Original Research Article

Study of prevalence, socio-epidemiological factors and clinical profile of iron deficiency anaemia among pregnant rural population

Dr. Vidyadhar B. Bangal[1], Dr. Kanika Gupta[2], Dr. Kunal Aher[3], Dr. Harshad Tuse[3], Dr. Ketaki Bhosale[3]
[1]Professor and Head, Dept. of Obstetrics and Gynaecology, Rural Medical College of Pravara Institute of Medical Sciences, (Deemed University) Loni, Maharashtra, India
[2]Dept. of Obstetrics and Gynecology, Rural Medical College of Pravara Institute of Medical Sciences, (Deemed University) Loni, Maharashtra, India
[3]Postgraduate Student (MS), Dept. of Obstetrics and Gynecology, Rural Medical College of Pravara Institute of Medical Sciences, (Deemed University) Loni, Maharashtra, India

*Corresponding Author:
Dr. Vidyadhar B. Bangal
Email: vbb217@rediffmail.com

Abstract: Nutritional anaemia in pregnant women continues to be one of the major public health challenges. Anaemia contributes to one fifth of the maternal deaths and large number of preterm deliveries and low birth weight babies in India. The objective is to study the prevalence, various epidemiological factors, clinical presentation in pregnancies complicated with iron deficiency anaemia in a tertiary care teaching hospital in central India. A Prospective observational study was conducted for a period of two years from September 2012 to August 2014. A total of 1644 pregnant women were investigated for evidence of iron deficiency anaemia by performing haemoglobin estimation and peripheral blood smear examination. Information on epidemiological factors was collected through interview and information on clinical profile was collected in predesigned and pretested structured proforma. Statistical analysis was done by finding out percentages, proportions, Mean and Standard deviation (SD), Chi square test. It is found that the prevalence of anaemia among pregnant women was 49.40%. Mild, moderate and severe degree of anaemia was seen in 19.46%, 25.06% and 04.86% cases respectively. Prevalence of anaemia was more in women with early marriages and teenage pregnancies, women without antenatal care, who had not taken iron folic acid tablets, who were less educated and who belonged to families with low per capita income, from rural area and those who were grand multi-gravida with short inter-conceptional period of less than 24 months in regards to the index pregnancy. The study revealed high prevalence of iron deficiency anemia among rural pregnant population. Improvement in female literacy, health education, prevention of early marriages and teenage pregnancies, strengthening the peripheral health care delivery system , improving contraceptive use and provision of safe abortion facilities to control unregulated fertility can reduce the prevalence of anaemia in pregnancy.
Keywords: Anaemia in pregnancy, Prevalence, Socio epidemiological determinants of anaemia, Clinical profile, maternal morbidity, maternal mortality.

INTRODUCTION

Women of child bearing age are at the maximum risk for development of anaemia. Anaemia is the most common nutritional deficiency disorder in the world. WHO has estimated that prevalence of anaemia in developed countries is 14 % and 51% in developing countries among pregnant population. Prevalence of anaemia in South Asian countries is among the highest in the world. WHO estimates that even among the South Asian countries, India has the highest prevalence of anaemia. Prevalence of anaemia in India is 65-75% in pregnant women [1].

Anaemia is defined by WHO as Haemoglobin (Hb) less than 11gm% in pregnancy, and is divided into three degrees mild (10 -10.99 gm %), moderate (7.0-9.9 gm %) and severe degree (<7.0 gm %) [2]. Most of the studies have demonstrated a strong association between maternal anaemia and adverse outcome such as low birth weight, preterm delivery and intrauterine growth retardation [3-7]. Iron deficiency anaemia is an important public health problem for pregnant women, living in developing countries, affecting 2/3rd of pregnant women and contributes to maternal morbidity and mortality and to low birth weight [8-9].

Iron deficiency (IDA) is the most common and primary cause of anaemia. IDA prevalence indicates the nutritional status of a community. Considering the effects of IDA on maternal and fetal mortalities, physical function and child growth and development, it is regarded as one of the main health indicators [10]. High prevalence is directly associated with poor health status, poverty, poor socioeconomic status, multiparty, less

birth spacing.Iron deficiency during pregnancy is thought to be caused by combination of factors such as previously decreased iron supply, the iron requirements of growing fetus and expansion of maternal plasma volume [11]. What is even more important is the fact that about half of the global maternal deaths due to anaemia occur in South Asian countries; India contributes to about 80 per cent of the maternal deaths due to anaemia in South Asia [14].

