CHAPTER-I

INTRODUCTION

BACKGROUND OF THE STUDY

Tea, the ultimate stimulating agent, originated in China and was considered as the best health drink by the Chinese emperor. Assam is the utmost producer of tea, festooned with a large number of tea estates. Assam and Tea are actually synonymous to each other. Measured as one of the major tea producing arena, the state of ‘blue hills’- Assam hosts numerous tea estates, with a total production of 360 million kg. Almost all of Assam’s Tea Gardens are positioned in the Upper Assam and Southern Barak Valley Region. It is a pleasure to know that today more than 100 tea estates in Assam contribute towards producing a large portion of total tea in India.

Assam can be regarded as the birthplace of Indian tea. Today, the economy of Assam is tremendously based on its Tea. Offering the finest quality of tea, Assam’s tea can be categorized into first flush and second flush tea.

Tea is an important agro industry of Assam which contributes immensely to the state’s economy. Assam’s tea industry is dependent on about two million laborers almost all of whom are the descendents of those who were brought to Assam as slaves first by the East India Company and later by the British rulers and entrepreneurs from 1830s through 1920s, mostly from the Santhal Parganas district of Bihar (now in Jharkhand state). The descendents of these slaves are
now called tea tribes (Chatterjee and Das Gupta, 1981; Verghese, 1996). The tea tribes form the backbone of the tea industry of Assam. The tea-tribes are found mainly in the districts of Darrang, Sonitpur, Lakhimpur, Nagaon, Jorhat, Golaghat, Dibrugarh, Cachar, Hailakandi, Karimganj, Tinsukia and almost all the districts of Assam (Wikipedia).

Tea garden population constitutes 1/5th of the state’s population. Poor socio-economic condition, ignorance due to illiteracy, overcrowded and unhygienic living conditions in the residential colonies make the tea garden population vulnerable to various communicable diseases and nutritional problems.

The tea garden workers, especially the women suffer from Iron Deficiency Anemia due to various factors-  

- Lack of nutritious diet  
- Ill-care during pregnancy  
- Illiteracy  
- Improper health practices  
- Unhygienic sanitation etc.

Iron is very important in maintaining many body functions, including the production of hemoglobin, the molecule in our blood that carries oxygen. Iron is also necessary to maintain healthy cells, skin, hair, and nails.

Iron from the food we eat is absorbed into the body by the cells that line the gastrointestinal tract; the body only absorbs a small fraction of the iron we ingest. The iron is then released into the blood stream, where a protein called
transferrin attaches to it and delivers the iron to the liver. Iron is stored in the liver as ferritin and released as needed to make new red blood cells in the bone marrow. When red blood cells are no longer able to function (after about 120 days in circulation), they are re-absorbed by the spleen. Iron from these old cells can also be recycled by the body.

WHO (2007) report states that, anemia as hemoglobin levels of $\leq 11$ g/dl is one of the world's leading causes of disability, and thus one of the most serious global public health problems. The prevalence of anemia in pregnancy varies considerably because of differences in socioeconomic conditions, lifestyles and health-seeking behaviors across different cultures. Anemia affects nearly half of all pregnant women in the world, 52% in developing countries compared with 23% in the developed world. The most common causes of anemia are poor nutrition, deficiencies of iron and other micronutrients, malaria, hookworm diseases, and schistosomiasis; HIV infection and haemoglobinopathies are additional factors.

Anemia is one of the most prevalent nutritional deficiency problems affecting pregnant women. The high prevalence of iron and other micronutrient deficiencies among women during pregnancy in developing countries is of concern and maternal anemia is still a cause of considerable perinatal morbidity and mortality.
WHO (2008), regards a deficiency in the mineral iron as the top nutritional disorder in the world. Research suggests that as many as 80 percent of people in the world do not have enough iron in their bodies. Without enough iron the body will make fewer RBCs or will produce RBCs that are smaller than normal. This leads to “iron deficiency anemia secondary to inadequate dietary iron intake”—in other words, anemia that is caused by not eating enough food that contain iron.

Anemia is a medical condition where a person has lower than normal levels of red blood cells (RBCs) in his or her blood. It can cause headache, weakness, and many other symptoms, and can also lead to long-term health problems if it is not treated.

WHO (2008), stated that there are many causes of anemia, but iron deficiency anemia is the most common type of anemia. As many as 30 percent of people in the world have anemia due to prolonged iron deficiency.

