayano and Amentie[13] also concluded that multiparous women had higher risk of anemia. Women with prior pregnancy sustain a 500–600 mg iron loss per pregnancy, which is increased by hemorrhage after delivery. Iron deficiency is, therefore, definitely more common as parity increases.

About 48% of subjects had anemia with interpregnancy interval of >2 years as compared to 22.4% of subjects with interpregnancy interval of ≤2 years. On the contrary, studies by Gautam *et al.*[8] showed higher prevalence of anemia in those with repeated pregnancies with poor birth spacing.

However, a cause-effect relationship still needs to be proved. In the present study, 15% of subjects were anemic who had history of abortion as compared to 85% of subjects who did not have any history of abortion which closely correlates with a study conducted by Ayano and Amentie[13] where the prevalence of anemia is 32.6% as compared to 67.3% who did not have a history of abortions.

Anemia was more prevalent in the patient with the one or the other comorbidity (52.6%) as compare to 47.4% of subjects who had no comorbid condition. It closely correlated with a study conducted by Turner *et al.*[27] where the prevalence of anemia in subjects with hypertension, diabetes, and hypothyroidism was 8.1%, 4.1%, and 3%, respectively. The present study (60.9%) was comparable with Okube *et al.*[19] (65.5%) which showed that anemia was more prevalent in the subjects having BMI >24.9 kg/m^2. It can be hypothesized that obesity can increase the prevalence of iron deficiency anemia because of increased inflammation, increases ferritin, thereby promoting sequestration of iron by macrophages, and reduces iron absorption from the gut.

Dietary factors associated with anemia

In the present study, 85.9% of pregnant women were found anemic who did not take iron and folic acid tablets. This may be due to increased iron requirements to supply the expanding blood volume of the mother with rapidly growing fetus and placenta. Our study is in agreement with Okube *et al.*[19] and Weldemariam.[17] A study done in India showed that those women who had just started to consume or not consuming iron folic acid amounted to 33.3% burden of anemia compared to those pregnant women who consumed full course. Risk of developing anemia increased in pregnant women who took tea (57%) and coffee (76.5%) immediately after meals. Tea and coffee consumption is associated with anemia by reducing iron absorption. Therefore, dietary advice should be given to all mothers to improve intake and absorption of iron from food. This finding was supported by Weldemariam.[17]

The magnitude of anemia was higher 44.8% among the subjects who never ate green leafy vegetables followed by 40.3% of subjects who ate green leafy vegetable at an interval of more than a week, as compared to subjects who ate less than a week 7.6%. Only 7.3% of patients who had green leafy vegetables daily were found to be anemic. This is attributed to the fact that the majority of the participants in the current study consumed plant-based food which is rich in non-heme iron form of consumption. The present study closely compares with a study by Gebreweld and Tsegaye.[28]

In the present study, significant increase in the prevalence of anemia is seen in the subjects who never consumed non-vegetarian 62.1% as compared to only 20% who consumed non-vegetarian diet. The result of the present study was similar to the study conducted by Gebreweld and Tsegaye[28] revealed that dietary habit of less intake of non-vegetarian diet was significantly associated with anemia.

CONCLUSION

The present study concludes that the prevalence of anemia among the women attending antenatal clinic for the 1st time is 81.8% which is a serious public health problem. It was observed that most of the antenatal women were moderately anemic (Hb<10). The foregoing discussion has indicated that anemia during pregnancy is the result of many factors, including patient belonging to urban or rural area, occupation and socioeconomic status, educational status, gestational age, intake of iron and folic acid supplement, and obstetrical history, dietary habits such as intake of green leafy vegetables, non-vegetarian food and habit of intake of tea immediately after meals. It was also observed that comorbid conditions such as hypothyroidism, hypertension, and diabetes mellitus along with deficiency of iron folate and Vitamin B12 have significant association with the prevalence of anemia.

Anemia control program should be executed more resourcefully in this vital segment of population. Efforts should be aimed toward the early diagnosis and treatment of anemia well before the time of full term delivery. Some of the measures have been suggested to prevent anemia such as screening programs for anemia, health awareness campaigns, frequent visits by Anganwadi workers to pregnant women, cooking food in iron utensils, fortification of food with iodized salt, and iron folic acid supplements. Such measures would go a long way in improving maternal health as well as health of the baby. All these efforts would help to ensure safe motherhood and achieve the target development goals of the millennium.

Recommendation

Keeping in view the observation of the present study, it is recommended that:
1. Pregnancy being the most nutritionally demanding period in a woman's life, women should be encouraged and counseled to eat more diversified extra meal and iron-rich foods than usual to reduce the incidence of anemia during antenatal period.
2. Employed pregnant women in private set up should be given time by their employers to attend antenatal clinic and maternity leave before delivery enough to get adequate rest as well as time for recovery after delivery.
3. Continuous advice and counseling should be given to all the pregnant women to avail the facility of hemoglobin estimation freely available at the rural and urban health center. This will help to define the healthy childbearing age so that the women can give birth without compromising their health.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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