RESEARCH QUESTIONS
- What are the epidemiological factors that influence occurrence and severity of anaemia during pregnancy?
- What are various presenting symptoms and signs of moderate to severe iron deficiency anaemia during pregnancy?

UTILIZATION OF RESULTS
The results of the present study were shared with the local government officials who are involved with implementation of anaemia prevention programme through supplementation of oral iron to all women coming for antenatal check up at various health facilities in the region. This in long run is expected to reduce the maternal and perinatal morbidity and mortality directly or indirectly related to iron deficiency anaemia.

AIMS AND OBJECTIVES
- To study various epidemiological factors associated with moderate to severe degree of iron deficiency anaemia in pregnancy.
- To study the clinical profile of the women presenting with moderate to severe degree of iron deficiency anaemia during pregnancy.

MATERIAL AND METHODS
- **Type of study**- Prospective Observational Study
- **Place of study**-Department of Obstetrics and Gynaecology, Rural Medical College, Loni, Ahmednagar, Maharashtra
- **Duration of study**- Two years
- **Period of study** -1st September 2012 to 31st August 2014
- **Study population** - Pregnant women reporting to antenatal clinic or admitted to Pravara Rural hospital for treatment or delivery.
- **Number of subjects** – 1644

Inclusion criteria:
a) Pregnant women in third trimester of pregnancy.
b) Moderate (Hb : 7 – 9.9 g/dl) to Severe degree (Hb :< 7 g/dl) of anaemia .
c) Blood indices and peripheral smear suggestive of iron deficiency anaemia

Exclusion criteria:
- Anaemia due to acute blood loss.
- Hemolytic anaemia.
- Anaemia cases with other medical and obstetrical complications like pre eclampsia, eclampsia, diabetes, urinary tract infections, thyroid disease,antepartum haemorrhage, heart disease, multi-fetal pregnancy, Immuno deficiency state.
- Anaemia cases who subsequently did not deliver at Pravara Rural Hospital or were lost to follow up after initial investigations and treatment.

METHODOLOLOGY
One thousand six hundred and forty four pregnant women coming to antenatal clinic in third trimester onwards were interviewed in regards to the socio demographic factors .The information on various epidemiological and demographic parameters like age, parity, educational status, occupation, socio economic class, place of residence, dietary habits, antenatal registration, number of antenatal visits, intake of haematinic tablets during pregnancy, history of blood transfusion and interval between pregnancies was gathered.

All women were subjected to haemoglobin estimation. Pregnant women who were diagnosed to have moderate to severe degree of anaemia as per WHO criteria in outpatient department were advised about the need for admission in the ward for detailed evaluation and treatment. Detailed medical and obstetrical history was obtained to find out the possible cause of anaemia. Haematological and other investigations were performed to know the degree and type of anaemia. Haemoglobin level was estimated by Automated Hematogy Analyzer (SYSMEX) which uses the non- cyanide haemoglobin analysis method. Typing of anaemia was done as per standard peripheral blood smear examination method.

Anaemia was classified according to WHO criteria, in which haemoglobin below 11 g/dl was considered as cut off value to label anaemia. It was further classified as mild (10-10.9g/dl), moderate (7-9.9g/dl) and severe (<7g/dl) anaemia. Discussion with each mother about the possible cause of anaemia, importance of regular intake of iron tablets, correction of faulty dietary practices was conducted .Cases that fulfilled the selection criteria were enrolled as the study subjects. Informed written consent was obtained from all study subjects in local language.

Data collection
A pilot study was conducted with the pre-designed proforma and necessary modifications were made in the proforma after pilot study. Pregnant women were interviewed with the pretested proforma. The information on various epidemiological and demographic parameters like age, parity, educational

status, occupation, socio economic class, place of residence, dietary habits, antenatal registration, number of antenatal visits, intake of haematinic tablets during pregnancy, history of blood transfusion and interval between pregnancies was gathered in all pregnant women coming for antenatal checkups. Socio-economic status of the study subjects was classified into Class I (Rs ≥ 3239), Class II (Rs 1620-3239), Class III (Rs 972-1620), Class IV (Rs 486-972) and Class V (Rs < 486) by using modified B.G. Prasad Classification based on Consumer Price Index of December 2009 of 657. Dietary history was obtained with the help of 24 hour recall method. Gestational age was assessed from the last menstrual period. It was co-related with ultra-sonography findings of either first or second trimester of pregnancy. For those who did not remember the date of last menstrual period, gestational age was co-related to local calendar events and assessing fundal height. The height (centimeters) and weight (kilograms) of the woman were recorded. Important clinical features like symptoms and signs on general and systemic examination were recorded in a structured proforma. Information regarding investigations performed, treatment given was entered in pretested structured proforma.