According to WHO (2009), report on Anemia –Anemia is common throughout the world. It affects mainly the poorest segment of the population, particularly where malnutrition is predominant and the population is exposed to a high risk of water related infection. Anemia is a major contributor towards maternal deaths in developing countries. Association of anemia with helminthes infestations is commonly seen worldwide.
Iron-deficiency anemia is a common anemia (low red blood cell or hemoglobin levels) caused by insufficient dietary intake and absorption of iron, and/or iron loss from bleeding which can originate from a range of sources such as the intestinal, uterine or urinary tract.

Iron deficiency causes approximately half of all anemia cases worldwide, and affects women more often than men. World estimates of iron deficiency occurrence are somewhat vague, but the true number probably exceeds one billion people. This can result if:

- The body does not make enough red blood cells
- Bleeding causes loss of red blood cells more quickly than they can be replaced

**According to American Society of Hematology (2013)** Iron deficiency anemia is very common, especially among women and in people who have a diet that is low in iron.

The following groups of people are at highest risk for iron-deficiency anemia:

- Women who menstruate, particularly if menstrual flow is heavy.
- Women who are pregnant or breastfeeding or those who have recently given birth
- People who have undergone major surgery or physical trauma
- People with gastrointestinal diseases such as celiac disease (sprue), inflammatory bowel diseases such as ulcerative colitis, or Crohn disease
• People with peptic ulcer disease.

• People who have undergone bariatric procedures, especially gastric bypass operations

• Vegetarians, vegans, and other people whose diets do not include iron-rich food (Iron from vegetables, even those that are iron-rich, are not absorbed as well as iron from meat, poultry, and fish.)

Other less common causes of iron deficiency include:

• Blood loss from the gastrointestinal tract due to gastritis (inflammation of the stomach), esophagitis (inflammation of the esophagus), ulcers in the stomach or bowel, hemorrhoids, angiodysplasia (leaky blood vessels similar to varicose veins in the gastrointestinal tract), infections such as diverticulitis, or tumors in the esophagus, stomach, small bowel, or colon

• Blood loss from chronic nosebleeds

• Blood loss from the kidneys or bladder

• Frequent blood donations

• Intravascular hemolysis, a condition in which red blood cells break down in the blood stream, releasing iron that is then lost in the urine. This sometimes occurs in people who engage in vigorous exercise, particularly jogging. This can cause trauma to small blood vessels in the feet, so called “March hematuria.” Intravascular hemolysis can also be seen in other conditions including damaged heart valves or rare disorders such as thrombotic thrombocytopenia purpura (TTP) or diffuse intravascular hemolysis (DIC).
Signs and Symptoms of Iron-Deficiency Anemia:

Symptoms of iron-deficiency anemia are related to decreased oxygen delivery to the entire body and may include:

- Being pale or having yellow “sallow” skin
- Unexplained fatigue or lack of energy
- Shortness of breath or chest pain, especially with activity
- Unexplained generalized weakness
- Rapid heartbeat
- Pounding or “whooshing” in the ears
- Headache, especially with activity
- Craving for ice or clay – “picophagia”
- Sore or smooth tongue
- Brittle nails or hair loss

Diagnosis of Iron-Deficiency Anemia:

Iron-deficiency anemia is diagnosed by blood tests that should include a complete blood count (CBC). Additional tests may be recommended to evaluate the levels of serum ferritin, iron, total iron-binding capacity, and/or transferrin. In an individual who is anemic from iron deficiency, these tests usually show the following results:

- Low hemoglobin (Hg) and hematocrit (Hct)
- Low mean cellular volume (MCV)
- Low ferritin
• Low serum iron (FE)
• High transferrin or total iron-binding capacity (TIBC)
• Low iron saturation

The peripheral smear or blood slide may show small, oval-shaped cells with pale centers. In severe iron deficiency, the white blood count (WBC) may be low and the platelet count may be high or low.

Treatment of Iron Deficiency Anemia:

Even if the cause of the iron deficiency can be identified and treated, it is still usually necessary to take medicinal iron (more iron than a multivitamin can provide) until the deficiency is corrected and the body’s iron stores are replenished. In some cases, if the cause cannot be identified or corrected, the patient may have to receive supplemental iron on an ongoing basis.

