Anaemia Prevalence Among University Students And Impact of an Iron Rich Supplement

By

K. Geetha

A THESIS SUBMITTED TO THE AVINASHILINGAM INSTITUTE OF HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN - DEEMED UNIVERSITY, COIMBATORE - 641 043

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE IN FOOD SERVICE MANAGEMENT AND DIETETICS

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CERTIFIED AS BONAFIED RESEARCH WORK

SIGNATURE OF THE HEAD
OF THE DEPARTMENT

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Introduction

I. INTRODUCTION

Todays healthy adolescents constitute tomorrows healthy citizens of any nation. Adolescent is a process rather than a period, a process of achieving the desirable growth, attitude, beliefs and methods for effective participation in society as the emerging adult (Devadas, 1996).

A profound growth period of adolescents requires increase in energy, protein, minerals and vitamins. Iron are particularly needed, because menstrual iron losses in the adolescent girls pre-dispose her to iron deficiency anaemia (Rolfes, 1991).

Although most teenagers do not have anaemia, adolescence is a particularly vulnerable time, especially for girls with well chosen diets at calorie levels to maintain optimal weight for age, the iron intake is likely to be 10 to 12 mg per day, not the 18 milligram of the Recommended Dietary Allowances. For many girls such an intake may appear to be adequate, but may not provide the iron reserves needed when menstrual losses are high or when the body is stressed by illness or the additional demands of pregnancy. Unfortunately many teenagers have particulars bizarre, inadequate diet that do not being to meet the needs and that further depleted iron reserves (Robinson etal, 1986).

There does seem to be a trend towards a decrease in the age at menarche over the decades both in the rural and urban situation, not only in the affluent upper classes but also among the poor classes of urban and rural community and making adolescent girl susceptible to anaemia (Neeman 1990)

A significant number of women in the developing world also fall easy victims to anaemia arising due to iron and folate deficiencies. Anaemia is being considered today as a major public health hazard affecting millions of women belonging to reproductive age group. Children and adolescent girls are most common in all the groups to the tune of 20-25 percent irrespective of the social class (Ramalakshmi, 1995).

Anaemia is the reduction in the total quantity of Haemoglobin in the circulating blood, with consequent impairment in the delivery of oxygen, to the tissues. Erythrocyte (Red blood cells) may be decreased in number, the amount of Haemoglobin in the red blood cells may be decresed or both may occur because of iron deficiency (Boyle, 1992).

Nutritional anaemia, particularly iron deficiency are among the most wide spread nutritional problems in the world, affecting primarily, developing countries, and to a lesser degree, industrialised countries. According to the World Health Organisation these disorders affect between 15 and 20 percent of the world's population (Pallares etal, 1993).

According to the world Health organisation criteria anaemia in India ranges from 38 - 72 percent depending upon age and sex (Rao, 1993).

Multicentric studies conducted by the Indian Council of Medical Research showed that anaemia is not confined to pregnent women alone, but affects other segments of the population as well. Prevalence of Anaemia was higher in rural than in urban

areas. In rural calcutta it was more than 80 percent. The percentage of prevalence of Anaemic girls between the age 15-24 years were 95 percent, 64.4 percent, 63.7 percent and 19 percent in Calcutta (rural), Hydrabad (rural), Delhi (rural) and Madras (Urban) respectively (Reddy etal, 1993).

Poor iron status in teenagers is a special problem caused by several factors. The main reason for the greater risk of anaemia during adolescent is due to the lack of iron in traditional snack foods. Other factors are over emphasis on dairy products by some teenagers, vegetarianism and the minimal contribution made by fast foods to iron intakes (Cafaldo etal, 1989).

Hamorrhagic anaemia through an exessive blood iron loss, past gastrectomy anaemia due to lack of gastric hydrochloric acid necessary to liberate iron for absorption and mal absorption anaemia is due to the presence of iron binding agents that prevent its absorption or mucosal lesions that affect the absorbing surface (Williams, 1990).