Data compilation

The data collected from 1644 pregnant women on socio demographic parameters was collected and then entered in a master chart.

Data analysis

Descriptive statistics were computed by finding percentages and proportions, Mean and Standard deviation (SD).Group comparisons were done by Chi square test. P values less than 0.05 were considered statistically significant. The study proposal was approved by institutional ethics committee vide letter No.PMT/PIMS/RC/2012/82, dated 23/08/2012. (RegistrationNo. RMC/PG/181/2012)

RESULTS

Total of 1644 pregnant women were screened for anaemia by haemoglobin estimation on OPD/indoor basis. WHO guidelines were used for classification for anaemia. Pregnant women with haemoglobin level below 11 grams /dl were considered as anaemic. It was observed that 832 women (50.60%) had normal haemoglobin level, 320 women (19.46%) had mild degree of anaemia, 412 women (25.06%) had moderate degree of anaemia and 80 women (04.86%) had severe degree of anaemia. The prevalence of anaemia in the study opulation was 49.40%.

Table 1 shows the minimum, maximum and mean values of various determinants like age of the pregnant woman, age at marriage, age at first pregnancy, period of gestation, parity, interval between previous pregnancy and index pregnancy, number of previous abortions, height and weight of pregnant women and haemoglobin level at the time of inclusion in the study.

Table 2 shows that 31.50% of pregnancies belonged to teenage group. Eighty five percent pregnant women were educated till 10th class. Fifty percent pregnant women were housewives. Sixty percent were taking vegetarian diet .Fifty percent women belonged to lower side of socio economic class as per B G Prasad classification.

Table 3 shows that 34 percent women got married below 20 years of age and 32 percent had their first pregnancy below 20 years of age. The interval between two pregnancies was less than two years in 40% women. History of previous abortions was noted in 41% women. Iron and folic acid tablets were consumed by 50% women for more than three months.

Out of 150 cases of anaemia in the study population, almost equal number belonged to moderate (76 cases) and severe (74 cases) variety.

It was observed that, majority (85-95%) of pregnant women with moderate to severe anaemia were symptomatic and they presented with various symptoms and signs of anaemia.

Table-1: General Profile of Study Subjects (No=1644)

Sr. No.	Variable / Characteristics	Minimum	Maximum	Mean	S.D.
1.	Age (years)	17	40	22.76	03.65
2.	Age at marriage (years)	16	28	20.62	03.26
3.	Age at first pregnancy (years)	16.5	30.5	21.83	3.54
4.	Parity	0	7	1.20	00.86
5.	Gestational age (weeks)	14	41	26	08.42
6.	Interval between previous & index pregnancy (months)	5	96	24.80	18.86
7.	No. of abortions	0	4	00.26	00.46
8.	Weight (Kilograms)	33	84	50.13	07.70
9.	Height (Centimetres)	135	169	150.6	06.65
10.	Haemoglobin %	3.2	13.6	9.52	01.82
SD = Standard Deviation					

Table-2: Distribution of Study Subjects by Socio-Demographic Profile and Severity of Anaemia

Particulars		Degree of Anaemia					Chi Square	P Value
		Normal N=832	Mild N =320	Mod N=412	Severe N=80	Total N=1644		
Age in Years:	Below 20	256(49.3)	97(18.6)	130(25.04)	36(6.93)	519(31.56)	14.4	0.01059
	20 – 25	303(49.2)	124(20.1)	162(26.3)	26(4.22)	615 (37.40)		
	26-30	221(53.7)	77(18.7)	102(24.8)	11(2.67)	411 (25.02)		
	Above 30	52(52.5)	22(22.2)	18(18.18)	07(7.07)	99 (06.02)		
Type of Family:	Nuclear	330(50.9)	127(19.5)	163(25.1)	28(4.32)	648 (39.41)	0.8412	0.8396
	Joint	501(50.3)	193(19.3)	249(25)	53(5.32)	996 (60.59)		
Education:	Illiterate	109(50.2)	42(19.3)	54(24.8)	12(5.52)	217 (13.19)	19.247	0.0827
	Primary	338(50.6)	130(19.4)	168(25.1)	31(4.64)	667 (40.57)		
	Secondary	252(49.3)	97(18.9)	125(24.4)	37(7.24)	511 (31.08)		
	Higher Secondary	78(53.4)	30(20.5)	38(26.02)	-	146 (08.88)		
	> Graduate	55(53.3)	21(20.3)	27(26.2)	-	103 (06.26)		
Occupation	Housewife	372(50)	143(19.2)	184(24.7)	45(6.04)	744 (45.25)	9.444	0.3973
	Labor	177(50.1)	68(19.2)	87(24.6)	21(5.94)	353 (21.47)		
	Service	44(51.7)	17(20)	22(25.8)	02(2.35)	85 (05.17)		
	House maid	239(51.7)	92(19.9)	119(25.7)	12(2.59)	462 (28.10)		
	Others	-	-	-	-	-		
Dietary Habits :	Vegetarian	494(50.8)	190(19.5)	244(25.1)	44(4.52)	972 (59.12)	0.5947	0.8976
	Mixed diet	338(50.2)	130(19.3)	168(25)	36(5.35)	672 (40.87)		
Socio-Economic Status	Class I	88(55.6)	30(18.9)	38(24.05)	02(1.26)	158 (09.12)	38.543	0.0001
	Class II	379(52.1)	142(19.5)	181(24.79)	25(3.43)	727 (44.40)		
	Class III	253(50.1)	97(19.2)	125(24.80)	29(5,75)	504 (30.65)		
	Class IV	102(45.1)	47(20.7)	60(26.54)	17(7.52)	226(13.74)		
	Class V	10(34.4)	04(13.7)	08(27.58)	7(24.13)	29 (01.58)		