There are several ways to increase iron intake:

Diet

• Meat: beef, pork, or lamb, especially organ meats such as liver
• Poultry: chicken, turkey, and duck, especially liver and dark meat
• Fish, especially shellfish, sardines, and anchovies
• Leafy green members of the cabbage family including broccoli, kale, turnip greens, and collard greens
• Legumes, including lima beans, peas, pinto beans, and black-eyed peas
• Iron-enriched pastas, grains, rice, and cereals
Medicinal Iron

The amount of iron needed to treat patients with iron deficiency is higher than the amount found in most daily multivitamin supplements. The amount of iron prescribed by the doctor will be in milligrams (mg) of elemental iron. Most people with iron deficiency need 150-200 mg per day of elemental iron (2 to 5 mg of iron per kilogram of body weight per day).

There is no evidence that any one type of iron salt, liquid, or pill is better than the others, and the amount of elemental iron varies with different preparations. In addition to elemental iron, the iron salt content (ferrous sulfate, fumarate, or gluconate) listed on the package can make it confusing for consumers to know how many tablets or how much liquid to take to get the proper dosage of iron.

Iron is absorbed in the small intestine (duodenum and first part of the jejunum). This means that enteric-coated iron tablets may not work well. If a person takes antacids, he or she should take iron tablets two hours before or four hours after the antacid. Vitamin C (ascorbic acid) improves iron absorption, and some doctors recommend to take 250 mg of vitamin C with iron tablets.

Possible side effects of iron tablets include abdominal discomfort, nausea, vomiting, diarrhea, constipation, and dark stool.
Intravenous Iron

In some cases the doctor may recommend intravenous (IV) iron. IV iron may be necessary to treat iron deficiency in patients who do not absorb iron well in the gastrointestinal tract, patients with severe iron deficiency or chronic blood loss, patients who are receiving supplemental erythropoietin, a hormone that stimulates blood production, or patients who cannot tolerate oral iron.

- Iron dextran
- Iron sucrose
- Ferric gluconate

Large doses of iron can be given at one time when using iron dextran. Iron sucrose and ferric gluconate require more frequent doses spread over several weeks. Some patients may have an allergic reaction to IV iron, so a test dose may be administered before the first infusion. Allergic reactions are more common with iron dextran and may necessitate switching to a different preparation. Severe side effects other than allergic reactions are rare and include urticaria (hives), pruritus (itching), and muscle and joint pain.

Blood Transfusions

Red blood cell transfusions may be given to patients with severe iron-deficiency anemia who are actively bleeding or have significant symptoms such as chest pain, shortness of breath, or weakness. Transfusions are given to replace
deficient red blood cells and will not completely correct the iron deficiency. Red blood cell transfusions will only provide temporary improvement.

Iron Deficiency Anemia, one of the most common chronic hematologic disorders, is found in up to 30% of the world’s population. In the U.S it occurs in about 5% to 10% of people over 45 years of age. In addition, those most susceptible to Iron Deficiency Anemia are the young, those on poor diets and women in their reproductive years.

Population in poor countries and people whose diet lack meat are at particular risk for iron deficiency anemia from insufficient dietary intake of iron, the most prevalent hematologic disorder worldwide. About 30% of the world’s population has this anemia. Anemia raises important international economic concern for two reasons:

- The diminished capacity of individuals to perform physical labor
- The impact on the growth, development and learning of infants and children.

According to National Family Health Survey-3(2005-06), Adolescence in India goes hand in hand with iron-deficiency anemia. IDA presents the statistics that mark a growth in cases pertaining to anemia. Most of the anemic patients, especially women, suffer from mild to severe iron deficiency. The hemoglobin count in most of the adolescent girls in India is less than the standard 12 g/deciliter, the standard accepted worldwide. In India 57.9% women are anemic of which 54.6% are in urban areas and 59% are in rural areas.
According to Dr R S Chatterjee, Iron deficiency anemia (IDA) is the most prevalent form of anemia in India, but “Lack of consciousness among women aggravates the situation, as now –a- days, they attach more importance to losing weight”.

Dr Anant Mohan reported that lack of consciousness, especially regarding the cause of the disease, is one of the main reasons of preponderance of anemia. “While heavy menstrual bleeding in adolescent girls cause anemia, intestinal worms and intake of mildly toxic elements by children, like paint and mud also facilitate the disease. It is very important to provide a child with iron supplements in order to protect him or her from anemia,”

WHO (2000) revealed that, in the developed world, where intestinal worm parasite burden is less than in many undeveloped countries, about 20% of all women of childbearing age have iron deficiency anemia, compared to only 3% of adult men. The principal cause of iron deficiency anemia in these countries is blood loss during menses in premenopausal women, which is not compensated by intake from food and supplements. Around 9 out of 10 anemia sufferers live in developing countries; about 2 million people suffer from anemia and it is observed that iron deficiency is also present in a large number of people.