The daily requirement of iron for girls between (13-18 years) of age were 2.4 milligram and for menstruating women 2.8 milligram (Park, 1994).

Realising the prevalence of anaemia among adolescent girls in the various parts of the country, the present study was conducted to find out the prevalence of anaemia among selected university adolescent girls and to study the impact of iron supplement on the Haemoglobin level and to compare the prevalence

rate of adolescent population in two colleges. The main objectives of this study are to

- Assess the prevalence of anaemia among the adolescent girls in the age group of 17 - 18 years in two colleges.
- Select anaemic girls from the samples surveyed.
- Supplement the samples with iron tablets and iron rich food for a period of two months.
- Study the impact of the supplementations of the selected samples.

Review of Literature

II. REVIEW OF LITERATURE

The review of literature for the title "Anaemia Prevalence among University Students and Impact of an Iron Rich Supplement" are presented under the following headings

A. Anaemia Prevalence

B. Factors affecting iron status in adolescent population.

C. Effect of Iron Supplementation

D. Bio availability of iron in food and tablets.

A Anaemia Prevalence

According to Gopalan (1986) the prevalence of anaemia is mostly attributed to iron and other nutritional deficiency and the percentage prevalence is more among the low income group. Anaemia due to iron deficiency is so widespread that it extends to a large cross section of the population including males. It is estimated that in India, the prevalence is atleast 50 percent among preschool children, 20 percent among school children, 60-70 percent among adolescent girls, 80 to 90 percent among expectant women, 30 to 40 percent among adult males. Among the males of rural India the prevalence percentage is approximately as 28 to 30 percent.

Prevalence of anaemia in Hydrabad, India was 25.7 percent by clinical assessment of pallor and 80.5 percent by estimation of Haemoglobin concentration (Rao, 1990).

Available information on iron deficiency and anaemia among indonesian population was analysed and found out that prevalence

was 21.1 percent in adolescent girls (Gross etal, 1997).

Toylor etal (1993) showed that the prevalence of iron deficiency ranged from 35 percent in 1 to 3 years old children to 10 percent adolescent population, the values being almost identical in the non anaemic group compared with the total population.

The prevalence of iron deficiencies in Europe is highest among children (2 years old), adolescents and young women especially during pregnancy (Burg, 1992).

The results of the first half of the Third National Health and nutrition Examination Survey as conducted in the US between 1988 and 1994 by Dallman etal (1995) reviewed that the prevalence of iron deficiency in females, the prevalence of both condition lose in adolescents and the child bearing years to about 8 - 13 percent with iron deficiency and 2-4 percent with iron deficiency anaemia.

According to zein and Assefa (1987) the prevalence of anaemia among population living at different attitudes in north western ethiopia showed the general prevalence rate of anaemia was 40.5 percent (44.5 percent in males and 36percent in females) decreasing with increasing attitude.

The prevalence of iron deficiency and iron deficiency anaemia in 452 adolescent poor Jamaican girls from a inner city school in kingston Jamaica studied by Himes etal (1997) showed that prevalence of iron deficiency and iron deficiency anaemia was 7.6 and 4.3 percentage respectively.

B Factors affecting Iron Status in adolescents

The body needs various minerals essential for proper metabolism, among them Iron tops the list. Ayuilera etal (1994) states that total iron binding capacity was significantly lower in the youngest and higher in the oldest girls than in boys of the same ages and among the boys values were higher in the younger group.

According to Bergstrom etal, (1995), preliminary findings show that there seems to be an association between low physical fitness, high body mass index and high iron stores in adolescent boys.

Iron status of adolescent boys and girls as influenced by variation in dietary ascorbic acid and iron intakes was studied by kies et al (1989) seemed that dietary factors influencing Iron availability were better predictors of iron status than the total iron intake.