Table 3: Distribution of Study Subjects by Obstetric Profile and Severity of Anaemia

Particulars		Degree of Anaemia					Chi Square	P value
		Normal N=832	Mild N =320	Moderate N=412	Severe N=80	Total N=1644		
Age at marriage (in Years):	≤ 20	266(47.1)	107(18.9)	150(26.5)	41(7.26)	564 (34.30)	17.035	0.0482
	21-25	293(51.4)	114(20)	142(24.9)	21(3.68)	570 (34.67)		
	26-30	226(53.4)	79(18.6)	105(24.8)	13(3.07)	423 (25.72)		
	>30	47(54)	20(22.9)	15(17.24)	05(5.74)	87 (05.29)		
Age at first pregnancy (in Years) :	≤ 20	261(48.8)	100(18.7)	136(25.4)	37(6.92)	534 (32.48)	11.521	0.2414
	21-25	296(50.5)	117(19.96)	150(25.5)	23(3.92)	586 (35.64)		
	26-30	228(52.1)	83(18.99)	111(25.4)	15(3.43)	437 (26.58)		
	>30	47(54.0)	20(22.98)	15(17.24)	05(5.74)	87 (05.29)		
Gravida	Primi	263(51.3)	101(19.72)	130(25.3)	18(3.15)	512(31.14)	6.931	0.3273
	G2-G4	538(50.4)	207(19.41)	266(24.9)	55(5.15)	1066(64.84)		
	G5 &above	31(46.9)	12(18.18)	16(24.24)	07(10.6)	66(04.01)		
IntervalbetweenPrevious &indexpregnancy(Years) :	< 1	138(51.4)	45(16.79)	70(26.11)	15(5.59)	268(16.30)	22.589	0.0314
	1-2	179(45.4)	75(19.03)	108(27.41)	32(8.12)	394(23.96)		
	3-4	127(51.4)	51(20.64)	60(24.29)	09(3.64)	247(15.02)		
	> 4	125(56.05)	48(21.52)	44(19.73)	06(2.69)	223(13.56)		
	NA	263(51.3)	101(19.72)	130(25.39)	18(3.51)	512(31.14)		
No. of abortions:	0	495(51.03)	195(20.1)	238(24.5)	42(4.32)	970(59.00)	19.598	0.0033
	1	160(49.07)	78(23.9)	77(23.6)	11(3.37)	326(19.82)		
	≥ 2	177(50.8)	47(13.5)	97(27.8)	27(7.75)	348(21.16)		
IFA tablets Consumption (months) :	NIL	06(5.50)	10(9.17)	41(37.6)	52(47.7)	109(10.62)	73.56	<0.001
	< 2	23(32.3)	15(21.1)	15(21.12)	18(25.3)	71(06.92)		
	2 – 3	157(54.13)	112(38.6)	13(4.48)	08(2.75)	290(28.26)		
	≥ 3	512(92.08)	34(6.11)	08(1.43)	02(0.35)	556(54.19)		
NA: Not Applicable (Primigravida)								

Table-4: Distribution of Anemia Cases as Per Severity

Sr. No	Severity of Anaemia	No. of Cases (N=150)
1.	Moderate (7 – 9.9 gm/dl)	76 (50.66%)
2.	Severe (<7 gm/dl)	74 (50.44%)

