# A Study to Prevent Iron Deficiency by Jaggery

Project Report
Submitted by

Dr. Sourabh Jain
Assistant Professor
Shri Ram College
Muzaffarnagar

funded by

Indian Potash Ltd.
Muzaffarnagar

**Shri Ram College**
**Muzaffarnagar**

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# INDIAN POTASH LIMITED

IPL
INDIAN POTASH LIMITED

Village & Post - Titawi, Distt Muzaffarnagar
Ph.: 0131-2486452, 2486497 Fax: 0131-2486603

Ref: IPL/2019/231

Date:

21/6/2019

To,

Dr Sourabh Jain
Department of Biosciences,
Shri Ram Charitable Trust,
Muzaffarnagar

Dear Dr Jain,

I am pleased to inform you that your request for funding the Project *A Study to Prevent Iron Deficiency by Jaggery* has received approval for the amount of Rs:50,000/-.

You are being sent the funding as a direct grant. You will be required to fill out a final report on your project once your it is completed. If you need additional time to complete your project, or would like to take more funding, you are requested to inform the undersigned.

We congratulate you and thank you for your efforts on behalf of our company.

(Sudheer Kumar)
General Manager

Enclosed:
Cheque No. 328976, Dated 18.06.2019,
Bank Name- State Bank of India, Railway Road, Muzaffarnagar
Amount: Rs. 50,000 in favor of Shri Ram Charitable Trust

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GOEL RAKESH & CO.
CHARTERED ACCOUNTANTS

57-A, Agarwal Market, First Floor,
Mahavir Chowk,
Muzaffarnagar (U.P) – 251001
Phone No. 0131-2622405

# Utilization Certificate

| S.N. | Detail of sanction of Fund with Project name and Duration | Amount |
|---|---|---|
| 1. | 60-Day project on A Study of villages Under Unnat Bharat Abhiyan, Date of Sanction of Fund- 21-06-2019 as per Sanction Letter | 50000.00 |
| | TOTAL | 50000.00 |

It is Certified that out of Rs. 50000.00 (Rs. Fifty Thousand Only) of grants sanctioned by **M/s Indian Potash Ltd** during the year 2019-20 in favor of **Shri Ram College, Muzaffarnagar,** a sum of Rs. 50000.00 has been utilized for the purpose of the project for which it was sanctioned and that the balance of Rs. **Nil** remaining unutilized at the end of the year has been surrendered. The Extra amount (If any) is met out by Shri Ram College.

2. Certified that we have satisfied our self that the conditions on which the grant was sanctioned have been duly fulfilled/are being fulfilled and that we have exercised the following checks to see that the money was actually utilized for the purpose for which it was sanctioned.

Kinds of checks exercise-

1 Checking of cash book
2 Checking of payment vouchers.
3 Checking of expenses bills.

For Shri Ram College

Secretary

Place: Muzaffarnagar
Date- 29-08-2019

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For Goel Rakesh & Co.
Chartered Accountants

Rakesh Kumar Goel
Proprietor
M. No. 071858
FRN : 003374C

# A Study to Prevent Iron Deficiency by Jaggery

Iron deficiency anaemia poses a burden on the limited health care delivery system. Current pharmacological anti anaemic agents cause undesirable side effect like nausea, vomiting dark stool *etc*. Herbal remedies offer the potential for alternative treatment strategies. This study was therefore conducted in an effort to formulate a food based extract prepared from Jaggery.

**INTRODUCTION:** Iron is essential element for blood production. It is used for formation of haemoglobin, oxygen transportation, brain development, regulation of body temperature and muscle activity. The most severe consequence of iron depletion is iron deficiency anaemia (IDA). Iron deficiency anaemia is still considered the most common nutritional deficiency worldwide. It generally results when the iron demands by the body are not met by iron absorption. Individuals with IDA have inadequate intake, impaired absorption or transport, physiologic losses associated with chronological or reproductive age, or chronic blood loss secondary to disease. Accelerated development, hormonal changes, unhealthy food and starting of menstruation in girls are major causes for iron deficiency anaemia in adolescence period. During this time, physical changes affect the body□s nutritional needs, while changes in lifestyle may affect eating habits and food choices. Adolescent nutrition is therefore important for supporting the physical growth of the body and for preventing future health problems.

