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# Iron deficiency anaemia and effect of nutrition education on change in dietary behavior among the adolescent girls of tea garden area in Nagaon District, Assam

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### Abstract

Anaemia is a manifestation of under-nutrition and poor dietary intake of iron is a serious public Health problem among pregnant woman, infants, young children and adolescents. The prevalence of Anaemia is high in developing countries than the developed countries due to poverty, inadequate diet, high incidence of communicable diseases, Pregnancy /lactation and low immunity. India has the highest prevalence of Anaemia among women, including adolescent, worldwide. Between 60 to 70% of Indian adolescent girls are anemic (Hemoglobin (Hb) <12g/dl). Therefore, to address this strategic gap, the researcher would like to conduct a participatory nutrition education and intervention on Iron rich diet study to improve the dietary behavior status, and reduce the prevalence of anemia among unmarried adolescent girls<sup>1</sup>. The main objective of the study was to assess the haemoglobin level among adolescent girls before nutrition education on Iron rich food. To assess the dietary practices among the adolescent tea garden Girls in selected Tea Garden of Nagaon District, Assam and to find out the effectiveness of Nutrition education on changing dietary practices among the adolescent girls of Tea Garden, Nagaon District Assam The research approach is Descriptive Evaluative approach and Research design adopted was pre-experimental one group pre-test post-test design. The total sample for the study is 800. Hence the for the Present pilot study the Researches has collected the Data from 10% of the total Population i.e. 80 numbers of Adolescent girls of Lungsung and Chapanala Tea Garden area of Nagaon District. The study results shows that food consumption habit mean score in Baseline assessment is higher than the Endline assessment Paired 't' value is 31.54 which was significant at  $p < 0.05$  level. There is significant association between the pretest level of Hb with the selected Demographic Variable such as age, religion, working status, water sanitation, consumption of Iron Tablets and Consumption of Albendazole tablet. As the tabulated value is less than the calculated value of Chi-square at  $p < 0.05$  level.

**Keywords:** Iron, anaemia, Haemoglobin

### 1. Introduction

Anaemia can be defined by a condition in which the total haemoglobin (Hb) level or number of red blood cells (RBCs) is poorly lowered. The World Health Organization (WHO) defines anaemia as Hb <130 g/L in men older than 15 years, 110 g/L in pregnant women, and <120 g/L in non-pregnant women older than age 15 years. Table 1 shows the definition of anaemia as defined by the World Health Organization (WHO) Iron deficiency anaemia (IDA) is a certain anaemic condition arising due to the inadequate iron to form normal RBCs. IDA is usually caused by insufficient iron intake, chronic blood loss, and increased iron demand<sup>2</sup>. The prevalence of IDA varies across the world. Recognizing the original aetiology and the relevant diagnostic and therapeutic issues are primary keys in the management and assessment of this disorder<sup>[2]</sup>.

Iron is an important dietary mineral associated with many body functions like oxygen transport in the blood. Iron deficiency anaemia is characterized by incomplete haemoglobin synthesis that results in microcytic and hypochromic red blood cells. Due to inadequate haemoglobin, the ability of blood to deliver oxygen to the other body cells and tissues is reduced<sup>[3]</sup>.

**Table 1:** World health organization definition of anaemia. 2

Population	Hb Diagnostic of Anaemia (g/dL)
Children aged 6 months to 6 years old	<11.0
Children aged 6-14 years old	<12.0
Adult men	<13.0
Adult non-pregnant women	<12.0
Adult pregnant women	<11.0

An adolescent girl who enters the reproductive age with low iron stores and becomes pregnant during adolescence or later is at greater risk of giving birth to a low birth weight and preterm baby. The baby is also born with low iron stores and due to poor infant feeding practices is more likely than ever to enter adolescence with low iron stores in the body. Thus this vicious cycle of iron deficiency anaemia continues. Women in general are more prone to anaemia than men because of smaller stores of iron and the onset of menstruation imposes additional requirement of iron to compensate for menstrual blood loss. In Indian girls, the highest prevalence of anaemia is reported between the ages of 12-13 years which also coincides with the average age of menarche. In girls, the lower total food intake or energy intake by compared to boys, combined with menstrual losses cause adolescent girls to be at greater risk of iron deficiency and IDA [4].

Chaudhary M Sanjeev, Dhage (Oct 2002-March 2003) conducted a study on Anaemia among Adolescent Females. The aim of the study was to estimate the prevalence of anaemia among adolescent females and to study the socio-demographic factors associated with anaemia. A cross-sectional survey was conducted among 296 adolescent females (10-19 years old) in an urban area under Urban Health Training Center, Department of Preventive and Social Medicine, Government Medical College and Hospital, Nagpur. The study result showed that prevalence of anemia was found to be 35.1%. A significant association of anemia was found with socio-economic status and literacy status of parents [2].

