

# **The Anemia Project-The Impact of Nutritional Counseling and Oral Iron Therapy in Indian Females in a Resource Restricted Setting**

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**Abstract:** Anemia is one of the most neglected diseases in the rural Indian population and can lead to severe consequences in overall health and productivity. The treatment of anemia, especially in women, is essential in developing countries, such as India. In our study, evaluated the proportion of anemia among rural Indian females and their response to oral iron therapy, in a resource restricted setting.

**Keywords:** anemia in females, iron deficiency, oral iron therapy, dietary advice.

## **Objectives:**

- 1.)To study the proportion of anemia among indian females in a resource restricted setting.
- 2.)To evaluate the impact of counseling on the compliance to oral iron therapy in indian females in a resource restricted setting.
- 3.)To assess the response to oral iron therapy in indian females in a resource restricted setting.

## **Introduction:**

In India, anemia continues to be a major cause for concern in the fight for women's health. According to the NFHS surveys taken over a period of 7 years, the prevalence of anemia in women in India has increased from 52% in 1998 to 56% in 2005. Even mild cases of anemia can negatively affect a woman's development, immune function and productivity. There is a strong association between maternal anemia and infant mortality and morbidity rates. It is estimated that 19% of maternal deaths are due to anemia. This is a crucial point as the status of a country depends on these factors.

The most common anemia worldwide, and especially in India, is iron-deficiency anemia. In one study performed on young women 18-35 years of age in Bangalore, India, it was found that of the anemic women, 95% were iron deficient. The WHO estimates that there are 800,000 deaths worldwide per year due to it, making it one of the fifteen leading contributors to the global burden of diseases.

In addition to the normal loss of 2 mg of iron per day in healthy adults, an additional 20 mg is lost during menstruation. Women, therefore, need to absorb at least 2.8 mg of iron from their diet per day. The daily requirement for iron in adults per day is 30 mg. Absorption of iron from the habitual Indian diet is low, however, and is estimated to be only 5%. According to one study, the average intake of iron in rural nonpregnant, nonlactating women above the age of 18 years was just 9.9 mg/day! It is not surprising that iron deficiency anemia in India is seen prevalently in women of the reproductive age

group (15-49 years).

The detrimental effects of anemia do not end at increased maternal and foetal mortality rates. In addition to abortions, premature births, low birth weights and postpartum hemorrhage, anemia causes an increased susceptibility to infections and a significantly reduced work capacity.

Anemia has a direct effect on adult productivity, especially in physically demanding occupations. Curing anemia results in a 5-17% increase in productivity, which can add up to 2% of GDP to the worst affected countries. Many investigations have studied the correlation between adult productivity and anemia. In a study of the treadmill performance of Guatemalan agricultural workers, a direct relationship was found between their performance on the treadmill and the severity of their anemia. Another study shows that when Indonesian rubber tappers were given oral iron supplementation for 60 days, their pay increased by more than 30%! In Sierra Leone, lack of anemia treatment programs results in loss of agricultural productivity among the female labor force, exceeding \$94.5 million, over five years. Likewise, the anemia burden in India is decreasing the productivity and increasing the mortality rates of a nation dependent on manual labour. According to one estimate, India's productivity loss due to anemia will cost \$114 billion between 2003 and 2012 (India's annual GDP is \$601 billion). It can be surmised, therefore, that freeing Indian women from the anemia burden can lead to an overall healthy and productive nation.

Many methods to treat iron deficiency in developing countries have been tried including, intravenous and oral iron supplementation and iron fortification of foods. Though flour fortification programs have substantially improved iron deficiencies in many countries such as Chile and Venezuela, fortification may not meet the requirements of those women in the reproductive age group, especially pregnant women. Fortification is of little use then, if it is taken into consideration that worldwide 20% of women (50% of pregnant women) are iron deficient, while the same is true for only 3% of men.

The cheapest way of correcting iron deficiency anemia is by oral iron supplementation. Ferrous sulphate tablets are the most inexpensive form of oral iron. It is estimated that 1000 tablets of oral supplements containing 60-100 mg of elemental iron cost about \$4-10. UNICEF provides sugar coated ferrous sulphate tablets for even less: \$1 per 1000 tablets. Injectable preparations are costlier as well as need trained staff for administration. In a low resource setting, oral iron supplementation is the only way to treat iron deficiency anemia.

