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Original Research Article

A study of haemoglobin percentage among pregnant woman at first visit in antenatal clinic in South Dumdum Municipal hospital, Kolkata

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ABSTRACT

Background: Low maternal haemoglobin concentrations during pregnancy have been reported to increase risk of small for gestational age (SGA) birth, which is a predictor of stillbirth. The objective was to find out a study of Hb% among pregnant woman.
Methods: All consenting of 200 pregnant woman attending antenatal clinic in the department of obstetrics and gynaecology at South Dumdum municipal hospital, Dumdum, Nager Bazar, Kolkata were included in the study.
Results: Out of 200 pregnant woman, 75 woman were anaemic and there average Hb% was 10.10 and 125 mothers were non-anaemic and their average Hb% was 11.61. 39 mothers whose parity p0+0 and avg. Hb%-11.305 out of them 10 mothers are anaemic. In contrast 73 mothers whose parity P_{0+1} and average Hb% was 23.860, out of them 30 mothers were anaemic. In contrast 5 mothers whose parity P_{0+2} and average Hb% was 10.76, out of them 0 mother was anaemic. In contrast 22 mothers whose parity P_{1+0} and average Hb% was 10.31, out of them 13 mothers were anaemic. In contrast 56 mothers whose parity P_{1+1} and average Hb% was 11.31, out of them 19 mothers were anaemic. In contrast one mother whose parity P_{1+2} and average Hb% was 0.2 and she was anaemic. In contrast one mother whose parity P_{2+0} and Hb% was 10 and she was anaemic. In contrast two mothers whose parity were P_{2+1} and Hb% was 9.55 and out of them one mother was anaemic. In contrast one mother whose parity is p_{3+1} and Hb% was 12.
Conclusions: Out of 200 pregnant woman 75 were anaemic and 125 woman were non-anaemic.

Keywords: Anaemia, Antenatal clinic, Determinants, Haemoglobin percentage, Kprototype, Puerperium

INTRODUCTION

Pregnancy is a period of a significant increase in iron requirement over and above the non-pregnant state. 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 of pregnancy. 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. Due to increased iron requirements, pregnancy is also a period of increased risk for anaemia. Thus, a high proportion of women become anaemic during pregnancy.[1-3] In developing countries, the cause of anaemia during pregnancy is multi factorial and includes nutritional deficiencies of iron, folate and vitamin B12 and also parasitic diseases such as malaria

and hookworm. Iron deficiency is the cause of 75% of anaemia cases during pregnancy.[4] Anaemia during pregnancy is of great concern because it contributes significantly to increased risk of maternal death during the prenatal period. Anaemia increases the risk of postpartum haemorrhage, pregnancy-induced hypertension, placenta praevia, haemorrhage and cardiac failure. Overall, 20-40% of the estimated 50,000 maternal deaths worldwide associated with child birth or the postpartum period are attributed to anaemia during pregnancy. Anaemia is also an established risk factor for intrauterine growth retardation and subsequent low birth weight, preterm delivery, prenatal death.[5,6,8] Iron deficiency anaemia affects the development of the nation by decreasing the cognitive and motor development of children and productivity of adults.[5,7] The prevalence of iron deficiency was 10 times higher than that of folate deficiency or vitamin B12 deficiency. The major factor responsible for nutritional anaemia is a deficiency of iron, with folate.[9]

Table 1: Normal blood values in non-pregnant and pregnant state are given in the table.

Blood values	Non pregnant	Second half pregnant
Haemoglobin (Hb) (gm/100 ml)	14.8	11-14
Red blood cells (RBC) (million/mm^3)	5	4-4.5
Packed cell volume (PCV) (%)	39-42	32-36
Mean corpuscular haemoglobin (MCH) (pg)	27-32	26-31
Mean corpuscular volume (MCV)	75-100 μg^3; 32-36 percent	75-95 μm^3
Mean corpuscular haemoglobin concentration (MCHC) (%)	32-36	30-35
Serum iron (μg/100ml)	60-120	Slightly lowered; 65-75
Total iron binding capacity (TIBC) (μg/100ml)	300-350	Increased; 300-400
Saturation percentage (Ratio-serum iron:TIBC) (%)	30	Less than 16
Serum ferritin l μg (mean)	20-30	15