According to WHO (2002), estimates India is one of the countries in the world that has the highest prevalence of anemia. Iron deficiency is the most common single cause of anemia worldwide, accounting about half of the causes of
anemia. Estimates of iron deficiency world wide range very high and the number almost certainly exceed one billion persons globally. Worldwide, the most important cause of iron deficiency anemia is parasitic infection caused by hookworms, and roundworms, in which intestinal bleeding caused by the worms can lead to undetected blood loss in the stool.

WHO (2002), reported that Anemia is common throughout the world. Its main cause, Iron deficiency, is the most prevalent nutritional deficiency in the world. Several infections related to hygiene, sanitation, safe drinking water and water management are significant contributors to anemia in addition to Iron deficiency. Anemia may contribute up to 20% of maternal deaths.

In North America and Europe, iron deficiency is most common in women of childbearing age and as a manifestation of hemorrhage. Iron deficiency caused solely by diet is uncommon in adults in countries where meat is an important part of the diet. Depending upon the criteria used for the diagnosis of iron deficiency, approximately 4-8% of premenopausal women are iron deficient. In men and postmenopausal women, iron deficiency is uncommon in the absence of bleeding.

In countries where little meat is in the diet, iron deficiency anemia is 6-8 times more prevalent than in North America and Europe. This occurs despite consumption of a diet that contains an equivalent amount of total dietary iron because heme iron is absorbed better from the diet than nonheme iron. In certain
geographic areas, intestinal parasites, particularly hookworm, worsen the iron deficiency because of blood loss from the gastrointestinal tract. Anemia is more profound among children and premenopausal women in these environs.

A study on Iron-Deficiency Anemia and Changing Dietary Behaviors among Adolescent Girls in Maharashtra explores and evaluates communication strategies developed to address India's high prevalence of iron-deficiency anemia among women. Between 60% and 70% of Indian adolescent girls are anemic, a condition that can result in adverse pregnancy outcomes or even maternal death, as well as reduced work productivity and impaired physical capabilities. Adolescence, as a period of growth and development, is considered the most appropriate time to intervene.

National Family Health Survey- 2(1998-99) reported that, in Uttar Pradesh alone, 85 per cent of children under the age of three years suffer from deficiency of iron, a leap of 11.3 per cent, but women within the age group of 25 to 49 suffer the most

Madhusmita De et al (2008) conducted a study on Prevalence of Anemia in tribal population of Eastern and North-East India (Assam, Arunachal Pradesh, Tripura & West Bengal). The incidence of anemia among the tribal population of Assam was 59.82%, Arunachal Pradesh was 53.77% & Tripura was 57.45%.

Medhi G K et al (2006) revealed in their study of health problems and nutritional status of tea garden population of Assam found that prevalence of
Anemia was 71.8% in males and 72.2% in females, underweight among children was 59.9% and worm infestation was 65.4%.

All Assam Small Tea Growers Association of INDIA (2007) reported that Assam has all total **768** tea gardens. Most of the tea gardens are situated in the upper Assam districts. Sonitpur district has a total of 72 nos of tea gardens and thus contributes a lot to Assam’s economy.

Many researches have been conducted in different districts of Assam regarding various nutritional and health related problems, socio economic conditions, but no research studies were conducted in the Sonitpur District tea garden areas though it contributes a lot to the Indian economy. Therefore the investigator is very much interested to conduct a study among the tea garden women of Sonitpur District.

After extensive review of literature the investigator has found that many researches have already been conducted on various aspects among the tea garden workers. Very few researches have been conducted in areas like anemia specially Iron Deficiency Anemia among the tea garden women. Tea industry is the backbone of Assam’s economy and tea garden women play a vital role in all tea gardens of Assam. It is our prime responsibility to maintain a high standard of health of these women. Studies also revealed that iron deficiency is related to productivity of workers in tea plantation areas. Most of the time it is observed that women of tea gardens are one of the most underprivileged groups. They cannot afford a nutritious diet and are neglected even during the time of
pregnancy. The Researcher felt the need of focusing mainly on Iron Deficiency anemia among the tea garden women as they are not well fed and deprived of nutritious diet and health care practices. Keeping all these aspects in mind the researcher has formulated the problem statement as -

**Problem statement:** A study on Iron Deficiency Anemia (IDA) among the tea garden women of Sonitpur District, Assam.

**Objectives:**

- To assess the prevalence of Anemia among the tea garden women.
- To study the prevalence of Iron Deficiency Anemia among the tea garden women of Sonitpur District, Assam.
- To determine the risk factors of Iron Deficiency Anemia among the women of tea gardens of Sonitpur District, Assam.
- To correlate Hb% and serum iron among the tea garden women.
- To associate the Prevalence of Iron Deficiency Anemia among the tea garden women with their selected demographic variables.
- To establish the association between risk factors and prevalence of iron deficiency anemia among the tea garden women.