According to National Family Health Survey (NFHS-4, 16) survey, about 40% of women are mildly anaemic, 12% are moderately anaemic, and 1% is severely anaemic. Among men, 12% are classified as mildly anaemic, 10% moderately anaemic, and 1% severely anaemic.

A quasi-experimental study was conducted by Sangroula Raj Kumar among 115 mild to moderately anemic pregnant women attending ante natal clinics. Pregnant women were consecutively enrolled and assigned to receive nutrition education and diet plan in intervention group (n = 58) and general education only in control group (n = 57). The study result shows that consumption of iron rich food was significantly high in intervention Group

## 2. Objectives

The objectives of the study are:

- To assess the haemoglobin level among adolescent girls before nutrition education on Iron rich food.
- To assess the dietary practices among the adolescent tea garden Girls in selected Tea Garden of Nagaon District, Assam.
- To find out the effectiveness of Nutrition education on changing dietary practices among the adolescent girls of Tea Garden, Nagaon District Assam.
- To find out the association between Pre-test level of

Haemoglobin with their selected socio-demographic variables.

## 3. Methodology

### 3.1 Research Design and Type

The research approach selected for the present study was Descriptive Evaluative approach

In order to achieve the objectives the Pre- Experimental Design with One group pre-test-post-test study design Approach is used for the present study to evaluate the effect of Nutrition Education on change in Dietary behavior. A Cross sectional study designed is obtained to collect information from the population regarding the food habits, haemoglobin level, and lifestyle of these populations

Group of Adolescent girls N=	Pre-test(before trial)	Intervention	Post-test(After trial)
Study Group	0 <sub>1</sub>	X	0 <sub>2</sub>

### Key

N = Sample number

0<sub>1</sub> = Assessment of Anthropometric measurement and Hemoglobin level, serum ferritinine, food frequency and Dietary practices among adolescent girls.

X= Nutrition Education on Iron deficiency Anaemia and Iron rich food.

0<sub>2</sub>= Assessment of Hemoglobin level, food frequency and Dietary practices, among adolescent girls.

### 3.1.1 Hypothesis

**H01:** = There is significant difference between the food consumption level before and after nutritional education.

**H2:** There is significant association between the pretest haemoglobin level and the selected demographic variables i.e. age, religion, caste, educational Status, Family income, working status, location of housing, type of house, toilet facility, sources of water supply, purification of water, water sanitation, puberty, duration menstrual bleeding availability of cattle shed, Kitchen facility, consumption of Iron tablet and consumption of Albendazole tablet.s

### 3.1.2 Variable

**Independent Variable:** Nutrition Education on Iron rich food.

**Dependent Variable:** It includes the dietary practices of Adolescent tea garden girls and Haemoglobin level of adolescent Tea Girls.

### Socio Economic and demographic Variable

1. **Socio-economic indicator:** It includes age, religion, caste, Educational Status of Respondents, occupation of the Parents, Marital Status, occupation of Self, Type of family, size of Family Total Family income Monthly expenses on food,
2. **Environmental Factor/Indicator:** It includes location of housing, type of house, toilet facility at home and work place, Sewage disposal, sources of water supply, purification of water, water sanitation, availability of cattle shed, Kitchen facility, type of fuel used for cooking, sources of lighting, availability of education facility availability of Health Facility.
3. **Behavioural Indicator:** It includes Smoking /drug abuse/alcohol abuse by parents, Habit of Handwashing,

Cleaning of perineum after toilet uses, Roaming with bare foot/ without chappal.

### 3.1.3 Description of the study setting

Tea community represents approximately 17% of Assam's Population and 10% of Nagaon district. Nagaon District has 26 registered tea estates in contributing to 10% of Assam production.

In this present study 12 tea Garden out of 26 registered tea Gardens are selected

### 3.1.4 Population

In this study it refers to adolescent tea Garden girls residing in selected tea gardens of Nagaon District Assam. The total population of the adolescent girls in 12 selected tea gardens are nearly 2000.

### 3.1.5 Sample

In this present study the sample size is consists of 432 adolescent girls age between 10-19 years in selected Tea Gardens of Nagaon District Assam.