Haemoglobin (Hb) is a complex protein found in red blood cells that contains an iron molecule. The main function of haemoglobin is to carry oxygen from the lungs to the body tissues, and to exchange the oxygen for carbon dioxide, and then carry the carbon dioxide back to the lungs and where it is exchanged for oxygen. Iron absorption is significantly increased by the presence of Vitamin C, (ascorbic acid). Vitamin C plays a vital role in the synthesis of red blood cells. Food iron is absorbed by the intestinal mucosa from two separate pools of heme and nonheme iron. Heme iron, derived from haemoglobin and myoglobin, is well absorbed and relatively little affected by other foods consumed in the same meal. On the other hand, the absorption of non-heme iron, the major dietary pool, is greatly influenced by meal composition.

Ascorbic acid is a powerful enhancer of non-heme iron absorption and can reverse the inhibiting effect of substances such as tea and calcium / phosphate. Recommended dietary requirements of Vitamin C in adolescent girls is 65mg. The enhancement of iron absorption from vegetable meals is directly proportional to the quantity of Vitamin C present. The period of early adolescence corresponds with the adolescent growth spurt and the highest iron needs. In addition, younger adolescents are easier to reach than the older ones because of higher enrolment rates in primary schools. There has been a steady increase in the school enrolment rates of girls in India [4] Therefore; the school network offers an excellent opportunity to reach "captive" adolescent children. These girls could be motivated to take responsibility of reaching "non-school going" girls.

Researchers identified different strategies to fight iron deficiencies such as, distribution of iron supplements, fortification of staple foods such as salt or flour; and food-based approaches which are used in combination with nutrition education programs. Adolescent girls with nutritional anaemia are prone to many health hazards. It affects growth, concentration, school performance and capacity to perform physical work. There is decreased immunity and inadequate preparation for motherhood. Numerous studies among children have shown that the prevalence of anaemia ranges from 52 - 96.50% in India.

In many countries national guidelines and standards of care for anaemia in adolescents are, in practice to improve the outcome of treatment. However, the practice remains less satisfactory in India, which might partly be due to diverse religions, food habits, lifestyles, languages, cultures, and traditions that influence management practices. There are possible side effects such as epigastric discomfort, nausea, diarrhoea, or constipation may be seen with a daily dose of iron at 60mg or more. There is a darkening (blackish) of faeces following oral iron therapy (WHO 2001). So it finds difficulty in the administration of iron tablet among adolescent girls.

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Iron and Folic Acid supplementation remains the main strategy for combating anaemia and improving haemoglobin status of adolescent girls and nutritional supplements are complementary strategy to improve it. The present study is based on community resources. Since amla, jaggery and pumpkin leaves are locally available, cost effective can be easily stored and utilized by community people. Supplementations of locally available foods helps to reduce the prevalence of anemia at lower cost and useful to the community for combating anaemia. There are several nutritional programs for the prevention of iron deficiency anaemia.

Most of the programmes are running on papers not in ground level. In a country like India with varying social customs and taboos against females pre disposes malnutrition among girls. The nutritional status which is often poor during early life gets worsened as the adolescent growth spurt occurs. The present study was based on alternative preventive and control strategies such as food based approach only at a micro customized level; in a school where the parents were concerned and motivated.

**MATERIALS AND METHODS:**

**Plant Collection:** Amla (*Embelica officinalis*) and pumpkin leaves (*Cucurbita pepo*) were collected from Magadi village and jaggery purchased at local market in Maddur (Wednesday open market for jaggery).

**Prepration of Amla Jaggery and Pumpkin Leaves Extract:** The first step was the preparation of Amla juice.

It was prepared by slicing 500gm of fresh Amla in to small pieces. (Removed the seeds) and blended well. This pulp was mixed with quarter liter of boiled and cooled water and used a sieve to strain it. The second step was two medium sized pumpkin leaves blended well with 50ml of water and strained out the juice. The third step was preparation of jaggery syrup by melting 1000gm jaggery in 250ml of water. Fourth step the herbal extract was prepared by adding the Amla (250ml) and pumpkin (50ml) leaves extract to the jaggery syrup. It was administered to the adolescent girls 30ml per day prior to lunch for duration of 60 days with the help of an ounce glass.