**Operational definition:**
**Prevalence:** The number of tea garden women exhibiting the signs and symptoms of Iron Deficiency Anemia, as diagnosed by a modified standard diagnostic checklist and blood investigation report of laboratory.

**Tea garden women:** A female, whose age is between 14-45 years and belonging to a tea tribe community residing and working in the tea garden areas.

**Iron deficiency anemia:** Iron deficiency anemia is a common anemia caused by insufficient dietary intake and absorption of iron, and/or iron loss from bleeding, worm infestation as diagnosed by the diagnostic check list of a tea garden health center modified by the researcher and blood investigation report (serum iron) of laboratory.

**Anemia:** Anemia is a condition in which the number of red blood cells or their oxygen-carrying capacity is insufficient to meet physiologic needs, which vary by age, sex, altitude, smoking, and pregnancy status as measured by using WHO color scale.

**Risk factors:** In this study risk factors are the factors which contribute to prevalence of iron deficiency anemia assessed by using an inventory check list.

**Hygienic:** In this study the term hygienic means the proper ways of disposing the “refuse” means the solid discarded material produced by tea garden women habitation except human excreta by using any one of the disposal method like open dumping, burning, burying.

**Unhygienic:** In this study the term unhygienic means the improper ways of disposing the “refuse” means the solid discarded material produced by tea garden
women habitation except human excreta without using any one of the disposal
method like open dumping, burning, burying.

**Balanced Diet:** In this study a balanced diet is one which contains all the
nutrients from various food groups such as energy providing foods, body
building foods and protective foods in adequate amounts which helps to meet
the daily requirement of all the nutrients.

**Recommended dietary allowances for Indians**

<table>
<thead>
<tr>
<th>Group</th>
<th>Particulars</th>
<th>Body wt (kg)</th>
<th>Net energy K.Cal</th>
<th>Protein g/dl</th>
<th>Fat g/dl</th>
<th>Iron Mg/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td>women</td>
<td>Sedentary</td>
<td></td>
<td>1875</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>50</td>
<td>2225</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heavy work</td>
<td></td>
<td>2925</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pregnant women</td>
<td>50 +30</td>
<td>+15</td>
<td>30</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lactation</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>0-6 months</td>
<td>50 +550</td>
<td>+25</td>
<td>45</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6-12 months</td>
<td>50 +400</td>
<td>+18</td>
<td>45</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td><strong>Girls</strong></td>
<td>13-15 years</td>
<td>46.7</td>
<td>2060</td>
<td>65</td>
<td>22</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>16-18 years</td>
<td>49.9</td>
<td>2060</td>
<td>63</td>
<td>22</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: National Institute of Nutrition.

**Adequate diet:** In this study diet which is consumed by the tea garden women
according to the recommended dietary allowances which contains all the
nutrients from various food groups such as energy providing foods, body
building foods and protective foods in adequate amounts which helps meet the
daily requirement of all the nutrients.

**Inadequate diet:** In this study diet which is consumed by the tea garden women
are deficit according to the recommended dietary allowances which contains all
the nutrients from various food groups such as energy providing foods, body
building foods and protective foods in adequate amounts which helps meet the
daily requirement of all the nutrients.

Tea garden women are considered as heavy workers as they constantly work for
8 hrs.

**Assumption:**

- Tea garden women may have mild –moderate level of prevalence of
  anemia.
- Tea garden women may have mild –moderate level of prevalence of Iron
  Deficiency anemia.
- Inadequate dietary intake may be one of the risk factors of iron
deficiency anemia.

**Null hypothesis:**
\( H_{01} \)-There is no significant association of prevalence of Iron Deficiency Anemia with their selected demographic variables.

\( H_{02} \)-There is no significant association between risk factors and prevalence of Iron Deficiency Anemia among the tea garden women.