Globally, 41.8% pregnant women and close to one third of non-pregnant women (30.2%) are anaemic. Anaemia during pregnancy contributes to 20% of all maternal deaths and it increases the risks of foetal, neonatal and overall infant mortality. Anaemia is defined as a low blood haemoglobin concentration below 11 g/dl. It has been shown to be a global public health problem that affects low, middle and high income countries and has significant adverse health consequences as well as adverse impacts on social and economic development.[6] Anaemia during pregnancy is considered severe when Hb concentration is less than 7.0 g/dl, moderate when Hb level is 7.0-9.9 g/dl and mild when Hb level is 10.0-10.9 g/dl.[3,7] Anaemia during pregnancy is a major cause of morbidity and mortality of pregnant women in developing countries and has both maternal and fetus consequences.[7] It is estimated that anaemia causes more than 115,000 maternal and 591,000 perinatal deaths globally per year.[4] Mild anemia and depleted iron stores detected early in pregnancy were not associated with adverse maternal and perinatal outcomes in iron supplemented women.[12] The WHO defines high parity (HP) as five or more pregnancies with gestation periods of ≥20 weeks and low parity (LP) as less than 5 pregnancies with gestation periods of ≥20 weeks.[16] The anaemia may be classified in various ways. However, the obstetricians are more concerned with two common types of anaemia, the deficiency anaemia and haemorrhagic anaemia. There is disproportionate increase in plasma volume, RBC volume and Hb mass during pregnancy. In addition, there is marked demand of extra iron during pregnancy specially in the second half. Even an adequate diet cannot provide the extra demand of iron. Thus, there always remains a physiological iron deficiency state during pregnancy. As a result, there is not only a fall in haemoglobin concentration and haematocrit value in the second half of pregnancy but there is also associated low serum iron, increased iron binding capacity and increased rate of iron absorption found in iron deficiency anaemia.

Thus, the fall in the Hb concentration during pregnancy is due to combined effect of haemodilution and negative iron balance. The anaemia is normocytic and normochromic in type.

Criteria of physiological anaemia

The lower limit of physiological anaemia during the second half of pregnancy should fulfil the following haematological values: Hb=10 gm%; RBC=3.2 million/mm^3; PCV=30%; peripheral smear showing normal morphology of RBC with central pallor. A rough prediction of the expected Hb level at term may be calculated as Hb level before 12 weeks minus 2 gm%.

Objectives

The objectives were to assess the Hb% among pregnant women at first visit in antenatal clinic in SSDM hospital, Kolkata and to monitor Hb% of pregnant women.

METHODS

Study type

This was an analytical cross-sectional study consisting of 200 pregnant woman attending antenatal clinic in the department of obstetrics and gynaecology at South Dumdum municipal hospital, Dumdum, Nager Bazar, Kolkata.

Study place

The study was conducted in South Dumdum municipal hospital, Dumdum, Nager Bazar, Kolkata.

Study period

The study was conducted from a period of July 2019 to April 2020.

Selection criteria of the patients

Study performed on consenting 200 pregnant woman attending antenatal clinic in the department of obstetrics and gynaecology.

Inclusion criteria

All pregnant woman who came for antenatal care services for the 1st time during the period were included in the study. And those women who were available at the time of data collection were also included.

Exclusion criteria

Seriously ill patients due to other medical condition unable to respond, mentally ill pregnant woman and pregnant woman with repeated visits were excluded during study time. Patients with Hb disorders, previous history of anaemia (before pregnancy), chronic anaemia were excluded.

A Hb concentration of less than 11 g/dl in a pregnant woman was consider an indication of anaemia. Normal range of Hb was 11 g/dl or above in pregnant woman.

Sampling Method

Simple random sampling technique was used to select the appropriate study unit. Every pregnant woman attending antenatal clinic in the obstetrics and gynaecology department during study period was selected for assessment.

Data collection tools and technique

The data was collected using questionnaire, physical examination and laboratory investigation. The Hb level was determined using Sahli's Hb meter. Laboratory investigation was done by laboratory technician as part of their routine activity.

Statistical tool (software) used for analysis of data

The R project for statistical computing was used as the statistical tool for analysis of data.