Oral iron and folic acid tablets are being supplied free of cost to the rural population of India by the government for the past 40 years (1971), yet the prevalence of anemia in India has not significantly reduced. Studies indicate a low compliance to this free oral iron supplementation as a main cause of failure of the anemia prevention and control program of India.

According to the review article *Determinants of Compliance with Iron Supplementation: Supplies, Side Effects or Psychology?*,

“Compliance occurs when a patient follows medical advice provided (e.g. taking medications, following diets or making lifestyle changes). When the physician or healthcare professional prescribes iron supplements and the expected outcome (increase in Hb, hematocrit, serum ferritin, etc) is

achieved, it is assumed that the patient is compliant.”

Though it is generally believed that the primary reason for the failure of iron supplementation programs with oral iron tablets is due to the unpleasant side effects, the review article found this theory to be incorrect. After studying the relationship between supplies, side effects and behavioural psychology of the patients to compliance with oral iron supplementation, the authors concluded that noncompliance was rarely due to the ill effects of oral iron therapy. It was found that only 1% of Indian women cited the side effects as the reason for not taking the iron pills. In fact, a study performed in Norway compared the compliance between women who received a placebo and women who took iron supplements and both groups were found to comply in an equivalent manner. Furthermore, 30% of the women who discontinued taking the iron supplements in Indian studies did so due to lack of motivation. This shows that simply making the tablets available and even educating the public are not sufficient measures to warrant the patient's compliance. As has been mentioned in many studies, patients appreciate the treatment they receive if they discover social value in it, even if their physical well being is not affected. Studies in Thailand and Burma show that high compliance levels were seen with oral iron supplementation if the patients were motivated.

In previous studies, the messages intended to motivate women to eat a healthy diet and to continue the iron therapy were not effectively delivered due to lack of skill of the primary health workers. Sometimes, due to lack of funding and limited resources, highly trained professionals cannot be hired to motivate the target population. Therefore, more innovative methods that incorporate a social aspect and make a lasting impression on the individual, using the limited resources available, should be tried. Only a few studies have tried to overcome this problem of low compliance to oral iron. Repeated counseling plays an important role to improve compliance. In one study in eight countries, it was found that compliance rates increase with counseling. In most countries in which studies have taken place, women are used to receiving iron and vitamin supplementation from the government, NGOs and even antenatal clinics. Though these women may take the tablets for a few days, it has been found that their compliance rates are low. Associated with low compliance rates is the blatant fact that these women do not know what the tablets are for or that they will alleviate their symptoms of anemia.

Therefore, education seems to be a key to patient compliance. Nutrition Education and Counselling (NEC) has been used in studies before to encourage patient compliance with some success. It has been found, however, that the NEC is most effective if it is used in conjunction with nutritional supplementation. According to a study of NEC and iron supplementation in deficient women carried out in eight countries:

“In spite of a range of negative effects experienced by some women (bad taste, dark stools, constipation, etc), the women persisted with the trial...the knowledge that iron will improve the health of their children and themselves, motivates the women...”

Dietary and general education about anemia is essential to its treatment. Girls should be exposed to education about anemia as a disease and its significant complications from a young age. Most studies focus on treating pregnant women with oral iron (and folic acid) supplementation, but these endeavors, including the National Nutritional Anemia Control Program started by the Indian government, have not

been successful. The failure of the national program is blamed on the fact that the oral iron supplement side effects are exaggerated in pregnancy. Therefore, it would be useful to incorporate the iron therapy in females who are not yet pregnant, especially in growing adolescent girls. According to national statistics, about 88% of adolescent girls have anemia. The development of a girl through adolescence determines the safety and health of her future pregnancies. Girls require a healthy diet during adolescence to help reduce problems in pregnancy and childbirth (especially low birth weights). Plus, women aged 15-19 account for 26% of the total fertility of Maharashtra state. In Maharashtra, the median age for first pregnancy is 19 years. Due to the increased focus on treating the anemia of pregnancy, most iron supplementation programs have overlooked the treatment of an incredibly important age group: the adolescent girl, who if left untreated, very soon becomes the complicated anemic pregnancy.