Iron status and food intakes of children and adolescents living in medium sized mediterranean city in spain had no relation between bio chemical indicators of iron status and total iron dietary intake (salas etal, 1990).

Auttila etal (1995) suggested that boys with large individual iron needs will be able to stimulate their gastro intestinal absorption of iron to the meet their needs, Serum ferritin decreased along with pubertal development, particularly in individuals with fastest growth. The decreasing iron stores may have an important stimulatory effect on iron absorption which probably account for the majority of the increased iron needs.

In relation to total energy density of iron per unit of energy seemed low, showing the difficulty of covering iron requirement in relation to energy intake regarding the Tunisian diet (Hamdoul etal, 1991)

The relationship between serum retinol and biochemical indices of iron nutritional status amongst adolescent girls was examined by Ahmed etal, (1996) suggested that there is an interaction between serum retinol and biochemical indices. Iron nutrition in adolescent girls who do not display any clinical Signs of overt deficiency.

Borel etal, (1991) indicates day to day biological varriation is a major component of the variability in these iron status indicators and must be considered when assessing iron status.

Bergstorm (1995) suggested that the difference in iron status between boys and girls in adolescence results primarily from biological difference other than menstrual bleeding or insufficient iron intake.

About 80 percent of the iron in the body is in the blood, so iron losses are greatest whenever blood is lost. For this reason, Women need more iron, menstruation incurs losses, that make a women's iron needs twice than the man's iron through urine and shed skin in 0.5 to 1.0 milligram. Through menstruation (about 15 milligram total averaged over 30 days) is 0.5 milligram, for growth 0.5 milligram so total average daily need will be 1.5 and 2.0 milligram (Hegarthy, 1995)

Dritchard etal, (1991) resulted that the role of hookworm in the aetiology of anaemia may be difficult to assess without the accurate measurement of hookworm burden. So there was significant corellation between plasma ferritin and hookworm burden.

Hookworm infestation, Malaria and other infection if present further aggravate iron dificiency aneamia and increase its prevalence. The most favourable groups of pregnant women and preschool children among whoom prevalence of anaemia may exceed to percent. The main cause of anaemia in India is iron deficiency. Folate deficiency also contribute to aneamia among pregnant women and school children (Roa 1993)

The relationship between iron status and degree of infection by schistosoma haematobium was studied by prual etal, (1992) shows that inverse relationship between degree of infection schistosoma haematobium and iron status.

Daily total iron losses in faeces, urine and sweat in endurance trained atheletes are about 1.7 milligram (compared with the value of 1 milligram) in males about 2.3 milligram (compared with the reference value of 1.4 milligram) in females because of the additional iron losses with menses. Investigation of the extent of iron losses and utilisation in persons exercising for fitness in needed (weaver, 1992).

Food intake record of iron deficient and iron replete distance runners and non exercising controls of both sex were analysed jacabs etal, (1992) shows that the habitual consumption

of iron poor diet is a factor in the aetiology of athletes iron deficiency.

A study conducted by Nelson etal, (1994) on iron deficiency anaemia and physical performance in adolescent girls from different ethnic backgrounds, suggested that physical performance may be compromised at mid levels of anaemia

C. Effect of Iron Supplementation

Examination showed that the iron supplemented children had grown significantly more in terms of weight, weight for Height, arm circumstances and skin foled thickness than had the placebo group, haemoglobin values also improved significantly (Latham etal, 1990)

The effect of a daily oral iron supplementation (160 mg) studied by Magazanik etal (1991) shows that a daily oral iron supplementation improved, several haematological variables and their body iron status.

Jensen etal, (1991) states that the effect of moderate, aerobic excercise training and iron supplementation was beneficial in maintaining or improving iron stores moderately exercising women.

