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Oral Ferrous Sulphate Therapy And Moderately Anaemic Antenatal Subjects in Relation To Changes in Haemoglobin Levels.

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Abstract: *Objective: This study was done to evaluate the changes in haemoglobin levels in moderately anaemic primigravidas and multigravidas after oral ferrous sulphate therapy. Materials and methods: 100 moderately anaemic antenatal subjects were selected which consisted of fifty moderately anaemic primigravidas and fifty moderately anaemic multigravidas respectively. All of them were prescribed with oral ferrous sulphate therapy and changes in haemoglobin levels were noted prior to and after the period of oral ferrous sulphate therapy.*
Result: Rise in haemoglobin levels was seen in all the antenatal subjects after oral ferrous sulphate therapy but the rise in case of moderately anaemic primigravidas (mean rise=2.232 ± 0.8052) was more than that of the moderately anaemic multigravidas (mean rise=1.656 ± 0.5873) and was statistically significant (t=4.087, p<0.05, considered significant). Conclusion: This study has shown that the rise in haemoglobin levels occur in both moderately anaemic primigravidas and multigravidas after oral ferrous sulphate therapy which is more significant in primigravidas.
Keywords: *Anaemia, antenatal, haemoglobin, ferrous sulphate, primigravida .*

I. Introduction

Iron deficiency anemia (IDA) remains the commonest medical disorder in pregnancy in the developing world [1], with the burden of disease impacting on both the mother and the newborn (and subsequent child and later adult).

The World Health Organization has uniform definition of anaemia during pregnancy haemoglobin levels below 11.0 g/dl [2, 3] . The impact of anaemia on the future health of newborns are a cause of concern [4]. Iron deficiency is the most common nutritional deficiency of the world [5]. The global prevalance of anaemia during pregnancy is estimated by the World Health Organization (WHO) to be 47.4% [6]. According to recent WHO figures, India is included in the list of countries with high prevalance of anaemia in pregnant women (>40%) [6]. The prevalance of anaemia among all age groups is high in India. Every second woman is anaemic (55%) [7]. Iron supplementation is almost universally recommended during pregnancy to correct or prevent iron deficiency [8] because dietary consumption of iron is unlikely to meet the daily dietary recommendation of 30mg [9]. Iron supplements of different kinds cause a rise in the haemoglobin levels.
According to Indian Council of Medical Research (ICMR), anaemia is classified as –

S. No.	Type	Range of Haemoglobin level
1.	Mild	8.0 – 10.9 g/dl.
2.	Moderate	5.0 – 7.9 g/dl.
3.	Severe	Less than 5g/dl.

These values are taken from 'Ian Donald's Practical Obstetric Problems. Seventh Edition. 2014.Data analysis on global prevalence shows that anaemia in pregnancy is disproportionately concentrated in low socio economic groups [10]. Maternal Haemoglobin level have been related to perinatal and neonatal mortality [11, 12]. Anaemia is widespread in different states of India and it varies considerably among states [13, 14]. There is high prevalence of anaemia in Assam which is 72% according to National Family and Health Survey III (Reports from National Family Health Survey (NFHS-3) India, 2005-2006). In another study done on population of Kashmir found that severity of anaemia inversely related to educational status and income [15].

Iron supplementation is almost universally recommended during pregnancy to correct or prevent iron deficiency [16] because dietary consumption of iron is unlikely to meet the daily dietary recommendation of 30mg [17]. Iron supplements of different kinds cause a rise in the haemoglobin levels. Elemental iron 100mg is used for the treatment of iron deficiency anaemia in pregnancy and 30-60 mg is used as prophylaxis for iron deficiency anaemia in pregnancy, and also for treatment of iron deficiency anaemia in children. Folic acid being a very essential vitamin in process of erythropoiesis has significant role in keeping the cell morphology intact. It is observed that low serum folate levels are associated with the iron deficiency and thus are related to the vicious cycle of deficiencies of iron and folate [18].

In this study for the comparison of the rise of haemoglobin levels, oral ferrous sulphate supplementation was selected out of the various available oral iron supplementations. Ferrous sulphate were taken into consideration because ferrous sulphate is available free of cost in the hospital dispensary of Gauhati Medical College and Hospital and in other Government Medical Centres. So, people generally prefer the oral ferrous sulphate tablets. Orally administered ferrous sulphate, the least expensive of iron preparations, is the treatment of choice for iron deficiency [19].