Though a simple hemoglobin gram percent is not diagnostic of iron deficiency or even nutritional anemia, we consider that iron deficiency anemia is the most common form of anemia worldwide and blind treatment with oral iron supplements has been proven to be effective in reducing anemia in studies in the past with negligible detrimental effects. Keeping this scenario in mind, we carried out this study in a resource restricted setting.

## **Materials and Methods(s):**

The study was carried out in the Taluka of Hinganghat, which caters to a population of rural Indian women. The duration of the study was of 2 months. Study subjects will be selected based on the following selecting criteria:

### **Selection Criteria:**

#### **Inclusion Criteria:**

1. Women above the age of 14 years
2. Those who will be giving their consent

#### **Exclusion Criteria:**

3. Pregnancy
4. Those subjects suffering from chronic illnesses with restricted ambulation
5. Diagnosed cases of hemoglobinopathies (sickle cell anemia, thalassemia, etc)

### **Study Type:**

Cohort

### **Sample Size:**

400 subjects

### **Study Design:**

The study has been conducted at a women's hospital under the NGO, Matru Sevha Sangh.

The health check up camps are organized on the second Tuesday of each month in an institution well known by the women in Hinganghat, the Matru Sevha Sangh. The program is advertised by a display of pamphlets on the hospital noticeboard, but the news is actually spread mainly by word of mouth.

The camps are held in the form of a social gathering. The very first camp held by this NGO was on the day of "Makarsankranti". Under the guise of this social gathering, women were invited to the hospital for free checkups. The iron tablets were given as a gift, anointed with the antiseptic haldi and the red kumkum, representing blood. This set up of a cultural and social gathering for a health checkup was accepted as a refreshing change from other health camps, and the educational seminars provided by doctors and trained nurses became interactive learning sessions. Each session had both a formal lecture and informal discussions. These camps now provide women with a social network and moral support that promotes good dietary practices and compliance to physicians' advice.

This setup was used to examine 400 women who had come to the gathering for the first time.

After the initial visit, the data for these women was kept for the following two visits (2 months).

### **Protocol for First Visit:**

#### 1.) Pretest Counseling Session

Subjects are asked to attend interactive lectures by medical professionals and social workers on the following subjects:

1. Introduction to Anemia
2. Importance of detection and treatment of anemia
3. Importance of women's health for the family
4. Practical tips to improve dietary health

Subjects also received informational pamphlets on the subjects in either Hindi or Marathi.

#### 2.) Data Collection:

The data collection was conducted by a registered medical practitioner and by social workers who are in association with the hospital. After the counseling session, informed consent was taken. For those giving their consent, basic data was collected as follows:

1. Age
2. Address
3. Occupation
4. Parity
5. Dietary history (vegetarian/mixed diet)
6. Weight
7. Hemoglobin gram percent

Following the WHO definition of anemia, a hemoglobin concentration of less than 12 gram % will be considered to be anemia.

The hemoglobin was estimated by trained nurses from the NGO (Matru Sevha Sangh) by Sahli's method.

### 3.) Distribution of Iron Therapy:

Ferrous Sulphate tablets were given to the women who have a hemoglobin gram percentage below 12. Each woman was told to take one 200 mg tablet per day, irrespective of the severity of anemia. The tablets are provided by the NGO.

### **Protocol for the Second Visit:**

#### 1.) Pretest Counseling Session

Components:

1. Introduction to Anemia
2. Importance of detection and treatment of anemia
3. Importance of women's health for the family
4. Practical tips to improve dietary health
5. Importance of Reducing faulty dietary habits, such as:
  - Washing vegetables after cooking
  - Cooking vegetables for a prolonged period of time
  - Not eating enough fresh salads
  - Having tea or coffee with meals
  - Not eating enough Vitamin C

#### 2.) Data Collection:

The data collection will be conducted by a registered medical practitioner and by social workers who are in association with the hospital. After the counseling session, informed consent was taken. For those giving their consent, basic data was collected as follows:

1. Age
2. Occupation
3. Parity
4. Dietary history (vegetarian/mixed diet)
5. Weight
6. Hemoglobin gram percent
7. Any change in the hemoglobin gram percent
8. Compliance (were the iron tablets taken)

The hemoglobin was estimated by trained nurses from the NGO (Matru Sevha Sangh) by Sahli's method.