A Study was undertaken in Beijing, China results a functional consequences of iron supplementation in iron deficient female cotton mill workers with ferrous sulphate (Fe 60 or 120 mg/day) or placebo treatment showed that iron supplementation enabled the women to do the same work at low energy cost [Li et al, 1994]

The impact of iron supplementation on school children of different ages of both sex was studied by seshadri, (1989) who investigated impacts of iron supplementation significantly improved scores in cognitive function after the 8th month.

A supplements containing iron 16.47 +/- 0.48 to 17.67 +/- 0.55 mg/100g consisting of whole wheat, pearl millet, bengal gram, green gram, ground nuts, amaranth leaves (Amaranth gangilicus) and jaggery (unrefined brown sugar) showed supplement mixes of cerals, pulses, nuts and leafy vegetables are good sources of iron and could improve iron status of young children of low income group (Dhiya etal, 1994)

Yepez etal, 1988 indicated that Haemoglobin concentration in 22 children significantly increased (more than 1gm per 100ml) after two months of Iron supplementations.

A study conducted by Gopaldas (1987) on the effect of giving 60 mg elemental iron (Feso 4) for a period of sixty days, resulted that prevalence of anaemia was 90 percent before supplementation and was reduced to 30 poercent after supplementation.

Ballin etal (1992) conducted a study on iron status in female adolescent, by supplementing iron containing syrup for 2 months in Isreal, shows that iron supplementation significantly improved for adolescent girls.

D. Bioavailability of iron in food and tablets

The Bioavailability of iron in a diet based on extruded maize or soya bean, semolina (70:30) resulted that it is

significant only at dinner, the quantities absorved in 3 meals were significantly greater with fortfied diet. Daily bioavalibility of total iron in normal women was 2.74 mg with the fortified diet and 1.18 mg with nonfortified diet and showed that ferrous fumerate 46 mg was adequate (maron et al, 1989).

Although absorption of iron from the gastro intestinal tract is strictly controlled excretipon limited to iron lost from exfoliation of skin and gastro intestinal cells, customary and abnormal blood loss. Persons highly vulnerable to iorn deficiency have high iron needs, as during growth and pregnancy high iron loss, as during marked haemorrhage and excess rice and or frequent menustral loses on diet with low iron content or bioavalibility. Food iron is classified as haem or nonhaem. meat, fish and poultry is heam iron its absortion rate is 15 to 35 percent. Foods containing nonheam iron and it make a larger contribution to the body's iron pool despite, its lower absorption rate of 2 to 20 percent absorption od nonheam iron is influenced by the level of iron stores and by contaminately comsumed dietory components. Factors whic increase absorption such ascorbic acid and meat, fish and poultry may increase nonheam iron avalibility (mansen, 1988).

Hulten etal, (1995) conducted a study to validate a new method of measuring iron absorption from the whole diet, shows that for the diet, bioavailability of dietary iron is a key factor in iron nutrition. The powerful control of iron absorption implies that dietary iron over loaded cannot develop

in normal diet even with diets having high iron content or high bioavailability.

An overview on dietary factors influencing iron absorption, there was 2 kinds of iron in the diet with respect to the mechanism for absorption heam and nonheam iron. Heam iron is derrived mainly from meat and from only a small fraction of the total dietary iron, 5 to 10 percent in western countries. Nonheam iron is thus the major part of dietary iron. These 2 kinds of iron probably utilised 2 different receptors on the mucosal cells for their absorption. Their absorption is differently affected by the iron status of the subjects. Various dietary factor markedly affect the absorption of non heam iron too, whereas absorption of heam iron is less affected by external factors (Rossander, 1995)

A absorption of iron from a whey concentrate product, nonvegian brown whey cheese, supplemented with ferrous sulphate, was estimated by using a extrinsic ratio iron label, by Broch et al (1994) shows that brown whey cheese may contain a promotor of nonheam absorption.

Hallberg (1995) states that the regulation of iron absorption from food is very effective when administered in tablet form, the absorption is predominently determined by the requirement of bone marrow. Absorption of iron from tablets is approximately same in men and women without iron deficiency despite the difference in iron depots. Dietary advice with

emphasis on meat, fruits and vegetables is more appropriate for maintaining the iron status normally in the western world.