For the pilot study the data has been collected from the 40 numbers of adolescent girls from each Tea Garden of Lungsung Tea garden, 40 numbers of Chapanala Tea Garden respectively the baseline study to endline study

### 3.1.6 Study tools

The tool was divided in to three section. Tool I deals with Socio economic and Demographic characteristics of Adolescent girls. Tool II: Checklist for Health and Nutritional status of Tea Garden Adolescent Girls which consist of Anthropometric measurement, Signs and symptoms of anaemia and Hemoglobin level and serum ferritin level. Tool III: Checklist list for Assessment of food frequency and dietary practices (24 hours dietary recall method).

### 3.1.7 Content Validity

Content validity of the tool was established from the field of Community Health Nursing, field of Nutrition, field of Paediatric Nursing and from the field of Ayurvedic Medicine.

### 3.1.8 Reliability of the tool

The reliability of the instrument was assessed by using interrator method (Karl Pearson's formula). The value was found to be reliable [r=0.9]. The reliability of the observational checklist was assessed by using interrator method (Karl Pearson's formula). The value was found to be reliable [r=0.9].

### 4. Pilot Study procedure

The Present pilot study the Researches has collected the Data from 10% of the total Population i.e 80 numbers of Adolescent girls of Lungsung and Chapanala Tea Garden area of Nagaon District by using non-probability purposive sampling technique. The data has been collected from the 40 numbers of adolescent girls from each Tea Garden of Lungsung Tea garden, 40 numbers of Chapanala Tea Garden respectively the baseline study to endline study.

### Main Study

The first phase of main study data collection was done for the 250 numbers of Adolescent girls respectively from the baseline study to end line. Data collection was conducted from April 1/4/2021 to September 30/9/2021.

The analysis and interpretation of data of Main study (First phase) collected from the 250 adolescent girls from six numbers of selected Tea Garden Area of Nagaon district Assam namely Matiyapahar, Udmari, Barbagan, Khanajan, Balijuri, Jiajuri-1. In the Baseline Assessment dietary practices, food frequency was observed for the 250 adolescent. Anaemic adolescent observe for continuously 3 alternate days in a week before the nutrition education using individual Dietary intake checklist/food practice checklist and 24 hour Dietary recall Method followed by Nutritional education on Iron deficiency anaemia and iron rich food was delivered. Endline assessment was carried out at 12 weeks by using 24 hours recall method for 3 alternate days in a weeks and checked the Haemoglobin level.

The collected data was organized and interpreted using descriptive and inferential statistics and was coded and analyzed as per objectives of the study under the following headings

**Section A:** Distribution of socio-economic and demographic status

**Table 1:** Frequency and percentage of Socio-Economic and demographic Status of Tea Garden adolescent girls. N-250

Socio-economic and demographic status		
I. Socio-economic information	Number	Percentage
Variable		
<b>1. Age</b>		
10-12 years	56	22.4
13-15 years	114	45.6
16 -19 years	80	32
<b>2. Religion</b>		
Hindu	200	80
Christian	40	16
Islam	10	4
Any other,Specify	0	0
<b>3. Caste</b>		
General	60	24
OBC	145	58
SC	25	10
ST	20	8
Any other	0	
<b>4. Educational Status of the Respondent</b>		

a. Illiterate	66	26.4
b. Primary	95	38
c. Middle level	44	17.6
d. HSLC Pass	35	14
e. Higher secondary	10	4
f. Graduation		
g. Above Graduation		
<b>5. Occupation of the parents</b>		
<b>Father</b>		
a. Regular tea garden labourer	120	48
b. Temporary tea Garden labourer	70	28
c. Agriculture	21	8.4
d. Unemployed	10	4
e. Any other	29	11.6
<b>Mother</b>		
a. Regular tea garden labourer	60	24
b. Temporary tea Garden labourer	70	28
c. Agriculture	4	1.6
d. Unemployed	112	44.8
e. Any other	4	1.6
<b>6. Marital Status</b>		
Unmarried	250	100
Married	0	
<b>7. Occupation of self</b>		
a. Regular tea garden labourer	15	6
b. Temporary tea Garden labourer	16	6.4
d. Student	163	65.2
c. Agriculture		
d. Unemployed	56	22.4
e. Any other	0	
<b>8. Occupation of husband, in case of married adolescent</b>		
a. Regular tea garden labourer		
b. Temporary tea Garden labourer		
c. Agriculture		
d. Unemployed		
e. Any other		
<b>9. Type of Family</b>		
a. Nuclear	220	88
b. Joint	30	12
<b>10. Size of Family (No of Family Member)</b>		
a. 1-2	3	1.2
b. 3-4	70	28
c. 5-6	140	56
d. 7-9	33	13.2
e. Above 9	4	1.6
<b>11. Total monthly income</b>		
a. Less than 1000	0	0
b. Rs 1,000-3000	10	4
c. Rs 3,000-6000	55	22
d. Rs 6,000-9000	149	59.6
e. Above 9000	36	14.4
<b>12. Monthly Expenses on Food</b>		
a. Less than 1000	5	2
b. Rs 1,000-3000	156	62.4
c. Rs 3,000-5000	85	34
d. Above 5000	4	1.6
<b>II. Environmental Factor</b>		
<b>1. Location of Housing</b>		
a. Basti area	130	52
b. Quarter	120	48
<b>2. Type of House</b>		
a. Katcha	91	36.4
b. Pakka	120	48
c. Semi Pakka	39	15.6
<b>3. Do you have Toilet facility?</b>		
a. Yes	130	52
b. No	120	48
If Yes, what type of		