### **Protocol for the Third Visit:**

Same as the protocol followed for Visit Two. However, the following measures are also added:

If there is no improvement in the hemoglobin levels even after iron therapy, the subjects are referred for further evaluation to the nearest possible district hospital.

## **Observations:**

**Table 1: Age Distribution of the Study Group**

<u>Age Group</u>	<u>Number of Women</u>	<u>Percentage of Women</u>
<b>15-25</b>	124	31.00%
<b>26-35</b>	139	34.75%
<b>36-45</b>	60	15.00%
<b>46-55</b>	43	10.75%
<b>56-65</b>	29	7.25%
<b>&gt;65</b>	5	1.25%

As can be seen in table 1, most women that appeared for the program were in the reproductive age group (15-49 yrs). Few women over age 55 are seen. The maximum number of women appear to be from 15-35 years of age.

**Table 2: Distribution of Study Group According to Occupation**

<u>Occupation</u>	<u>Number of Women</u>	<u>Percentage of Women</u>
<b>Housewife</b>	100	25.00%
<b>Manual Labor</b>	120	30.00%
<b>Farming</b>	41	10.25%
<b>Students</b>	43	10.75%
<b>Sedentary Job</b>	80	20.00%
<b>Retired</b>	16	4.00%

30% of the women in this study stated that their main line of work was manual labor. About 10% worked on farms. 25% of women stated that they did not work and were housewives.

**Table 3: Distribution of Study Group According to Parity**

<u>Parity</u>	<u>Number of Women</u>	<u>Percentage of Women</u>
<b>0</b>	58	14.50%
<b>1</b>	83	20.75%
<b>2</b>	150	37.50%
<b>3</b>	75	18.75%
<b>4</b>	26	6.50%
<b>5 or more</b>	8	2.00%

Almost 40% of women in this study had only two children. 20% had only one child. Grandmultipara (parity of more than 4) was seen in 8.5% of the study group.

**Table 4: Distribution Of Study Group According to Diet**

<u>Diet</u>	<u>Number of Women</u>	<u>Percentage of Women</u>
Vegetarian	224	56.00%
Mixed	176	44.00%

More than half of the women were vegetarian.

**Table 5: Distribution of Study Group According to Weight**

<u>Weight (Kg)</u>	<u>Number of Women</u>	<u>Percentage of Women</u>
<30	8	2.00%
31-40	104	26.00%
41-50	172	43.00%
51-60	69	17.25%
61-70	35	8.75%
>71	12	3.00%

26% of the women were found to have a weight between 31-40 kg, 11% were found to be greater than 60 kg.

**Table 6: Distribution of Study Group According to Follow-up Visits for Social Gathering**

<u>Visit Number</u>	<u>Number of Women</u>	<u>Percentage of Women</u>
1 <sup>st</sup> Visit Only	160	40.25%
1 <sup>st</sup> and 2 <sup>nd</sup> Visit	138	34.50%
1 <sup>st</sup> , 2 <sup>nd</sup> , and 3 <sup>rd</sup> Visit	102	25.50%

In the excitement of the cultural gathering, 400 women gathered on the first day of the program. The initial excitement did not last for 40% of the women, however, as they did not come back the next month. Only 34.5% came back the second time and only 25.5% came back for the third session.

**Table 7: Distribution of Study Group According to Compliance for Oral Iron Therapy**

<u>Compliance Time</u>	<u>Number of Women</u>	<u>Percentage of Women</u>
One Month (n=138)	99	71.73%
Two Months (n=102)	72	70.58%

Out of the 138 women that came back for the second visit, 99 (71.73%) stated that they had taken the iron supplementation. After two months, on the third visit, 102 women came back of which 70.58% stated that they had taken the supplementation.

**Table 8: Distribution of Study Group According to Compliance for Oral**

## Iron Therapy

<u>Visit Number</u>	<u>Number of Women</u>	<u>Percentage of Women</u>
Second Visit	262	65.50%
Third Visit	298	74.50%

Of the 400 women that were examined in the first visit, 262 (or 65%) did not come back for the second visit. Of those initial 400, 298 did not come back for the third visit, which is about 75% of the initial study group.