II. Aims And Objectives

1. To evaluate the changes in haemoglobin levels in moderately anaemic antenatal subjects before and after oral ferrous sulphate therapy.
2. To evaluate and compare the changes in haemoglobin levels in between moderately anaemic primigravidas and multigravidas after oral ferrous sulphate therapy.

III. Materials And Methods

A cross-sectional comparative study was carried out among one hundred moderately anaemic pregnant women in the Department of Obstetrics and Gynaecology in Gauhati Medical College and Hospital, Guwahati from 1st of August, 2014 to 31st of May, 2015.

- A simple random sampling was done.
- 18 to 40 years of vegetarian and non-vegetarian subjects were included.
- Voluntary participation in the study.
- The written consent of pregnant women was obtained prior to collection of blood samples.
- Data was collected through general information and standardized questionnaire. Pretested questionnaire was including education, trimester, gravida etc.
- Under all aseptic and antiseptic measures venous blood samples were drawn and collected in EDTA (ethylene diamine tetraacetic acid) tubes and were analysed on the same day.

Inclusion Criteria:

1. No history of any gynaecological abnormalities.
2. Subjects in between 18 – 40 years were included.
3. Moderately anaemic primigravidas and multigravidas.
4. Persons who came for regular routine check-up and took iron supplements daily as prescribed.
5. Persons not taking any medications that can interfare with iron absorption.
6. Subjects not hypersensitive to iron or any of the components or ferrous sulphate were included in the study.
7. Subjects with a balanced diet.

Exclusion criteria:

1. Females having gynaecological abnormalities.
2. Subjects less than 18 years and above 40 years of age.
3. Persons having obesity, diabetes mellitus and any complications related to pregnancy
4. Persons irregular in their routine check-ups and who didnot take iron supplements daily as prescribed.
5. Persons with medications that can interfare with iron absorption.
6. Subjects suspected of hypersensitivity to iron or any of the components or ferrous sulphate were also excluded from the study.
7. Subjects with an unbalanced diet.

The study group consisted of 100 moderately anaemic antenatal subjects. The study group was divided into two groups. One group comprised of fifty moderately anaemic primigravidas who were prescribed oral ferrous sulphate therapy and the other group comprised of fifty moderately anaemic multigravidas to whom also oral ferrous sulphate therapy was prescribed. All the subjects who were involved in the study were dispensed with fixed-dose combination (FDC) of ferrous sulphate (equivalent to elemental iron 100mg) and folic acid 0.5mg oral tablets, two tablets i.e. one tablet before lunch and the other tablet before dinner was prescribed on a daily basis. Haemoglobin levels in the end of first trimester before initiation of oral ferrous sulphate therapy were estimated and again the haemoglobin levels towards the end of third trimester near the subject's expected date of delivery after the intake of oral ferrous sulphate therapy were estimated and the changes in haemoglobin levels were determined. Cyanmet haemoglobin method was used for haemoglobin estimation.

Cyanmethemoglobin (Hemiglobincyanide) Method:

This is the World Health Organization's recommended method for determining the haemoglobin concentration of blood (Van Assendelft OW, Lewis SM 1991 Recommended method for the determination of the haemoglobin concentration of blood. World Health Organization Document LAB/84.10, Rev 1). This is the method of choice for estimation of haemoglobin and is recommended by International Committee for Standardization in hematology.

In this method, blood is mixed with a solution of potassium ferricyanide, Potassium cyanide and a non-ionic detergent (Drabkin's solution). Erythrocytes are lysed producing an evenly distributed haemoglobin solution. Potassium ferricyanide converts haemoglobin to methemoglobin, and methemoglobin combines with potassium cyanide to form cyanmethemoglobin (hemiglobincyanide). All forms of haemoglobin present in blood are completely converted to a single compound, cyanmethemoglobin. When the reaction is completed, absorbance of the solution is measured in a spectrophotometer at 540nm. At this wavelength, cyanmethemoglobin has a broad absorbance peak. To obtain the amount of haemoglobin in the unknown sample, its absorbance is compared with that of the standard cyanmethemoglobin solution (the haemoglobin concentration of which is known) by using a formula or a previously prepared graph/ table.

Statistical Analysis- The collected data was compiled, tabulated and analyzed. IBM SPSS Ver.21.0 was used. Students' t test was performed considereing 'p' values less than 0.05 to be statistically significant.