Table-5: Distribution of Anaemia Cases as Per Clinical Picture

Sr.No	Symptoms / Signs	Moderate Anaemia(N=76) No (%)	Severe Anaemia (N=74)No (%)
1.	Symptoms I-Asymptomatic :	12 (15.78%)	03 (04.05%)
	II-Symptoms :		
	a) Easy fatigability	32 (42.10%)	58 (78.37%)
	b) Breathlessness on exertion	12 (15.78%)	62 (83.78%)
	c) Palpitations	11 (14.47%)	34 (45.94%)
	d) Headache	03 (03.94%)	12 (16.21%)
	e) Cough	03 (03.94%)	06 (08.10%)
	f) Giddiness	18 (23.68%)	24 (32.43%)
	g) Reduced appetite	15 (19.73%)	37 (50.00%)
	h) Swelling over Feet	20 (26.31%)	46 (62.16%)
	i) Passing of worms in stool	03 (03.94%)	07 (09.45%)
2.	Signs: a) Pallor	51 (67.10%)	74 (100%)
	b) Edema	24 (31.57%)	56 (75.67%)
	c) Nail changes (Koilo/Platynychia)	02 (02.63%)	14 (18.91%)
	d) Signs of heart failure	0	04 (05.40%)
	e) Cardiomegaly	02 (02.63%)	12 (16.21%)
	f) IUGR	12 (15.78%)	37 (50.00%)
	h) IUFD	0	04 (05.40%)

CLINICAL PHOTOGRAPHS

Fig-1: Pitting oedema over feet

Fig-2: koilonychias

Fig-3: Abdo wall Oedema

Fig-4: Gross Pallor over tongue and conjunctiva

Fig-5: Comparison of the colour of palm of a person with normal haemoglobin with a person with severe anaemia

DISCUSSION

Nutritional anaemia continues to be a major public health problem throughout the world. The problem is highly prevalent in developing and underdeveloped countries as compared to their developed counterparts. Iron deficiency anaemia is the commonest variety among nutritional anaemia. Pregnancy being a highly demanding situation, iron deficiency becomes even more evident during this state. Government and international agencies are making efforts to reduce the prevalence of anaemia during pregnancy since last many decades. Nutritional deficiencies, frequent gastrointestinal infections, faulty dietary habits, unhygienic living conditions, poor sanitation and unsafe potable water are main reasons behind continuing high prevalence of anaemia.

The present study was carried out in a medical college hospital, where complicated cases are drawn from neighbouring villages and townships. The hospital is recognized as a tertiary care centre where in all basic and speciality services are available under one roof.

Cases are referred here from the area with radius of 150 km. Pregnant women with anaemia are regularly being referred for treatment and safe confinement from government primary health centres, rural hospitals and private nursing homes. Hospital has a full-fledged authorized blood bank with facilities of blood and component preparation and storage. For this reason many pregnant women with severe anaemia are referred during pregnancy or after delivery.

Prevalence of Anaemia

The prevalence of anaemia in the present study was 49.40 percent. It was seen that the results of the present

study were similar to the observations made by Panghal et al [10] and National Family Health Survey 2. [11]

There were a wide range of prevalence rates reported in different studies carried out by different workers with study subjects from varied population and background. The prevalence rates of anaemia differ from one state to another state in India. It is because of different socio economic class, literacy status of women and differences in the availability and accessibility of health care facilities. The prevalence is more in underdeveloped states than the states which are economically better of. The comparative lower prevalence rate in the present study was because of relatively better living conditions, sound economy as a result of agricultural belt, female literacy rates and health facilities in the state of Maharashtra as compared to northern states.

Pevalence of severe anaemia

The prevalence of severe anaemia in the present study was 4.86%. The prevalence rates reported in literature range between 1.80% to 22.80%. The prevalence rate of severe anaemia observed in the present study was similar to the figures reported by Umesh Kapil [10] and NFHS-2 [11]. Prevalence of severe anaemia carries special significance than mild or moderate degree of anaemia as these are the cases who are prone for complications like cardiac failure, postpartum haemorrhage, puerperal sepsis, intrauterine growth restriction and perinatal deaths.