(i) Sanitary	120	48
(iii) Katcha	10	4
if no,		
a. Open air defecation	42	16.8
b. Public/community /relative place	78	31.2
<b>4. Do you have toilet facility at work place?</b>		
a. Yes	10	4
b. No	11	4.4
If Yes, what type of		
a. Sanitary	10	4
b. Katcha		
<b>5. Sewage disposal</b>		
a. Pit toilet latrine	100	40
i. Own	50	20
ii. Shared	40	16
iii. Public	10	4
b. Sanitary Latrine	70	28
i. Own	40	16
ii. Shared	10	4
iii. Public	20	8
c. No facility/bush/field	80	32
d. Any other		
<b>6. Sources of Water &amp; Supply</b>		
<b>a. Piped water</b>		
i. Piped into residence		
ii. Public tap	34	13.6
<b>b. Well</b>		
i. Well in residence	22	8.8
ii. Public well	20	8
<b>c. Surface Water</b>		
c. Pond/river /Lake	49	19.6
<b>d. Ground water</b>		
i. Tube-well in residence	39	15.6
ii. Tube well in yard	86	34.4
<b>7. How do you purify of water</b>		
a. None	102	40.8
b. Filtration	34	13.6
c. Boiling	114	45.6
<b>8. Water sanitation</b>		
a. Latrine within 10 m of the water source	130	52
b. Water is accessible to domestic animals	68	27.2
c. Other contamination like dumping areas, drainage etc. within 10 m radius	106	42.4
d. Waste water collection on the platform of water source.	130	52
e. Drainage channel was missing, damaged or blocked with debris of households		
f. Regular bathing, washing of clothes and cooking utensils at the platform or near the water sources in of cases.	130	52
<b>9. Any Pet/animal kept at home?</b>		
a. Yes	180	72
b. No	70	28
<b>10 Kitchen Facility</b>		
a. Yes	250	100
b. No		
If Yes (Attached in separate room)	130	52
(living room itself)	120	48
<b>11. Type of fuel use for cooking</b>		
a. Wood	189	75.6
b. Cow dung cakes	4	1.6
c. Kerosene	37	14.8
d. Charcoal		
e. LPG	20	8
f. Other		
<b>12. Source of Lighting</b>		
a. Electricity	120	48
b. Kerosene	130	52

c. Candle		
d. Oil		
e. Other		
<b>13. Availability of Education Facility</b>		
a. Yes, If Yes		
i. Government	163	65.2
ii. Non-Government	0	0
b. No		
<b>14. Availability of Health Facility</b>		
a. Yes, If Yes		
i. Government	250	100
ii. Non-Government	0	
b. No		
<b>III. Behavioural related indicators</b>		
<b>1. Smoking /drug abuse/alcohol abuse by parents?</b>		
a. yes	180	72
b. No	70	28
<b>2. Habit of hand washing before food</b>		
a. Yes	120	48
b. No	60	24
c. Sometime	70	28
<b>3. Habit of hand washing with soap after coming from toilet</b>		
a. Yes	223	89.2
b. No	10	4
c. Sometime	17	6.8
<b>4. Cleaning of perineum after using toilet</b>		
a. With Soap and water	50	20
b. Only water	200	80
<b>5. Habit of roaming without chappal/bare foot</b>		
a. Yes	120	48
b. No	80	32
c. Sometime	50	20
<b>6. Taken Weekly Iron and Folic Acid Tab distributed from Govt. or self</b>		
a. Yes	50	20
b. No	200	80
<b>If Yes, Reported any Complaints of Iron tablet</b>		
<b>7. Taken albendazole tablet (Dewarming)</b>		
a. Yes	180	72
b. No	70	28