IV. Result

For evaluation the following steps were done – The statistical analysis after performing paired t test shows that the group of moderately anaemic primigravidas showed a mean haemoglobin level of 9.252 ± 0.7437 towards the end of the third trimester, which in the end of first trimester was 7.02 ± 0.6496. It shows that there was a mean rise of haemoglobin levels and the mean rise is found to be 2.232 ± 0.8052. ($t=19.601$, $p<0.05$, considered significant)(see Table-1 and Fig-1).

Similarly, statistical analysis after performing paired t test shows that the group of moderately anaemic multigravidas showed a mean haemoglobin level of 9.056 ± 0.6765 towards the end of the third trimester, which in the end of first trimester was 7.4 ± 0.5022. It shows that there was a mean rise of haemoglobin levels and the mean rise is found to be 1.656 ± 0.5873 ($t=19.937$, $p<0.05$, considered significant)(see Table-1 and Fig-1). After performing paired t test the results were –

Table-1

S. No	Group	n	End of First trimester	Third trimester	Statistical parameters
1.	Primigravidas with moderate anaemia	50	7.02	9.252	t = 19.601 p < 0.05, considered significant.
2.	Multigravidas with moderate anaemia	50	7.4	9.056	t = 19.937. p < 0.05, considered significant.

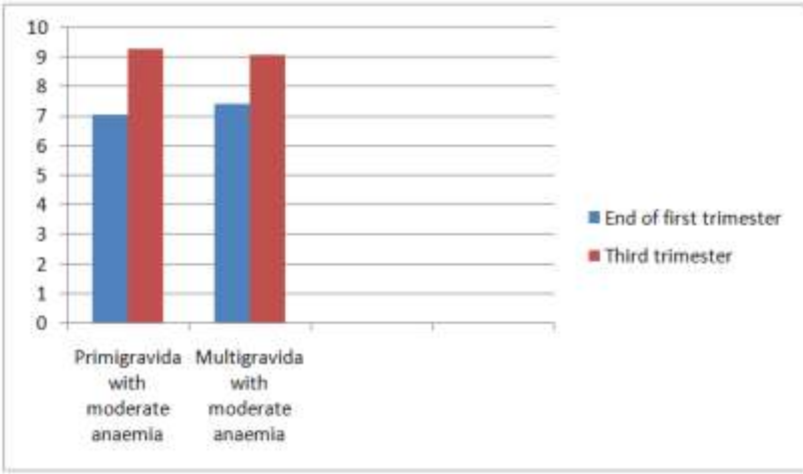

Fig-1: This figure shows the mean rise of haemoglobin levels after oral ferrous sulphate therapy in moderately anaemic primigravidas and multigravidas.

The result showed a mean difference in the rise of haemoglobin levels in between the two groups and the mean rise was more in the case of the group of moderately anaemic primigravidas than that of the moderately anaemic multigravidas and independent unpaired t test showed that it was statistically significant ($t=4.087$, $p<0.05$, considered significant) (see Table-2 and Fig-2).

After performing unpaired t test the results were –

Table -2

S. No	Group	n	Mean	
1.	Primigravidas with moderate anaemia	50	2.232	t = 4.087. $p < 0.05$, considered significant.
2.	Multigravidas with moderate anaemia	50	1.656	

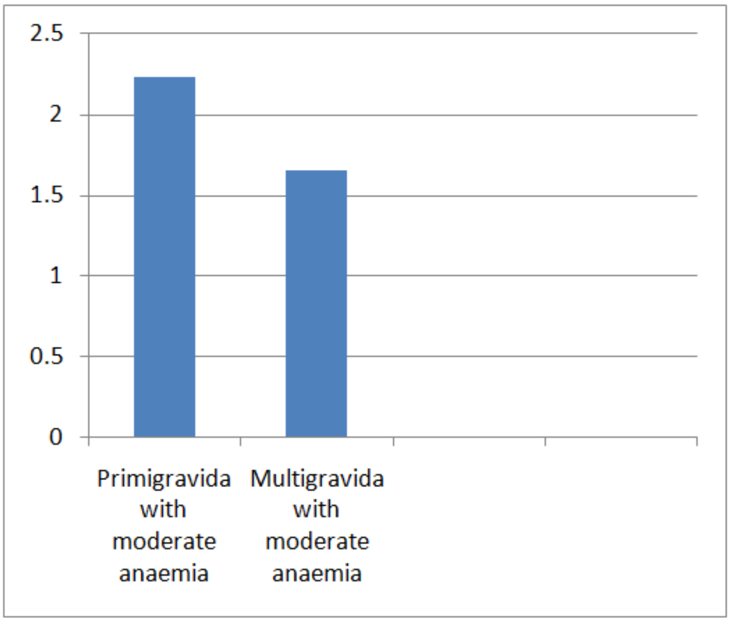

Fig-2: This figure shows the mean rise of haemoglobin levels is more in case of moderately anaemic primigravidas than that of moderately anaemic multigravidas.