RESULTS

This was an analytical cross-sectional study consisting of 200 pregnant women, done to study of Hb% among pregnant woman at first visit in SDDM hospital, Kolkata.

Table 2: Anaemic analysis.

Anaemic indicators	Anaemic	Non-anaemic
Count	75	125
Modal occupation	12	12
Modal parity	0+1	0+1
Modal socioeconomic status	E 1	E 1
Average menarche age	11.84	11.856
Q1 menarche age	11	11
Q3 menarche age	13	13
Modal past history	A 1	A 1
Modal nutritional status	G 1	G 2
Average BMI	23.07142338	24.09263835
Q1 BMI	20.25275441	21.27814907
Q3 BMI	25.60883177	26.02264427
Average systolic pressure	102.12	97.824
Average diastolic pressure	69.133333333	80.44
Modal pressure	90.0/60.0	100.0/60.0
Average Hb	10.10266667	11.6112
Q1 Hb	10	11.7
Q3 Hb	10	12.3

Table 2 represents the anaemic and non-anaemic of the entire population where 75 mothers were anaemic and 125 mothers were non-anaemic (total sample was 200). All the mothers were belonging to low socio-economic status. Where the anaemic mothers were having ideal body weight according to their height and non-anaemic were overweight. The first 25% of the anaemic population the average BMI was 20.25275441 and 75% of the anaemic patient population the average BMI was 21.2781490.

Table 3: Missing information.

V 1	Missing
Sample	0
Occupation	0
Parity	0
Socioeconomic status	0
Age of menarche	0
Past history of anaemia	0
Nutritional status	0
Height (cm)	0
Weight (kg)	0
Systolic blood pressure	0
Diastolic blood pressure	0
Haemoglobin percentage	0

There was no missing value of Table 3.

88 woman had their menarche at the age between 11-13 years out of them 37 woman developed anaemia during pregnancy and the average Hb% of those 88 woman was 11.119.

73 woman had their menarche at the age between 13-15 years out of them 25 women developed anaemia during pregnancy and the average Hb% of those 73 woman was 11.104.

39 woman had their menarche at the age between 9-11 years, out of them 13 woman developed anaemia during pregnancy and the average Hb% of those 39 woman was 10.76923.

Table 4: Menarche analysis.

Menarche bins	Count	Anaemic count	Non-anaemic count	Percentage anaemic	Avg. Hb%	Q1 Hb%	Q3 Hb%
11-13	88	37	51	0.4204545455	11.11931818	10	12
13-15	73	25	48	0.3424657534	11.10410959	10	12
9-11	39	13	26	0.3333333333	10.76923077	10	12

Table 5: Occupation summarization.

Occupation	Anaemic count	Non-anaemic count	Modal parity	Avg. menarche age	Q1 menarche age	Q3 menarche age	Modal past history	Modal nutritional status	Avg. Hb%	Q1 Hb%	Q3 Hb%
House wife (O1)	65	135	0+1	11.87283237	11	13	A 1	G 1	11.04508671	10	12
Working (O2)	10	190	0+1	11.7037037	11	13	A 1	G 1	11.04814815	10	12

Table 6: Parity report.

Parity	Count	Anaemic Count	Non anaemic Count	Modal socio economic status	Modal nutritional status	Avg. BMI	Avg. systolic pressure	Avg. diastolic pressure	Modal pressure	Avg. Hb	Q 1 Hb	Q3 Hb
0+0	39	10	29	E 1	G 1	23.1526526	99.51282051	70.56410256	100.0/60.0	11.30512821	10.1	12
0+1	73	30	43	E 1	G 1	23.860011912	101.7945205	80.93150685	90.0/110.0	10.99726027	10	12
0+2	5	0	5	E 1	G 1	22.976069444	95.4	82.4	90.0/60.0	10.76	9.3	12.3
1+0	22	13	9	E 1	G 1	23.0911668 5	97.27272727	77.72727273	110.0/70.0	10.31363636	10	10.275
1+1	56	19	37	E 1	G 1	24.18	97.6428	72.3928	100.	11.310714	10	12

Continued.