Table 1 shows Socio-Economic and demographic Status of study participants N=250

A total of 250 tea Garden adolescent girls participated in the first phase of main study, the majority 45.6 percentage are falls under the age of 13-15 years of Age. Around 80% of the study participants were Hindu religion. More than 50% (around 58%) of the participants were OBC. Most of the 38% participants had educational level up to primary level only. All the participants were unmarried. More than 70% (76% parents (Father Works in the Garden and 56% mothers are working in the tea Garden. All the adolescent girls (100%) are unmarried. Majority 65.2% adolescent girls are students; 12.4% participants are working in the tea garden. Majority 88% participants have nuclear family and 56% numbers of participants had family members from 5-6 nos. most of the 59.6% participants had total income of 6000-9000 and 62.4% participants has monthly expenses of 1000-3000.

#### Environmental Factor

Majority 52% participants are residing in Basti area where as 48% were lives in Pacca House. More than 13.6% study participants were drinking water from Public tap, 16% participants were drinking from well 19.6% participants were drinking water from Pond/river /lake. 49% participants were drinking water from Ground water. Where as 40.8% of

the participants were drinking water without any purification. Majority 52% of the study participants had toilet facility and 16.8% of the study participants uses Open spaces for defecation. Majority (52%) study participants used the platform or near the water source area for regular bathing, washing of clothes and cleaning of cooking utensils. Majority 72% of the study participants had Cattle shed at their home. All the participants (100%) had Kitchen facility. More than 70% (75.6) study participant's uses wood for cooking. Half of the participants (52%) uses kerosene for electricity. More than 60% (65.2) participants are studying in Govt. School.

#### Behavioural related indicators

Majority 72% participant's parents are having Smoking /drug abuse/alcohol abuse where as 48% has the habit of hand washing before food Majority 89.2% participants had the habit of handwashing with soap after coming from toilet. 80% participants had Cleaning of perineum after using toilet where as 48% has the Habit of roaming without chappal /bare foot.

#### Section B

Health and Nutritional status of Tea Garden Adolescent Girls.

**Table 2:** Frequency and percentage of Health and Nutritional status of Tea Garden adolescent girls. N=250

SL. No.	Variables	Frequency (F)	Percentage (%)
1	<b>BMI (kg/m<sup>2</sup>)</b>		
	a. Underweight (<18.5)	100	40
	b. Normal (18.5-23)	150	60
	c. Overweight (23-27.5)		
2	<b>Sign and symptoms of Anemia</b>		
	(a) Pallor in Conjunctiva, tongue and nail	151	60.4
	(b) Glossitis (inflammation of tongue)	0	0
	(c) Stomatitis (inflammation of mouth)	0	0
	(d) Oedema of legs	3	1.2
	(e) Tachycardia	5	2
	(f) Puffiness of face	0	0
	(g) Irritability	5	2
3	<b>Symptoms of Anaemia</b>		
	(a) Fatigue	124	49.6
	(b) Loss of appetite	86	34.4
	(c) Headache		
	(d) Breathlessness		
	(e) Giddiness	25	10
	(f) Palpitation	31	12.4
	(g) Brittle hair	45	18
	(h) Bone pain	5	2
4	<b>Hemoglobin level</b>		
	No Anaemia Hemoglobin >12	22	8.8
	Mild Anaemic 10-12 gm/dl	155	62
	(Moderate Anaemic 7-10gm/dl	73	29.2
	Severe Anaemic (<7)	0	0
5	<b>Serum Ferritin level (Tested only for Severe and Moderate Anaemic) n=73</b>		
	Normal 11.0-306.8ng/ml	50	20
	low <11ng/ml	23	9.2
6	<b>Puberty attained</b>		
	Yes, if age of attaining puberty	102	40.8
	No	70	28
7	<b>Duration of Menstrual Bleeding</b>		
	2-4 days	13	5.2
	b. 5-7 days	71	28.4
	c. More than 7days	18	7.2
8	<b>Monthly Menstrual Cycle</b>		
	15-20 days	2	0.8
	21-28 days	30	12
	More than 28 days	70	28
9	<b>Health Complaints</b>		
	a. Painful Menstrual Cycle	46	18.4
	b. Irregular Mensural cycle	16	6.4
	c. Loss of weight	46	18.4
	d. Loose motion		
	e. Gum bleeding		
	f. Loss of appetite	26	10.4
	g. Weakness	34	13.6
	h. Night blindness		
	i. Passage of worm in stool/mouth		
	j. Any other, specify		
10	<b>Reproductive infection</b>		
	a. Vaginal discharge	15	6
	b. Lower abdominal Pain	2	0.8
	c. Any ulcer in perineal Region	Nil	