### Table 9: Distribution of Study Group According to Severity of Anemia in First Visit

<u>Severity of Anemia (First Visit)</u>	<u>Number of Women (n= 400)</u>	<u>Percentage of Women</u>
No Anemia (12 gm %)	2	0.50%
Mild Anemia (10-11.9 gm%)	58	14.50%
Moderate Anemia (7 - 9.9 gm%)	325	81.25%
Severe Anemia (<7.0 gm%)	15	3.75%

On the first visit it was noted that of the 400 women examined, 398 had anemia! The maximum (81.25%) had moderate anemia. Only two subjects were found to have a hemoglobin level of 12 gm %. Another 14% had mild anemia and the rest had a severe anemia of less than 7 gm %.

### Table 10: Distribution of Study Group According to Severity of Anemia in Second Visit

<u>Severity of Anemia (Second Visit)</u>	<u>Number of Women (n=138)</u>	<u>Percentage of Women</u>
Mild Anemia (10-11.9 gm%)	43	31.15%
Moderate Anemia (7 - 9.9 gm%)	90	65.21%
Severe Anemia (<7.0 gm%)	5	3.60%

On the second visit, of the 138 women examined, 65% were found to have moderate anemia. Mild anemia was seen in 31%. The number of women who had severe anemia had decreased from 15 to 5.

### Table 11: Distribution of Study Group According to Severity of Anemia in Third Visit

<u>Severity of Anemia (Third Visit)</u>	<u>Number of Women (n= 102)</u>	<u>Percentage of Women</u>
Mild Anemia (10-11.9 gm%)	24	23.52%
Moderate Anemia (7 - 9.9 gm%)	77	75.49%

gm%)		
Severe Anemia (<7.0 gm%)	1	0.98%

During the third visit, 102 women were examined, of which 75.49% were found to have moderate anemia and 23.52% were found to have mild anemia.

In the entire study, only 2 individuals were seen to have a hemoglobin gram % of 12. Both were seen during the first visit and both did not come back for either the second or third visit.

**Table 12: Distribution of Study Group According to Rise in Hb after Oral Iron Supplementation**

<u>Rise in Hb (gm %)</u>	<u>After Second Visit</u>		<u>After Third Visit</u>	
	<u>Number of Women (n=138)</u>	<u>Percentage of Women</u>	<u>Number of Women (n=102)</u>	<u>Percentage of Women</u>
No Rise	2	1.44%	2	1.96%
Up to 0.5 gm %	64	46.37%	54	52.94%
0.6 - 1 gm %	54	39.13%	45	44.11%
1.1 – 1.5 gm %	18	13.04%	1	0.98%

After one month, during the second visit, it was seen that the hemoglobin concentration of 64% of women taking oral iron supplementation rose by up to .5 gram %. In 54% of women taking oral iron supplementation for one month, the concentration rose by .6 to 1 gm %. After two months of supplementation, the concentration of 54% of women rose by .5 gm % and the concentration of 45% of women rose by .6 to 1 gm %. The majority of women showed a rise in Hb levels, with only two women not showing a rise (non-responders to oral iron therapy). These women were referred to hospitals in Nagpur.

## Discussion:

As can be seen in table 1, most women that appeared for the program were in the reproductive age group (15-49 yrs). Few women over age 55 are seen. The maximum number of women appear to be from 15-35 years of age. This may be due to the fact that women in the age group of 15-35 are socially more active, whereas elderly females are usually less involved in social gatherings.

Hinganghat is a small town focused on the cotton trade. It has four large cotton mills, and many of the rural poor provide the manual labor needed for the operation of the mills. In spite of working and earning for the family, many women still found the time to come for the social gathering. This shows that this type of social gathering attracts those who are working as well as those who are housewives. It can also be seen that many of the women provide the manual labor on which India survives as a nation. As has been discussed before, oral iron supplements can have many beneficial effects. In adolescents and women, they improve attention and concentration, regardless of the baseline level of iron status. Anemia has a direct effect on the productivity of adults who work in physically demanding occupations, like manual labor. It has been estimated by one study that iron interventions can improve the productivity of light manual laborers by 5% and of heavy manual laborers by more than 17%.

Eliminating anemia would cause a 5-17% increase in their productivity and would even add 2% to India's GDP.