V. Discussion

Iron deficiency is the most common nutritional deficiency of the world [20]. Iron deficiency is largely responsible for low haemoglobin. Approximately 2 billion people suffer from iron deficiency and the residents of developed countries are also having iron deficiency [21]. Anemia is one of the most frequent complications related to pregnancy. All women during the childbearing age are prone to develop iron deficiency but pregnant females are especially at risk. Low haemoglobin in the blood is widely identified as the commonest haematological abnormality and it is associated with adverse pregnancy outcome as haemoglobin levels continue to fall as pregnancy advances [22,23]. Increased iron requirements during pregnancy are due to fetal growth and expansion of red cells mass [24]. In Pakistan, 75-80% women suffer from iron deficiency anemia during pregnancy [25], probably due to poor nutrition, frequent and closely spaced pregnancies; in rural settings worm infestations may play an important additional role [26].

Detection of latent iron deficiency during pregnancy is important for both maternal and fetal well-being but is generally difficult to detect. Routine parameters are only useful in the detection of overt iron deficiency but not the sub clinical iron deficiency [27]. During pregnancy the physical adjustments vary depending upon the health status of pregnant female, genetic determinants of fetal size and maternal lifestyle. Multigravida women showed a significant lowering of their serum iron status as compared to the primigravida subjects as quoted in other studies [28]. The most important cause of haemoglobin lowering in pregnant females is relative hemodilution due to plasma expansion by 30-50% [29]. In multigravida females in addition to this plasma expansion, iron deficiency can play a major role in lowering the haemoglobin concentration and therefore making them more prone to develop anemias as compared to the primigravidas [30]. The risk of developing iron deficiency is higher in multigravidas as compared to primigravidas [31]. It is an established fact that maternal iron stores become depleted in second and third trimesters of pregnancy. Most of the iron transfer from mothers to fetus occurs during this period which corresponds to the time of peak efficiency of maternal iron absorption [32]. Also, analysis of data of multigravida subjects in order to determine the effects of spacing and number of children on their iron status revealed that the women who had a spacing period of upto one year between the subsequent pregnancies had lower iron levels as compared to those having spacing of upto two years. This data further strengthens the fact that minimum spacing recommended should be two years in between subsequent pregnancies as recommended by WHO [33]. Number of children does not affect the iron status of the pregnant females much as compared to the spacing period. Haider et al and Elhassan et al concluded that both spacing and number of children affects the iron status of the female [34, 35]. There is a trend of decreasing severity of anaemia with increase in percapita income of the family as reported by Kapur et al [36].

In addition, in developing countries, anaemia is common even among non-pregnant women, and anaemia develops rapidly because in most cases iron stores were depleted even before a pregnancy starts [37]. Subsequent pregnancies in a shorter period can have ominous effect on the mother and baby and can also affect the health of already born children. Appropriate family planning measures to be taken to prevent repeated pregnancies with narrow spacing.

VI. Conclusion

The study has shown that the rise in haemoglobin levels occur in both moderately anaemic primigravidas and multigravidas after oral ferrous sulphate therapy but is more significant in primigravidas. The limitation faced during this study was small sample size and also this study was limited to only one medical college and hence only a small region of the country. Also, illiteracy among the subjects was a problem in conducting the study as many of them did not know about the beneficial effects of iron therapy and also many of them were inclined to social orthodox taboos. So, there lies a prospect of doing a large scale study in one or more regions of the country including the hilly and the more remote areas. There is also a prospect of doing study in this regard with a different iron supplementation as well as in moderately or severely anaemic antenatal subjects so that we acquire more insight as well as valuable information regarding the unfavourable condition known to all as maternal anaemia.

So, in during pregnancy iron supplementation is very essential as this has the propensity to save an iron-deficient mother and her child and hence to bless this entire world with a new life and a new day as without our mothers our lives are fragile and incomplete.

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