**Standardization of the Herbal Extract:** The standardization of extract was done at "Bangalore Test house at Rajajinagar". The herbal mixture was subjected to nutrient analysis. The extract has prepared as per the guidance of dieticians and Ayurvedic doctor before supplementing the extract to adolescent girls. The result of the analysis showed that with nil alcohol content, 40% Vitamin C and the level of Fe 101.27mg/kg.

**Participants:** An experimental design with pre-test and post test control group was used for the study. This study was conducted among adolescent girls after getting Institutional Human Ethics Committee of Saveetha University, (011/01/2015/IEC/SU Dated 20/01/2015). Informed consent and assent was obtained from the adolescent girls and from their parents. The total sample consists of 120 adolescent girls between the age group of 14-17 years studying at selected higher secondary school using simple random sampling method. The sixty participants from Srigandhadakaval Public School were taken to control group and sixty participants from Gangothri Public School was taken to experimental group.

**Inclusion and Exclusion Criteria:** The study includes adolescent girls in the age group of 14-17 years, who were studying at selected higher secondary schools with haemoglobin level less than 12gm%, attained menarche and willing to participate in the study. The study excludes adolescent girls with any systemic disease, with history of metrorrhoes / menorrhagia, reproductive disorders.

**Methodology:**

**Phase I:** A prior permission was taken from the school authorities. Informed consent and assent was obtained from adolescent girls and from their parents. The purpose of the study was explained to adolescent girls and their parents. The screening test was conducted in two steps. Check list was used to assess the signs and symptoms of anaemia with the score of 1-26. The second screening test adopted was sahlis method of measuring the level of haemoglobin as a confirmatory diagnostic investigation. The adolescent girls with mild and moderate anaemia (Hb is 7-11.9gm/dl) were selected as samples for the study.

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**Phase II:** The structured questionnaire was used to collect demographic and clinical profoma. The blood withdrawal procedure was explained in detail. 5ml of venous blood was collected and sent to the lab for the estimation of haemoglobin, Vitamin C and iron.

**Phase III:** The freshly prepared extract was given to the adolescent girls in the experimental group. It was administered to the adolescent girls in a quantity of 30ml per day prior to lunch for duration of 60 days the with the help of an ounce glass. It was administered during the lunch break before having the food between 12:30-1:00pm for the duration of 60 days from Monday to Saturday.

**Phase IV:** After 60 days, post-test was carried out with the same procedure.

**RESULT:**

**FIG. 1: LEVEL OF HAEMOGLOBIN**

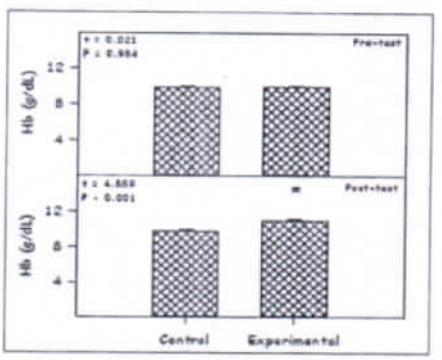
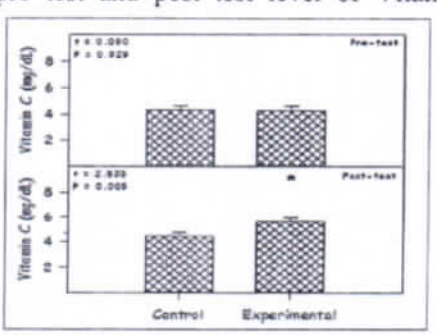



**Fig. 1** represents the comparison of pre test and post test level of haemoglobin of the control group and experimental group. The mean and standard error of control group pre test, post test, experimental group, pre test, post test were 9.93+0.172, 9.86+0.17, 9.94+0.45, 0.99+0.19
respectively. The comparison of pre and post test level of haemoglobin within control group using paired ttest value obtained was 0.469 ($p = 0.641$) which was not significant. The comparison of experimental pre and post test level of haemoglobin using paired ttest value was 3.96 ($p < 0.001$) which was found to be highly significant. In the experimental group there was a rise in mean value from 9.942 to 10.99 which shows that the herbal extract was effective in improving the level of haemoglobin among the adolescent girls.