Table 2 shows the prevalence of anemia was found to be 91.2 out of which 62% of them had mild anemia. And 29.2% of them had Moderate anaemia. 60% of study participants had normal weight where as 40% had underweight. Above half (60.2%) of the study participants had the symptoms of pallor in Conjunctiva, tongue and nail. 49.6% participants had fatigue, 34.4% participants had the problems of loss of appetite. Lower ferritin level (< 11

mg/ml) was found in 9.2% (23/73) participants. More than (40.8%) of adolescent girls had already menstruated. Around 28.4% of adolescent girls had duration of menstrual flow  $\geq 5$  days during each cycle. Above half of the adolescent girls 56.25% had a habit of Hand-washing before eating or using toilet. More than 70% (71.25) of the participants used only water for cleaning of perineum after using toilet. N=250.

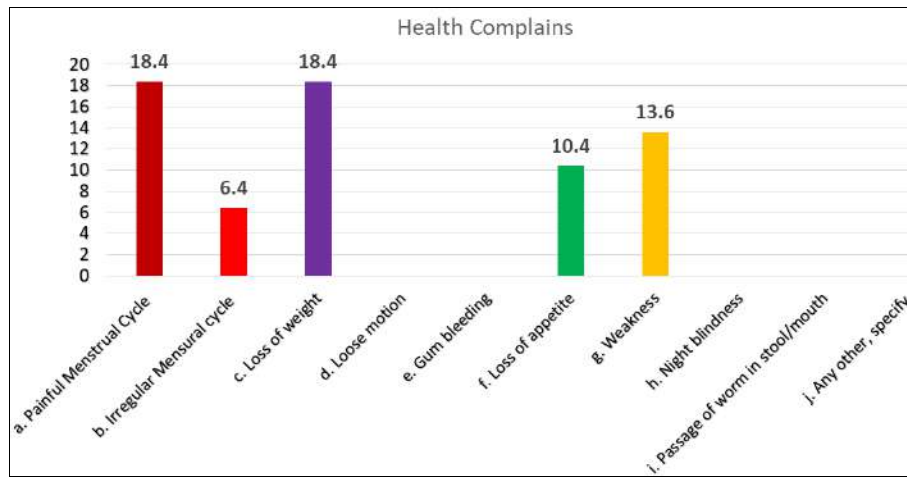


Fig 1: Health Complains

Bar diagram shows 18.4% adolescent girls had painful menstruation. 6.4% had irregular menstruation, 18.4% had loss of weight, 10.4% had loss of appetite, 13.6% had weakness.

**Section C**  
Dietary Practices of Tea Garden Adolescent Girls

Table 3: Frequency and percentage of Dietary Practices of Tea Garden Adolescent Girls N=250

Dietary Practices						
A. Individual Dietary Intake	Baseline 1		Baseline 2		End-line	
	Number	Frequency	Number	Frequency	Number	Frequency
1. Vegetarian	0					
2. Non-Vegetarian Vegetarian	250	100	250	100	250	100
<b>Meal Frequency per day</b>						
twice a day	116	46.4	100	40	90	36
Thrice a day	128	51.2	135	54	140	56
>3 times a day	6	2.4	15	6	20	8
<b>Nos of food items per meal</b>						
1-2 food items	137	54.8	137	54.8	137	54.8
3-4 items	53	21.2	53	21.2	53	21.2
>4 items	0	0				
<b>Post meal consumption of Tea (within 30 min)</b>						
Yes	111	44.4	98	39.2	80	32
No	139	55.6	152	60.8	170	68
<b>Consumption of green leafy vegetables</b>						
None	82	32.8	50	20	30	12
1-2 times/week	90	36	100	40	110	44
3-4 times/week	39	15.6	50	20	60	24
>4 times/week	26	10.4	40	16	45	18
Sometimes	13	5.2	10	4	5	2
<b>Consumption of legumes (Beans/peas/nuts/lentils)</b>						
none	27	10.8	30	12	30	12
Daily	33	13.2	40	16	50	20
1-3 times /week	87	34.8	90	36	90	36
>=4 times/week	54	21.6	60	24	60	24
Sometimes	49	19.6	30	12	20	8
<b>Consumption of Meat/ poultry/ fish</b>						
none	0	0	0	0	0	0
Daily						
1-2 times /week	111	44.4	111	44.4	111	44.4
>=3 times/week	110	44	110	44	110	44
Sometimes	29	11.6	29	11.6	29	11.6
<b>Consumption of Milk and milk products /week</b>						
none	117	46.8	117	46.8	117	46.8
daily	26	10.4	26	10.4	26	10.4
1-2 times/week	31	12.4	31	12.4	31	12.4
>=3 times/week	37	14.8	37	14.8	37	14.8
Sometimes	39	15.6	39	15.6	39	15.6
<b>Consumption of Fruits</b>						
None	125	50	110	44	85	34