Almost 40% of women in this study had only two children. This reflects a growing trend in India, as the total fertility rate (number of children per woman) has been gradually declining for the past two decades. In 1992, the rate was almost 4 children per woman, but by 2006 the rate had reached around 2.5. In fact, in 2006, 83.3% of Maharashtrian women having two children already, stated that the ideal number of children for their family was two. Nationally, 68.4% of women stated the same. This can be compared to less than 46% of women wanting the same in 1992.

More than half of the women in this study were vegetarian. It is a well known fact that iron from vegetable sources is more difficult to absorb than the heme-iron absorbed from animal sources. Women who are not well informed about their nutritional needs and sources of iron rich foods are at a greater risk for developing anemia. Also, since women are conventionally assigned the responsibilities of cooking in the household, they tend to determine the eating habits of the family. Therefore, it may be possible for the woman to introduce iron-rich foods into the family diet. As animal heme proteins are more readily absorbed, non-vegetarian sources (red meat, fish, liver, egg yolk, etc) should be promoted where allowed by religious and social customs. In other studies, it has been noted that a less proportion of Muslim females have anemia than women of other religions in India. This is supported by the fact that Muslim females tend to eat more iron rich foods, such as red meat. Vegetarian women should be taught to eat more green, leafy vegetables, sprouts, jaggery, lentils and whole grains. Even vitamin C intake, which increases iron absorption, should be promoted. Also, the intake of tea one or two hours before and after taking the iron supplements should be avoided, as tea diminishes the absorption of iron.

Dietary and general education about anemia is essential to its treatment, as anemia is not only a nutritional problem in women but can be seen as a cultural problem as well. Though it has been found that in developed countries, individuals of low socioeconomic status are less likely to consume a healthy diet, the same is not true in India. Though it plays a role, the diet of women in India is not only affected by their socioeconomic status. Family, especially husbands and mother-in-laws, play a strong role in affecting what the woman eats. It has been documented in many studies that the access to foods are many times restricted to Indian women due to the observance of taboos and rituals. For example, in some homes it is a custom that though the woman will buy and cook meat in her home for her family, she will never be allowed to eat it. Many women eat last during meals, eating only what remains after their entire family has finished. Therefore, not only is the education of women important, but the entire family should be educated as to the significance, prevention and treatment of anemia.

In the excitement of the social gathering, 400 women gathered on the first day of the program. The initial excitement did not last for 40% of the women, however, as they did not come back the next month. Only 34.5% came back the second time and only 25.5% came back for the third session. In other words, of the 400 women that were examined in the first visit, 262 (or 65%) did not come back for the second visit. Of those initial 400, 298 did not come back for the third visit, which is about 75% of the initial study group.

One of the reasons for this decline, may be due to the large percentage (60%) of working women earning daily wages, who could not afford to attend the program. As the program was set in the middle of the week (Tuesday) it may have been difficult for the women to attend every week. It is also possible that the initial advertising for the first visit was stronger than subsequent visits, and the initial curiosity

about the program did not last until the third visit. If a more personal approach to inviting the women to the subsequent follow-up visits had been taken, perhaps the number of women would have increased in the second and third visits.

In other studies, it has been noticed that some women take the iron supplements for a small initial time period, and stop either as soon as they start to feel the benefits of the therapy. Others stop coming to the clinic if they do not immediately feel the benefits or as soon as they feel the side effects.

On the first visit, 400 women were examined and their hemoglobin levels without iron supplementation were measured. Of these women, 398 had anemia! The maximum number of women (81.25%) had moderate anemia. Another 14% had mild anemia and the rest had a severe anemia of less than 7 gm %. The lesser percentage of severe anemia is possibly due to the fact that the symptoms of severe anemia are too noticeable to not be treated. Therefore, women with severe anemia would usually be seen and treated by a physician. The symptoms of moderate anemia may not significantly affect the day to day activities, however, and the women may have gotten used to the symptoms because of the slow to develop, chronic iron deficiency anemia. Due to the increased prevalence of iron deficiency anemia among Indian women, the symptoms are commonly seen. Many women have therefore come to view the symptoms as normal and usual features of the childbearing age group. The large percentage of women in the moderate anemia group shows the negligence and ignorance to anemia as a disease.

Out of 400 women, only two did not have anemia. This reflects the poor health status of the population.