The difference in bioavailability of iron in raw and cooked spinach and broccoli was about 50 percent of iron in spinach and 80 percent in broccoli was available for Haemoglobin repletion. Spinach has a higher iron content than broccoli 185 gram raw and cooked provides 1.0 and 0.7 mg of available iron respectively (Miller, 1987)

The influence of Bovine serum albumin and beef was studied by Hurreu et al, (1988) in nonheam iron absorption in man on dialysable iron in clitro shows that facilitation of nonheam iron absorption by meat is not a general property of all animal protien but is better explained by the action of one or specific animal tissues.

Radioactive iron absorption measurement were made in healthy subjects to various availability of fortification iron added to various bread products. When ferrous sulphate was added as a fortifier iron absorption fron a traditional equptian flat bread (Baladi)was an average only 16 percent of that observed from European bread (Guindi etal, 1988)

According to Reddy (1995)a study was undertaken to see the effect of different processing techiniques on bioavailability of iron from different processed wheat products. The total amount of iron present in different wheat products varied from 3.6 (Vermicelli) to 11.3 (whole wheat flour) mg per 100 gm. Total iron content of all the processed wheat product was found to be

significantly less than that of whole wheat flour. The percent of bioavalibility of iron was the highest in phulka made from whole wheat flour while it was the lowest in biscuits made from refined wheat flour

B. preparation of the tools for the survey

Keeping in view the objectives of the study a questionnaire was formulated to elicit information regarding the, Dietary pattern, usual meal pattern, food habits, frequency of taking iron rich foods, prevalence of major and minor illness and menstrual problem. (Annexure I).

According to Chaudhary (1991) "questionnaire refers to a device for securing answers to questions by using a form, which is usually filled in by the respondent himself".

C. Selection of the sample

The selection of sample was done by random sampling method, which is defined by Gupta (1995) as that "Sampling techniques in which each and every unit of population has an equal opportunity of being selected in the sample".

One hundred were selected randomly from each Institutions.Among the randomly selected samples, 25 from each Institution who were anaemic were choosen purposively as subjects.

Purposive sampling "is a type of non-random sampling where the choice of the sample items depends exclusively on the judgement of the investigator" (Gupta, 1995).

D. Assessing the prevalence of anaemia among the selected Adolescent girls

A survey among 200 adolescent girls, was conducted using the questionnaire formulated in order to elicit informationregarding the prevalence of anaemia. the main

purpose of this survey was to find out the socio economic status, information on family back ground,Anthropometric measurement,Dietary pattern, usual meal pattern, frequency of taking iron rich foods, food habits,prevalence of major and minor illness and menstrual problem.

E. Calculating the mean nutrient intake of the selected sub sample

From the 25 selected sub samples the mean nutrient intake for 8 subjects were calculated using a three day recall method. The individual mean nutrient intake of the subjects are presented in (Annexure II).

F. Supplementation of Iron Tablets and Dates to the selected cub sample

From the background information of the 200 samples, 25 from each institution were selected for the supplementation by purposive sampling method and in basis of haemoglobin content.

The 25 samples from each Institution which were selected by purposive sampling method were tested for the Haemoglobin content and supplemented with iron tablets and Dates. Twenty five students from Institution I with 50g Dates and tablets irex (Ferrous Fumurate, 300mg)., and 25 students from institution II with tablets Febec-Z (Ferrous Fumurate, 300mg). The tablets and Dates were administered by the Investigator for a period of 2 months.

G. Analysis of Haemoglobin before and after supplementation

Blood samples were obtained from the 25 subjects from each Institution and the Haemoglobin content was analysed by Sahil Haemoglobinometer method (Sahil, 1985) (Annexure III).