Daily						
1-2 times/week	38	15.2	50	20	70	28
>=3 times/week	23	9.2	40	16	55	22
Sometimes	64	25.6	50	20	40	16
<b>Free school Feeding programme</b>						
Yes						
No	250	100	250	100	250	100
<b>Habit of Drinking Hariya/ Alcohol/ Tobacco</b>						
Yes						
No	250	100	250	100	250	100
Is Yes, Frequency of drinking daily						
Amount of Hariya Daily						
<b>Do you have habit of Eating extra salt with meals</b>						
a. Yes	112	44.8	90	36	50	20
b. No	138	55.2	160	64	200	80
<b>Do you take Weekly Iron and Folic Acid Tab distributed from Govt. or self</b>						
a. Yes	82	32.8	100	40	150	60
b. No	168	67.2	150	60	100	40
<b>Reason for Irregular Intake of Iron Tablet</b>						
No response	14	8.3	10	4	5	2.9
other reasons	8	4.76	10	4	3	1.78
Parents Ignorance	13	7.7	10	4	5	2.9
Misinformation/Misconcepts	11	6.54	15	8.9	7	4.16
<b>Distance</b>						
Timing inconvenient						
In availability of the tablet	32	12.8	60	35.71	50	29.76
Side effect of the tablet	55	22	30	17.85	20	11.90
Self-Ignorance	35	14	15	8.9	10	4

Table 3 shows in the baseline assessment 51% of the participants had practices food thrice a day which was increases to 56% in the Final assessment. 25% adolescent girls had practices 4-6 items daily which is increased in post-test to 37.5%. In the baseline assessment (44.5% adolescent had practices of post meal consumption of Tea (within 30 min) which was decreases to 68% in final assessment. Half (32.5%) of the adolescent girls does not

had the habit of eating green leafy vegetables in the baseline assessment where as it is decrease to 12% in the final assessment. The free school feeding programme remain same 52.5% in the baseline assessment 1 and 2. None of adolescent girl had the habit of drinking Hariya. Using of Extra salt with meal is decreasing from 44.2% to 20%. Taking of Iron and Folic Acid under WIFS programme increasing from 32% to 60%

**Comparisons of Food consumption pattern during baseline to end line study**

24 Hours Dietary Recall								
Variable	Baseline Assessment (X)	Final Assessment (Y)	Mean difference (y-x)	Standard deviation	t value			
<b>Daily in gram</b>								
1.	Rice (Daily in Gram)	315.76	318.29	2.53	3.91	73.42		
2.	Dal (Masoor dal) daily in gram	15	18	3				
3.	Other vegetable in cooked (Daily in Gram)	86.37	110	23.63				
<b>Weekly in gram</b>								
1.	Iron rich green leafy (Weekly in gram)	80	115	35				
2.	Refined flour (Atta, Maida) weekly in gram	56.66	120	63.34				
3.	Egg weekly in gram	66	67	1				
4.	Fish (weekly in gram)	60	77	17				
5.	Meat (weekly in gram)	163.08	185	21.92				
6.	Diary Product (weekly in gram)	233.3	234	0.7				
7.	Fruits (Weekly in Gram)	52.56	62	9.44				
8.	Pulses Whole (Sprouts)							
9.	Cereals (Puffed rice, Flake Rice) Weekly in gram	83.75	84	0.25				
10.	Pickled veg. (Weekly in gram)	20	20					
11.	Dessert/sweet	nil	nil					
12.	Legumes (weekly in gram)							
	Nuts and			0				

p<0.05

Food consumption habit mean score in Final Assessment is higher than the baseline assessment. Paired ‘t’<sub>129</sub> value is 78.42 which was significant at p<0.05 level. Hence Null hypothesis is rejected and Research Hypothesis

H<sub>1</sub> is accepted.  
H<sub>1</sub> = There is a significant difference between the food consumption level before and after nutritional education  
Table 4: Association of selected demographic variable with

Pre-test Hemoglobin level Null Hypothesis

H<sub>0</sub>: There is no significant association between the pretest haemoglobin level and the selected demographic variables i.e. age, religion, caste, educational Status, Family income, working status, location of housing, type of house, toilet

facility, sources of water supply, purification of water, water sanitation, puberty, duration menstrual bleeding availability of cattle shed, Kitchen facility, consumption of Iron tablet and consumption of Albendazole tablet N=250

