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 P0+1 and average Hb% was 23.860, out of them 30 mothers were anaemic. In contrast 5 mothers whose parity P0+2 and average Hb% was 10.76, out of them 0 mother was anaemic. In contrast 22 mothers whose parity P1+0 and average Hb% was 10.31, out of them 13 mothers were anaemic. In contrast 56 mothers whose parity P1+1 and average Hb% was 11.31, out of them 19 mothers were anaemic. In contrast one mother whose parity P1+2 and average Hb% was 0.2 and she was anaemic. In contrast one mother whose parity P2+0 and Hb% was 10 and she was anaemic. In contrast two mothers whose parity were P2+1 and Hb% was 9.55 and out of them one mother was anaemic. In contrast one mother whose parity is p3+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.\textsuperscript{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.\textsuperscript{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.\textsuperscript{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.\textsuperscript{9}

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.\textsuperscript{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.\textsuperscript{5,7} Anaemia during pregnancy is a major cause of morbidity and mortality of pregnant women in developing countries and has both maternal and fetus consequences.\textsuperscript{7} It is estimated that anaemia causes more than 115,000 maternal and 591,000 perinatal deaths globally per year.\textsuperscript{4} Mild anemia and depleted iron stores detected early in pregnancy were not associated with adverse maternal and perinatal outcomes in iron supplemented women.\textsuperscript{12} The WHO defines high parity (HP) as five or more pregnancies with gestation periods of $\geq$20 weeks and low parity (LP) as less than 5 pregnancies with gestation periods of $\geq$20 weeks.\textsuperscript{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.

### 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 $\mu$g$^3$; 32-36 percent | 75.95 $\mu$m$^3$   |
| 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 (µg mean)                  | 20-30        | 15                   |
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 woman, 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.
There was no missing value of Table 3.

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

73 women 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 women was 11.104.

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

| Menarche bins | Count | Anaemic count | Non-anaemic count | Percentage anaemic | Avg. Hb% | Q1 Hb% | Q3 Hb% |
|---------------|-------|---------------|-------------------|--------------------|----------|--------|--------|
| 11-13         | 88    | 37            | 51                | 0.4204545455       | 11.1193  | 10     | 12     |
| 13-15         | 73    | 25            | 48                | 0.3424657534       | 11.1041  | 10     | 12     |
| 9-11          | 39    | 13            | 26                | 0.3333333333       | 10.76923 | 10     | 12     |

Table 5: Occupation summarization.

| Occupation | Anaemic count | Non-anaemic count | Modal parity | Modal socio-economic status | Modal nutritional status | Avg. BMI | Avg. systolic pressure | Avg. diastolic pressure | Modal pressure | Avg. Hb% | Q1 Hb% | Q3 Hb% |
|------------|---------------|-------------------|--------------|------------------------------|--------------------------|----------|------------------------|------------------------|----------------|----------|--------|--------|
| Housewife  | 65            | 135               | 0+1          | 11.872 83237                | 11                       | 13       | A 1                    | G 1                    | 11.04508        | 671      | 10     | 12     |
| Working    | 10            | 190               | 0+1          | 11.703 7037                 | 11                       | 13       | A 1                    | G 1                    | 11.04814        | 815      | 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% | Q1 Hb% | Q3 Hb% |
|--------|-------|---------------|-------------------|----------------------------|--------------------------|----------|------------------------|------------------------|----------------|----------|--------|--------|
| 0+0    | 39    | 10            | 29                | E 1                        | G 1                      | 23.15    | 26526                  | 99.5128 2051           | 100.0/60.0      | 11.305128 21 | 10.1   | 12     |
| 0+1    | 73    | 30            | 43                | E 1                        | G 1                      | 23.86    | 001192                 | 101.794 5205           | 90.0/110.0      | 10.997260 27 | 10     | 12     |
| 0+2    | 5     | 0             | 5                 | E 1                        | G 1                      | 22.97    | 606944                 | 95.4                  | 90.0/60.0      | 10.76     | 9.3    | 12.3   |
| 1+0    | 22    | 13            | 9                 | E 1                        | G 1                      | 23.09    | 116685                 | 97.2727 2727           | 110.0/70.0      | 10.313636 36 | 10     | 10.2   |
| 1+1    | 56    | 19            | 37                | E 1                        | G 1                      | 24.18    | 97.6428                | 72.3928              | 100.0          | 11.310714 10 | 10     | 12     |
null
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 $P_{0.25}$ population having Hb% 9.3 and the 75% of the $P_{0.75}$ 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 $P_{0.25}$ population having Hb% 10 and the 75% of the $P_{0.75}$ 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 $P_{0.25}$ population having Hb% 10 and the 75% of the $P_{0.75}$ population having Hb% 11.392.

Out of one woman with her 2nd gravida and past history of one abortion, 19 woman where anaemic and 9 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 $P_{0.25}$ population having Hb% 9.325 and the 75% of the $P_{0.75}$ 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 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.

Table 8 shows the uniqueness of the data.

**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 pressure 72.392 and average Hb% 10.76, where the 1st 25% of the $P_{0.25}$ population having Hb% 9.3 and the 75% of the $P_{0.75}$ 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 $P_{0.25}$ population having Hb% 10 and the 75% of the $P_{0.75}$ 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 $P_{0.25}$ population having Hb% 10 and the 75% of the $P_{0.75}$ population having Hb% 11.392.

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Table 8 shows the uniqueness of the data.
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. 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. 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 P₀, P₁, P₂, P₃, P₄, P₅, P₆, P₇, P₈, P₉, P₁₀, 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. 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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