On the second visit, of the 138 women examined, 65% were found to have moderate anemia. Mild anemia was seen in 31%. The number of women who had severe anemia had decreased from 15 to 5, much less than previously seen.

During the third visit, 102 women were examined, of which 75% were found to have moderate anemia and 23% were found to have mild anemia. The increase in number of women with moderate anemia in the third visit may be due to many factors including:

1. Decrease in number of women attending the gathering.
2. Decrease in number of compliant women.
3. Iron therapy was not individualized for each woman. This is a major drawback of this study. Ideally, each woman should have an individualized dose that is increased or decreased according to response and side effects of the oral iron therapy. A standard dose may not cause improvement in moderate and severe anemias, which may require a higher dose of iron supplementation.
4. Measurement/Record Keeping/ Calculation Errors

In the entire study, only 2 individuals were seen to have a hemoglobin gram % of 12. Both were seen during the first visit, received dietary counseling, but did not require iron supplementation. Both did not come back for either the second or third visit.

Out of the 138 women that came back for the second visit, 99 (71.73%) stated that they had taken the iron supplementation. After two months, on the third visit, 102 women came back of which 70.58% stated that they had taken the supplementation. These are appreciable results, as in an evaluation of the Indian iron supplementation program, it was found that only 20% of the women who received iron supplements actually took them. This is a 50% increase in compliance compared to other studies! However, it must be taken into consideration that in this study, compliance was measured according to an indirect method: patient reporting. It has been found that patients do tend to over report on how well they comply and therefore, self reporting can be a less reliable source of measurement of compliance.

In almost all the women in the study who came back for the second and third visits, a rise in Hb levels was seen with the iron therapy. After one month, the hemoglobin concentration of 16% of women taking oral iron supplementation rose by up to .5 gm%. In 39% of women taking oral iron supplementation for one month, the concentration rose by .6 to 1 gm%. After two months of supplementation, the concentration of 52% of women rose by .5 gm% and the concentration of 49% of women rose by .6 to 1 gm%. The majority of women showed a rise in Hb levels, with only two women not showing a rise (non-responders to oral iron therapy). These women were referred to hospitals in Nagpur, as it is possible that they did not have iron deficiency anemia and had another underlying etiology for the low hemoglobin levels.

In our study, after 2 months (the third visit), the hemoglobin rise was only up to 0.5 gm % in more than half of the women. This is comparable to one study which found up to a 0.4 gm% increase in hemoglobin levels after 56 days with similar treatment with oral iron supplementation.

## **Conclusion:**

- ✦ It was found that 99.5% of the women had anemia.
- ✦ Of the 398 anemic women, 81.25% had moderate anemia.
- ✦ In this study, 70.58% of women who came back for follow-up in the third visit were compliant with the oral iron therapy.
- ✦ Out of the women who came back for follow-up, 98.04% showed a rise in Hb levels at the time of the third visit. This indicates that iron deficiency is the commonest cause of anemia in Indian women.
- ✦ Counseling and nutritional education play an important role in the compliance for oral iron therapy, as compliance was seen in 25% which is significantly much more than what is seen in other studies.
- ✦ There is an urgent need for detection and correction of anemia in Indian women by increasing the public awareness with the help of educational programs in India.
- ✦ Iron deficiency anemia can be detected and treated in a low resource setting.

## **Finances:**

No financial assistance will be required for the present project as it will be carried out in an NGO run facility (Matru Sevha Sangh).