Socio Demographic Variable							
Sl. No	Demographic Variable	(F)	Mid Hb	Moderate Hb	DF	Chi-Square	Inference P<0.05
1	<b>Age</b>				2	11.38	Significant P value = 5.99
	10-12 years	10	8	2			
	13-15 years	40	10	30			
	16 -19 years	25	7	18			
2	<b>Religion</b>				2	7.41 7.41	Significant P value = 5.99 Significant P value = 5.99
	Hindu	70	20	50			
	Christian	5	5	0			
	Islam	0	0	0			
	<b>Any other, Specify</b>						
3	<b>Caste</b>				3	3.006	Not Significant P value =7.82
	General	2	2	0			
	OBC	58	18	40			
	SC	10	3	7			
	ST	5	2	3			
	<b>Any other</b>						
4	<b>Marital Status</b>						NS
	Unmarried	80	100				
	<b>Married</b>						
5	<b>Educational Status</b>					3.34	Not Significant P value 7.82
	Primary school	20	10	10			
	Middle School	15	5	10			
	High school	30	10	20			
	Above	10	0	10			
6	<b>Working status</b>				1	4.11	Significant P value 3.84
	Only household works	55	25	30			
	Works at Tea Garden	20	3	17			
7	<b>Location of Housing</b>				1	0.79	Not Significant P value =3.84
	Basti Area	55	20	35			
	Tea Garden Quarter	20	5	15			
8	<b>Type of House</b>				2	3.804	Not Significant P value =5.99
	Katcha	40	10	30			
	Pakka	20	10	10			
	Semi Pakka	15	5	10			
9	<b>Toilet facility</b>				2	3.39	Not Significant P value =5.99
	Own, If Yes	72	90				
	(i) Sanitary	0	0	0			
	(ii) Pakka	20	10	10			
	(iii) Katcha	47	13	34			
	Open air defecation	8	2	6			
	Public/community	0	0	0			
10	<b>Sources of Water &amp; Supply</b>				1	0.8162	Not Significant P value =3.84
	Tap Water	0	0	0			
	Well	55	20	35			
	Pond	0	0	0			
	Tube-well	20	5	15			
11	<b>Purification of Water</b>				1	10.55	Significant P value =3.84
	None	40	20	20			
	Filtration	35	5	30			
	Boiling	0	0	0			
13	<b>Cattle Shed</b>				1	0.27	Not Significant P value =3.84
	Yes	67	23	44			
	No	8	2	6			
14	<b>Kitchen Facility</b>				1	0.18	Not Significant P value =3.84
	a. Yes, If Yes	80	100				
	Attached	60	20	40			
	separate	15	5	10			
	b. No						
15	<b>Do you take Weekly Iron and Folic Acid Tab distributed from Govt. or self</b>				1	12	Significant
	Yes	25	15	10			

	No	50	10	40			P value =3.84
	<b>If Yes, then any compliant reported</b>						
16	<b>Do you take Albendazole tab in every 6 monthly distributed from Govt. or self</b>						
	a. Yes	41	20	21	1	9.7	Significant P value =3.84
	b. No	34	5	29			

Table 4: Chi-square value was calculated to find out the association between the nutritional education among adolescent girls with iron deficiency anemia with their selected demographic variables such as age, religion, caste, Marital Status, Educational Status, working status, location of housing, type of house, toilet facility, sources of water supply, purification of water, water sanitation, availability of cattle shed, Kitchen facility, Consumption of Iron tablet and consumption of Albendazole tablet. The demographic variables like age, education, total family members, type of family, income per month, religion, type of food consumption, source of health information had no association with hemoglobin and signs and symptoms scores of iron deficiency anemia after pretest hemoglobin level among adolescent girls. There is significant association between the pretest level of Hb with the selected Demographic Variable such as age, religion, working status, water sanitation, consumption of Iron Tablets and Consumption of Albendazole tablet. As the tabulated value is less than the calculated value of Chi- square at  $p < 0.05$  level. Hence the Research hypothesis is partially accepted

### Conclusion

The present study assessed the effectiveness of nutritional education among adolescent girls with iron deficiency anemia. The study findings revealed that there was a significant difference in the pre and post-test nutritional education score. ('t' value 78.42). Therefore it is evident that the nutritional education is effective in changing the dietary practices among the adolescent girls.

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### Author's Contribution

Not available

### Conflict of Interest

Not available

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