General Profile of study subjects

The general profile of the study subjects revealed that the age group of pregnant subjects ranged between 17 years to 40 years with the mean age of 22.76 years. The age at marriage in the study subjects ranged between 16 years to 28 years with the mean age of 20.62 years. The age of first pregnancy of study subjects ranged between 16.50 to 30.50 years. The above finding suggested that there was a trend of early marriages in the area. The young married women became pregnant immediately after marriage with resultant teenage pregnancies and complications thereof. Similar observations were reported by Viveki RG [12] in which the mean age of marriage was 19.25 years and that of first pregnancy was 21.77 years. The mean gestational age at the time of examination was 31 weeks in the present study whereas it was 28.01 in the study done by Viveki R G [12]. The average interval between previous pregnancy and index pregnancy was 24.80 months in the present study, which was less than the figure reported by Viveki R G [12] ie 30.68.This could be due to lower use of spacing methods of contraception. Women in rural areas have a wrong belief that breast feeding provides complete safety against becoming pregnant and thus land up with unplanned pregnancy with shorter inter-conception period. The mean height and weight of the study subjects were 150.6cms and 50.13 kgs respectively. These findings were similar to the findings reported by Viveki RG [12] ie 151.88 cms and 47.19kgs. The mean

haemoglobin value reported in the study subjects were 9.52gms/dl which was almost similar to that reported by Viveki R G [12] ie 9.62gms/dl.

Socio demographic factors

Co-relationship between various socio demographic factors and severity of anaemia was observed. The present study observed that the prevalence of anaemia was highest (37.40%) in the age group of 20-25 years followed by age group below 20 years(31.56%).This shows that younger women especially teenagers were having higher prevalence of anaemia. This could be attributed to the poor iron intake as compared to the demands of the growing age through the diet resulting in iron deficiency. The problem of iron deficiency gets compounded by menstrual blood loss and physiological demands of body and fetus when pregnant. Lokare P [13] and Viveki R G [12] in their study observed that the prevalence of anaemia was more in the age group above 30 years and 26 years respectively. It was observed that the prevalence of severe anaemia was highest in the teenage pregnancies and in women above 30 years of age.

The data analysis showed that the prevalence of anaemia was more common in women staying in joint families as compared to the nuclear families .Although the difference was not significant. The possible reason for the above observation could be sharing of food among more family members in joint family structure and women being the last to have food as a part of culture and tradition, gets less calories as compared to her counterpart in the nuclear families.

It was observed that maximum number of pregnant women (71.65%) with anaemia was educated up to tenth class and 13.19% of pregnant women with anaemia were illiterate. There was no case of severe anaemia when the pregnant women were educated above 10th class. The higher prevalence of anaemia, especially severe variety among less educated women was indirectly related to discontinuation from education for early marriages in teenage group .The young girls who remain less educated are unaware about the nutritious balanced diet, availability of various contraceptive methods at government centres .Thus they become pregnant after marriage in teenage with subsequent development of severe anaemia, which is aggravation of pre-existing mild to moderate anaemia with poor or depleted body iron stores. The women, who continue their education till graduation or postgraduation, do not face the above mentioned consequences of early drop out from the schools. Lokare et al [13] in their study reported the lower the educational level of the women,the higher the probability of suffering from anaemia during pregnancy. The relationship had been reported as statistically significant.(p<0.05). Viveki et al [12] in their study reported that overall prevalence of anaemia and especially severe anaemia was higher than women with education above tenth class.

In the present study, 94% of anaemic women were living in rural area and only 9% were from urban area. These finding co relate well with the findings of NFHS 2 [12] and 3[16]. According to NFHS 3 (2008), 57.9% pregnant women are anaemic; 54.6% in urban and 59% in rural. Of these 35% mildly anaemic, 15% moderately anaemic and 2% severely anaemic [14]. According to NFHS-2 [12] survey rural women population has higher prevalence rate of anaemia i.e. 53.9% as compared to urban women population i.e. 51.5%.

The prevalence of anaemia was more in women having vegetarian food (59.12%) than those having mixed diet (40.88%).Viveki R G [12] in their study reported similar observation with 83.03 percent women with vegetarian food habit developing anaemia over 16.70% women with mixed dietary habit. This indicates the role of animal food in the diet as it contains more iron as compared to routinely consumed vegetarian food.

It was observed that the proportion of pregnant women suffering from anaemia from socio economic class I and II were less (44.4% and 47.9% respectively) as compared with the lower socioeconomic III, IV and V (49.90%, 54.90% and 65.60% respectively) according to B.G. Prasad Classification. Thus, lower socioeconomic status is associated with the increase in the risk of development of anaemia in pregnancy. This association between the socioeconomic status of the family and anaemia in pregnancy was found to be statistically significant ($P < 0.05$).