## **References:**

1. Bates I, McKew S, Sarkinfada F (2007) Anaemia: A useful indicator of neglected disease burden and control. *PLoS Med* 4(8): e231. doi:10.1371/journal.pmed.004023
2. Park: Preventive and Social Medicine. 20th Edition, Jabalpur, Bhanot, 2009.
3. Colledge, et al (eds): *Davidson's Principles and Practice of Medicine*. London, Elsevier, 2010.
4. International Institute for Population Sciences (IIPS) and ORC Macro. 2000. *National Family Health Survey (NFHS-2), 1998–99: India*. Mumbai: IIPS.
5. Rae Galloway; Judith McGuire: “Determinants of Compliance with iron supplementation, supplies, side effects or psychology.”
6. Sulabha Parasuraman; Sunita Kishore; Y. Vaidehi: “National Family Health Survey [NFHS3]”: International Institute for Population Sciences: June 2008
7. Palo Alto Medical Foundation: “Preventing and Treating Iron Deficiency Anaemia” : Form 143976; Dec 2009
8. Ministry of Health and Family Welfare : “Policy on Control of Nutritional Anemia”: Government of India: Jan 1991
9. National Nutritional Anemia Control Program (NNACP): <nifw.nic.in/ndc-nihfw/html/programmes/nationalnutritionalanemia.htm>
10. NETV: “Health Status of Maharashtra”: <netv.org/india/mh/healthstatus/demographic.htm>
11. UNICEF; WHO; UNESCO; UNPFA; UNDP; UNAIDS; WFP; World Bank: “Facts for Life”; United Nations Children's Fund, NY: 2010: <http://www.factsforlifeglobal.org>.
12. Dr. Subhash Khirwadkar; Dr. Prakash Bhatiwade: “Integrated Population and Development Project”: Health Status-Maharashtra.
13. The World Bank/ The International Bank for Reconstruction and Development: “Repositioning Nutrition as Central to Development- A Strategy for Large Scale Action.”
14. Dr. Ellen Girard-Barcloy; Dr. Kalpana Tiwari: “Prevention and Control of Nutritional Anemia: A South-Asia Priority”: UNICEF; Regional Office for South Asia: 2002.
15. E.M. DeMaeyer: “Preventing and Controlling Iron Deficiency Anemia Through Primary Health Care- A Guide for Health Administrators and Program Managers”: WHO: 1990.
16. Klaus Kraemer; Michael B. Zimmerman: “Nutritional Anemia: Sight and Life Press.
17. Thankarhan P; Muthayya S; Walczyk KT; Kurpad A.V.; Hurall R.F.: “An Analysis of the Etiology of Anemia and Iron Deficiency in Young Women of Low Socioeconomic Status in Bangalore, India.”: *Food Nutrition Bulletin*: Sept 2007; 28(3); 328-336.

18. Bentley ME; Griffiths P.L.: "The Burden of Anemia Among Women in India": *European Journal of Clinical Nutrition*: Jan 2003; 57 (1); 52-60.
19. Ingles. V; Ball. K. Crawford, D: "Why Do Women of Low Socioeconomic Status Have Poorer Dietary Behavior Than Women of Higher Socioeconomic Status? A Qualitative Exploration." : *Appetite*: Dec 2005; 45: 334-343; London, England. Academic Press.
20. K. Mallikharjuna Rao; N. Balakrishna; N. Arlappa; A Laxmaiah; G.N. Brahman: "Diet and Nutritional Status of Women in India." : *J.Hum E. Col*:2010: 29 (3): 165-170: National Institute of Nutrition; Indian Council of Medical Research: Hyderabad, India.
21. Prashant Thankachar; Thomas Walczyk; Sumitha Muthayya; Anura V. Kurpad; R. F. Hurrell: "Iron Absorption in Young Indian Women and the Interaction of Iron Status with the Influence of Tea and Ascorbic Acid." : *American Journal of Clinical Nutrition*: April 2008: Vol. 87: 4; 881-886.
22. Olude, Abigail.: "Impact of Nutritional Education and Counseling on Anemia Prevalence and Iron Status in Women of Reproductive Age- A Systemic Review." : 2011.
23. Paul R. Meier; H. James Nickerson; Kurt A. Olson; Richard L. Berg; James A. Meyer: "Prevention of Iron Deficiency Anemia in Adolescent and Adult Pregnancies": *CM&R*: Kan 2003: 29-36.
24. Sanghvi T.G.; Harvey P.W.; Wainwright E.: "Maternal Iron- Folic Acid Supplementation Programmes: Evidence of Impact and Implementation": Academy for Educational Development, Washington D.C., USA.
25. Chandrashekhar, Gautam; Kavita Sekhri; Lekha Saha; Pradeep Kumar Saha: "Iron Deficiency in Pregnancy and the Rationality of Iron Supplementation Prescribed During Pregnancy.": *MedScape* 2008: 10(12): 283.
26. Tania Rastogi; Colin Mathers: "Global Burden of Iron Deficiency Anemia in the Year 2000.": WHO; *Global Burden of Disease*; 2000.