Parity	Count	Anaemic Count	Non anaemic Count	Modal socio economic status	Modal nutritional status	Avg. BMI	Avg. systolic pressure	Avg. diastolic pressure	Modal pressure	Avg. Hb	Q 1 Hb	Q3 Hb
						305645	5714	5714	0/60.0	29		
1+2	1	1	0	E 1	G 1	19.7704477	96	52	96.0/52.0	10.2	10.2	10.2
2+0	1	1	0	E 2	G 1	26.2388952	80	110	80.0/110.0	10	10	10
2+1	2	1	1	E 1	G 2	24.541715 75	107	66	98.9/64.0	9.55	9.325	9.775
3+1	1	0	1	E 1	G 2	24.9722721 7	100	110	100.0/110.0	12	12	12

Table 7: Kprototype clustering description.

Occupation	Parity	Socio economic Status	Age of menarche	Past history of anaemia	Nutritional Status	Systolic blood pressure	Diastolic blood pressure	Hb%	BMI	Size	Within sum of square (ss)
1	4	1	12.04347826	1	1	95.07246377	58.14492754	11.04782609	23.76831144	69	47778.43978
1	5	1	11.8	2	3	100.6666667	55.2	9.82	21.67529746	15	14103.61871
1	5	1	11.46153846	1	1	87.09615385	111.5192308	11.39230769	23.61416676	52	45186.81508
1	5	1	11.96875	1	1	113.875	71.890624	11.0484375	24.20088944	64	39927.30104

Table 8: Uniqueness level information.

V 1	Unique
Sample	200
Occupation	3
Parity	9
Socioeconomic status	2
Age of menarche	7
Past history of anaemia	2
Nutritional status	5
Height (cm)	24
Weight (kg)	45
Systolic blood pressure	35
Diastolic blood pressure	33
Haemoglobin percentage	36

Table 5 shows that the 65 anaemic woman who were non-working and 135 anaemic woman who were non-working, were those housewife and the average HB% was 11.04.

10 anaemic woman who were working woman and 190 non-anaemic woman who were working, were those working and the average HB% was 11.04814.

Table 6 shows out of 39 woman with her primigravida and no past history of abortion, 10 woman were anaemic and 29 woman were non-anaemic who were having ideal body weight and their average BMI 23.1526526, average systolic pressure 99.51282051, diastolic pressure 70.56410256 and their average Hb% was 11.30512821, where the 1st 25% at the P_{0+0} population having HB% 10.1 and the 75% of the P_{0+0} population having HB% 12. Out of 73 woman with her primigravida and past history of one abortion, 30 woman were anaemic and 43 woman were non anaemic who were having ideal body weight and their average BMI 23.8600192, average systolic pressure 101.7945205, average diastolic pressure 80.93150685 and their average Hb% was 10.99726027, where the 1st 25% of the P_{0+1} population having Hb% 10 and the 75 percentage of the P_{0+1} population having Hb% 12. Out of five woman with her primigravida and past history of two abortion, 5 woman were non anaemic who

were having ideal body weight and their average BMI was 22.976, average systolic pressure 95.4, average diastolic pressure 82.4 and average Hb% 10.76, where the 1st 25% of the P_{0+2} population having Hb% 9.3 and the 75% of the P_{0+2} population having Hb% 12.3. Out of 22 woman with her 2nd gravida and no past history of abortion, 13 woman where anaemic and 9 woman where non anaemic who are having ideal body weight and their average BMI was 23.091, average systolic pressure 97.272, average diastolic pressure 77.727 and average Hb% 10.313, where the 1st 25% of the P_{1+0} population having Hb% 10 and the 75% of the P_{1+0} population having Hb% 10.275. Out of 56 woman with her 2nd gravida and past history of one abortion, 19 woman where anaemic and 37 woman where non anaemic who were having ideal body weight and their average BMI was 24.183, average systolic pressure 97.642, average diastolic pressure 72.392 and average Hb% 11.310, where the 1st 25% of the P_{1+1} population having Hb% 10 and the 75% of the P_{1+1} population having Hb% 12. Out of one woman with her 2nd gravida and past history of pressure 100, average diastolic pressure 110 and average Hb% 12, where the P_{3+1} population having Hb% was 12.