The influence of socio economic class was very evident in the prevalence of severe anaemia.(class I- 1.26 % as against 24.13% in class V) .Viveki R G [12]reported higher prevalence of anaemia in women below class IV. Similar observations were reported by Gautam V P [15] in which a trend of decreasing severity of anaemia with higher per capita income was noted. Occurrence of anaemia in pregnancy in relation to age at marriage was studied. It was observed that the prevalence of severe anaemia (07.26%) was higher in women who got married before 20 years of age. The prevalence of severe anaemia was two and half times less (03.07%) in women who got married in the age group between 21-30 years.

Occurrence of anaemia in relation to age of woman at first pregnancy was studied. It was observed that the prevalence of severe anaemia (06.92%) was higher in women, whose age at first pregnancy was less than 20 years as compared to the women whose age at first pregnancy was in between 21-25 years (03.92%). Viveki R G [12], Gautam V P [15], Thangaleela T [16] and Roy S Chakravorty [17] in their studies reported that severity of anaemia was more when first pregnancy occurred before 18 years of age and those aged more than 25 years.

Influence of number of past pregnancies on occurrence of anaemia in index pregnancy was studied. It was observed that the prevalence of severe anaemia was two times more (10.60% in gravida 2-4 as against 05.15% in gravida 5 and above) when woman was pregnant for fifth time or more. There was significantly higher prevalence of anaemia among those cases with less than two years of spacing between previous and index pregnancy and those who received iron folic acid tablets for less than two months. Mengi V and Abdul R [18] reported lower anaemia prevalence among women taking iron folic acid supplements than those not consuming the same. Thus, anaemia continues to be endemic among pregnant women in India, despite the intervention measures like distribution of IFA tablets. Indian council of medical research (ICMR) in their report "Task Force Study for evaluation of the National Nutritional Anaemia Prophylaxis programme" mentioned about some of the reasons for ineffectiveness of Iron supplementation programmes. According to the report, the health workers engaged in peripheral health institutions were not adequately motivated for effective distribution of IFA tablets and the low compliance by women in consumption of iron folic acid tablets for sufficient period of time was particularly due to the side effects associated with iron preparations [19].

In the present study, there were 150 cases of moderate to severe anaemia among 1644 pregnant women. All women with severe anaemia were unbooked cases and were referred from either peripheral health centres run either by the government or by the organization running medical college. These cases mainly belonged to lower socio economic class with poor nutritional and educational status.

Poverty was the basic reason for their poor health status. Women were either involved in household activities or were doing labour work in field on daily wages. They invariably had high parity with shorter inter-conceptional period. They were ignorant about the importance of taking iron folic acid tablets.

Clinical presentation, Diagnosis and Management of cases with anaemia
Clinical presentation
Women with moderate and severe anaemia presented with the symptoms of easy fatigability, breathlessness on exertion, palpitations, giddiness, anorexia, swelling over feet. The symptoms were more common in women with severe anaemia. Some women presented with the features of cardiac failure. They had symptoms of cough, chest pain, difficulty in breathing and orthopnoea. Majority of the women (85%) with mild to moderate degree of anaemia were asymptomatic. The common signs in anaemic women were presence of pallor in conjunctiva, nail changes in the form of koilonychias and platy-nychia. Oedema over feet was seen in 31.57% of moderate anaemia and 75.67% of cases of severe anaemia. There was evidence of growth

restriction in 50% cases of severe anaemia and 15.78% cases of moderate anaemia. These women had not gone to any hospital for antenatal check up during index pregnancy. Similar symptomatology and socio demographic picture in anaemic cases was reported by Gautam VP, [15] Jin L, [20] Thangaleela T [16] and Roy S [17].

CONCLUSION

A high prevalence of anaemia (49.40%) among pregnant women of the study area is an indicator of the failure of the National and WHO programmes to address this important issue. Unfavourable socio demographic factors like poor female literacy, poverty, early marriages, uncontrolled fertility ,gender bias, non availability or poor accessibility to health facilities are some of the reasons for high prevalence of anaemia during pregnancy.

The health care system at all levels should not miss any health related opportunities during important years of adolescence, before marriage and during child bearing and rearing. Strategic shift in the programme to ensure supply of iron folic acid tablets to adolescent girls and pregnant women from 4th month onwards till 3 months or even six months postpartum, food fortification along with correction of other nutritional deficiencies and timely intervention for reducing the burden of malaria, worm infestations, and other infectious diseases will go a long way in reducing the burden of this totally preventable disease.

Improvement in female literacy, health education, prevention of early marriages and teenage pregnancies, strengthening the peripheral health care delivery system, improving contraceptive use and provision of safe abortion facilities to control unregulated fertility will reduce the prevalence of anaemia.