The comparison of pre test level of haemoglobin of control group and experimental group using unpaired t test value was 0.02 ($p = 0.984$) which was not significant. The comparison of post test level of haemoglobin of the control and experimental group using unpaired ttest value was 4.56 ($p < 0.001$) which found to be highly significant. Hence there was significant difference observed in the post test level of haemoglobin between the control and experimental group after receiving herbal extract.

**FIG. 2: LEVEL OF VITAMIN C**

**Fig. 2** represents comparison of pre test and post test level of Vitamin C of the control group and

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experimental group. The mean and standard error of control group pre test, post test, experimental, pre test and post test were 4.34+0.26, 4.46+0.26, 4.30+0.33, 5.63+0.32 respectively. The comparison of pre and post test level of Vitamin C within the control group using paired t est value obtained was 0.92 (P = 0.361) which was not significant. The comparison of experimental pre and post test level of Vitamin C using paired t test value was 7.81 ($p < 0.001$) which was found to be highly significant. In the experimental group there was a rise in mean value from 4.302 to 5.63 it shows that the intervention to the experimental group was effective in increasing the level of Vitamin C among adolescent girls.

The comparison of pre test level of Vitamin C of the control group and the experimental group using unpaired t test value was 0.0089 ($p = 0.929$) which was not significant The comparison of post test level of haemoglobin of the control group and experimental group using unpaired test value obtained was 2.84 ($p = 0.05$) and was highly significant which proved there was a significant difference noted between the control group and experimental group after receiving the herbal extract for sixty days.

**DISCUSSION:** Iron deficiency anaemia is the most common micronutrient deficiency in the world, bringing serious economic consequences and obstacles to national development. Accelerated growth during adolescence makes it a period during which earlier growth deficiencies might at least partially compensated. Therefore adolescence is an opportune time for interventions to address anaemia and improve their nutritional status, thus reducing reproductive risk and increasing productive capacity.

In the present study there was a difference in the mean level of haemoglobin between the pre test and post test among experimental group and the mean difference observed was $t = 3.96$ ($p < 0.001$). And also post test means score of experimental group was higher than the control group after the intervention. It shows that the level of haemoglobin in the blood increased after the administration of herbal extract for 60 days. A similar study has conducted on impact of leaf concentrate and iron folic acid supplementation on blood profile of anaemic adolescent girls. The study found that a statistically significant improvement had taken place in haemoglobin level, as well as other blood parameters.

Impact of lotus stem supplementation on the haemoglobin status of the college students (17-19 years) indicated that a significant increase in level of haemoglobin. A study on impact of leaf concentration and iron folic acid supplementation on blood profile of anaemic adolescent girls. Group 1 was supplemented with one tablet of iron and folic acid (50mg elemental iron and 500 microgram of folic acid). The group II was supplemented with 10gm of leaf concentration powder. The result highlighted that there was significant improvement in all blood parameters of group II compared to group one.

In the present study there was difference in the level of Vitamin C between the pre test and post test among experimental group and the difference obtained was $t = 7.81$ ($p < 0.001$). And also there was difference in the comparison of post assessment level of Vitamin C of the experimental and control group. It found that the herbal extract was effective in increasing the level of Vitamin C in the blood after the administration of herbal extract to the experimental group.

This study consistent with a study on Impact of iron, folic acid and Vitamin C supplementation on the prevalence of iron deficiency anaemia in anaemic non-pregnant woman of Shimla age group of 15-65 years showed that the experimental group was divided into two sub-groups. Group 1 supplemented with iron, folic acid and Vitamin C. Group 2 was supplemented with iron and folic acid alone. No supplements were given to control group. There was considerable improvement in the haemoglobin status of subjects on supplementation with iron and folate alone but more with Vitamin
C. The study emphasised on the need to improve the diet through increased intake of fruits and vegetables rich in Vitamin C.

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