Explanation

Kprototype clustering was an unsupervised machine learning algorithm that helped in tracking patterns inside the data set. Table 7 for centroids location of the individual parameters and it helped us understand distinguishing patterns and the behaviour of the individual members of the population. We can clearly understand the behaviour on an average of the entire population. In the 1st cluster out of 200, 69 samples were included in the cluster, whom average Hb% 11.0478, BMI 23.768, systolic blood pressure 95.072, diastolic blood pressure 58.144 and the sum of square was 47778.43978. In the 2nd cluster out of 200, 15 samples were included in the cluster, whom average Hb% 9.82, BMI 21.6752, systolic blood pressure 100.666666, diastolic blood pressure 87.096 and the sum of square was 14103.6187. In the 3rd cluster out of 200, 52 samples were included in the cluster, whom average Hb% 11.39230769, BMI 23.61416676, systolic blood pressure 87.09615385, diastolic blood pressure 111.5192308 and the sum of square was 45186.81508. In the 4th cluster out of 200, 64 samples were included in the cluster, whom average Hb% 11.0484375, BMI 24.20088944, systolic blood pressure 113.875, diastolic blood pressure 71.890624 and the sum of square was 39927.30104.

two abortion, who were anaemic and having ideal body weight and her average BMI was 19.770, average systolic pressure 96, average diastolic pressure 52 and average Hb% 10.2, where the P_{1+2} population having Hb% was 10.2. Out of one woman with her multigravida and past history of no abortion, who were anaemic and having ideal body weight and her average BMI was 26.238, average systolic pressure 80, average diastolic pressure 110 and average Hb% 10, where the P_{2+0} population having Hb% was 10. Out of 2 woman with her multigravida and past history of one abortion, one woman where anaemic and one woman where non anaemic who were having over weight and their average BMI was 24.541, average systolic pressure 107, average diastolic pressure 66 and average Hb% 10, where the 1st 25% of the P_{2+1} population having Hb% 9.325 and the 75% of the P_{2+1} population having Hb% 9.775. Out of one woman with her 4th primigravida and past history of one abortion, who are non-anaemic and having over weight and her average BMI was 24.972, average systolic

Table 8 shows the uniqueness of the data.

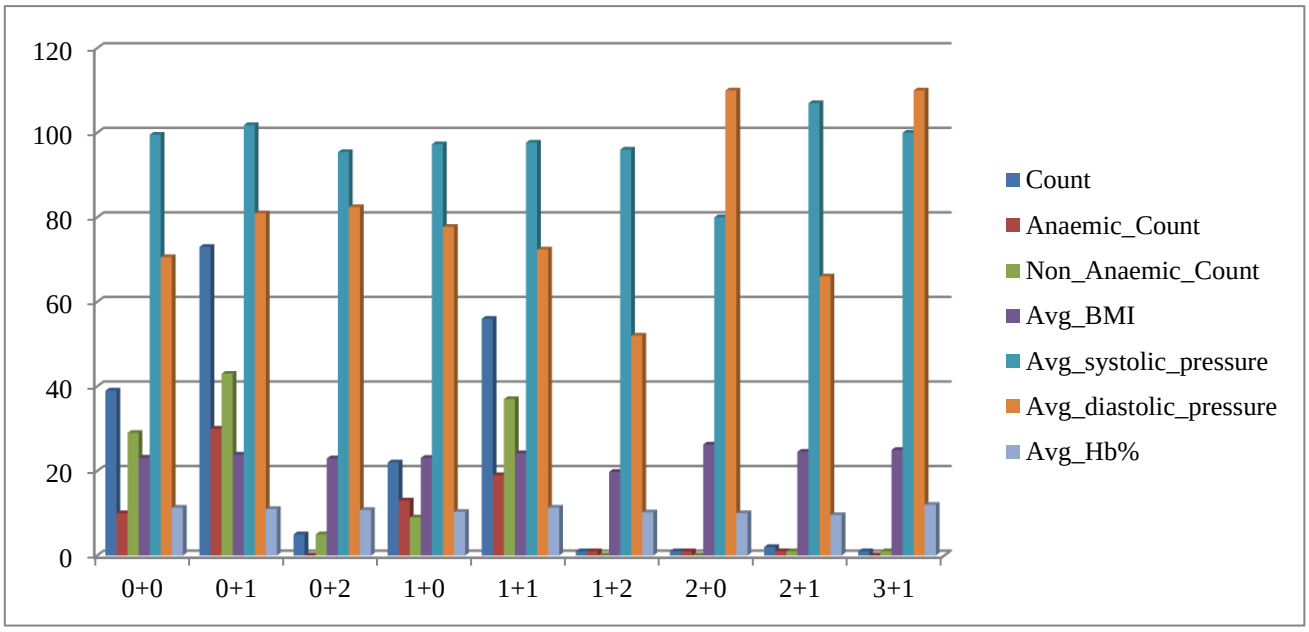

Figure 1: Parity report.