REFERENCES
1. DeMaeyer, E. M., & Adiels-Tegman, M. (1985). The prevalence of anaemia in the world. La prevalence de lanemie dans le monde. *World health statistics quarterly. Rapport trimestriel de statistiques sanitaires mondiales*, *38*(3), 302-16.
2. Marahatta, R. (2007). Study of anaemia in pregnancy and its outcome in Nepal Medical College Teaching Hospital, Kathmandu, Nepal. *Nepal Med Coll J*, *9*(4), 270-274.
3. Preeti, J., Kural, M., & Tulika, J. (2013). Maternal and fetal outcome in cases of severe anaemia with pregnancy in rural setup. *Int. J. of Medical and Applied Sci*, *2*(3).
4. Levy, A., Fraser, D., Katz, M., Mazor, M., & Sheiner, E. (2005). Maternal anemia during pregnancy is an independent risk factor for low birthweight and preterm delivery. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, *122*(2), 182-186.
5. Hussein, K. L., Mogren, I., Lindmark, G., Massawe, S., & Nystrom, L. (2009). The risks for pre-term delivery and low birth weight are independently increased by the severity of maternal anaemia. *South African Medical Journal*, *99*(2), 98-102.
6. Rusia, U. S. H. A., Madan, N. I. S. H. I., Agarwal, N. E. E. R. A., Sikka, M. E. E. R. A., & Sood, S. K. (1995). Effect of maternal iron deficiency anaemia on foetal outcome. *Indian Journal of Pathology and Microbiology*, *38*, 273-280.
7. Bakhtiar, U. J., Khan, Y., & Nasar, R. (2007). Relationship between maternal hemoglobin and perinatal outcome. *Age (years)*, *25*, 24-20.
8. Pasricha, S. R., Caruana, S. R., Phuc, T. Q., Casey, G. J., Jolley, D., Kingsland, S., ... & Biggs, B. A. (2008). Anemia, iron deficiency, meat consumption, and hookworm infection in women of reproductive age in northwest Vietnam. *The American journal of tropical medicine and hygiene*, *78*(3), 375-381.
9. Baig-Ansari, N., Badruddin, S. H., Karmaliani, R., Harris, H., Jehan, I., Pasha, O., ... & Goldenberg, R. L. (2008). Anemia prevalence and risk factors in pregnant women in an urban area of Pakistan. *Food and nutrition bulletin*, *29*(2), 132-139.
10. Panghal, R., & Boora, P. (2010). Prevalence of anaemia among pregnant women of low income group of Hisar District of Haryana. *Journal of Dairying Foods & Home Sciences*, *29*(2).
11. NFHS-2; National Family Health Survey (NFHS-2), 1998-1999, India, Mumbai: Indian Institute of Population studies; 2000.
12. Viveki, R. G., Halappanavar, A. B., Viveki, P. R., Halki, S. B., Maled, V. S., & Deshpande, P. S. (2012). Prevalence of anaemia and its epidemiological determinants in pregnant women. *Al Ameen J Med Sci*, *5*(3), 216-23.
13. Olokare Puspa, O., Karanjekar Vinod, D., Gattani Prakash, L., & Kulkarni Ashok, P. (2012). A study of prevalence of anemia and sociodemographic factors associated with anemia among pregnant women in Aurangabad city. *India*, *6*(1), 30-34.
14. IIPS. National Family Health Survey 2005-06 (NFHS- 3).
15. Gautam, V. P., Bansal, Y., Taneja, D. K., & Saha, R. (2002). Prevalence of anemia amongst pregnant women and its sociodemographic associates in a rural area of Delhi. *Indian Journal of Community Medicine*, *27*(4), 157.
16. Thangaleela, T., & Vijayalakshmi, P. (1994). Prevalence of anaemia in pregnancy. *Indian J Nutr Diet*, *31*, 26-29.
17. Roy, S., & Chakravorty, P. S. (1992). Maternal and perinatal outcome in severe anaemia. *J Obstet Gynae Ind*, *42*, 743-50.
18. Vijay, M., Abdul, R., & Bhan, V. K. (1988). A study of anaemia in Pregnancy in Block Ganderbal. *Indian Journal of Community Medicine*, *13*(2), 92.
19. Indian Council of Medical Research Task Force. (1989). Evaluation of the national nutritional

anaemia prophylaxis programme. *New Delhi: Indian Council of Medical Research*.

20. Jin, L., Yeung, L. F., Cogswell, M. E., Ye, R., Berry, R. J., Liu, J., ... & Zhu, L. (2010). Prevalence of anaemia among pregnant women in south-east China, 1993–2005. *Public health nutrition*, *13*(10), 1511-1518.