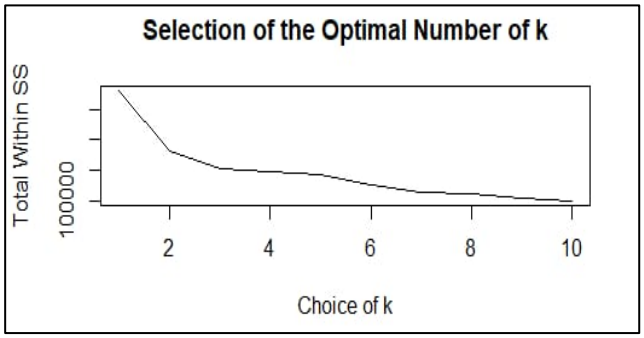

Figure 2: Plot-selection of k for clustering algorithm.

DISCUSSION

The patients with less than 11 gm/dl Hb% were found in 75 pregnant woman and more than 11 gm/dl Hb% were found in 125 pregnant women. HP was among the factors with etiologic potential in causing anaemia in pregnancy.[13] Anaemic patient having average BMI was 23.0714, non-anaemic patient had average BMI 24.0926. Anaemic patient had average systolic blood pressure 102.12 and diastolic blood pressure 69.133. Non-anaemic patient had average systolic blood pressure 97.824 and diastolic blood pressure 80.44. In working pregnant woman out of 200, 10 women were anaemic and 190 women were non-anaemic. In housewife individual out of 200, 65 pregnant women were anaemic and 135 pregnant women were non-anaemic. In developing countries, the cause of anaemia during pregnancy was multi factorial and included nutritional deficiencies of iron, folate and vitamin B12 and also parasitic diseases such as malaria and hookworm. Iron deficiency was the cause of 75% of anaemia cases during pregnancy.[4] Anaemia during pregnancy was of great concern because it contributed significantly to increased risk of maternal death during the prenatal period. This study was undertaken to Hb% in 200 pregnant women. In our study parity undertaken P_{0+0}, P_{0+1}, P_{1+0}, P_{0+2}, P_{1+0}, P_{1+1}, P_{1+2}, P_{2+0}, P_{2+1}, P_{3+1}, mostly showed low socio economic background. Anaemic patients had average BMI 23.0714, non-anaemic patients had average BMI 24.0926. Anaemic patients had average systolic blood pressure 102.12 and diastolic blood pressure 69.133. Non-anaemic patients had average systolic blood pressure 97.824 and diastolic blood pressure 80.44. Anaemia increased the risk of postpartum haemorrhage, pregnancy-induced hypertension, placenta praevia, haemorrhage and cardiac failure. Overall, 20-40% of maternal deaths worldwide associated with child birth or the postpartum period were attributed to anaemia during pregnancy. Anaemia was also an established risk factor for intrauterine growth retardation and subsequent low birth weight, preterm delivery, prenatal death.[5,6,8] In working pregnant woman out of 200, 10 woman were anaemic and 190 woman were non-anaemic. In housewife individuals out of 200, 65 pregnant women were anaemic and 135 pregnant women were non-anaemic.

Limitations

Medical conditions like Hb disorders, previous history of anaemia (before pregnancy), chronic anaemia patients were not included in the study.

CONCLUSION

Pregnancy is a period of a significant increase in iron requirement over and above the non-pregnant state. 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 of pregnancy. 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. Due to increased iron requirements, pregnancy is also a period of increased risk for anaemia. Thus, a high proportion of women become anaemic during pregnancy. We found a prevalence of anaemia in pregnant woman (37.5%). Our study shows that 200 pregnant woman were concluded in the study. Out of them 75 women are anaemic and 125 women are non-anaemic.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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