H. Analysis of data

The data obtained from the two institutions was statistically analysed for comparison of the prevalence of anaemia among the students of the two institutions and to know the impart of the iron supplements.

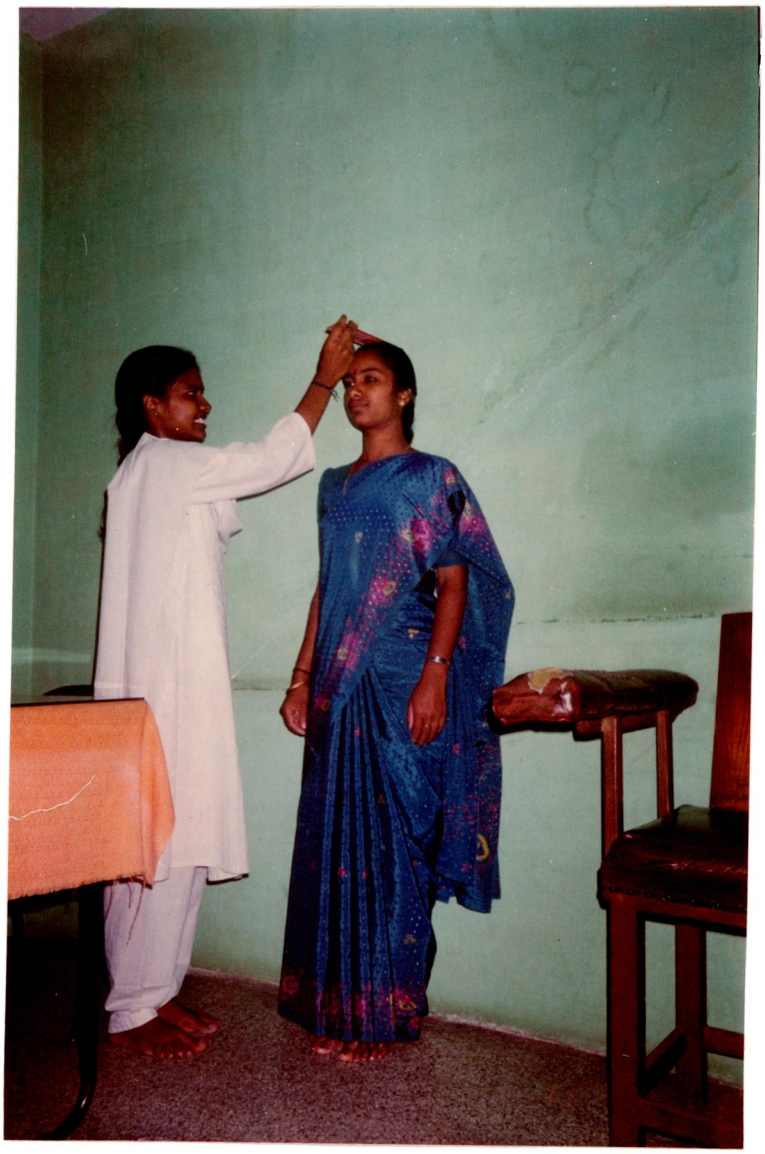


PLATE. NO.

HEIGHT BEING TAKEN FOR ONE OF THE SAMPLE

PLATE - II.

WEIGHT BEING TAKEN FOR ONE OF THE SAMPLE.

PLATE – III

BLOOD BEING DRAWN FROM ONE OF THE SELECTED SUB SAMPLE.

Results and Discussion

RESULTS AND DISCUSSIONS

The results of the study entitled " Anaemia Prevalence among University students and impact of an Iron rich supplement" is discussed under the following headings

A. Background information of the samples

B. Anthropometric measurements of the samples

C. Dietary pattern of the samples

D. Food habits of the samples

E. Medical history of the samples

F. Mean nutrient intake of the selected sub samples

G. Haemoglobin values of selected sub samples before and after supplementation.

A. Background information of the samples

Income

The total family income of the samples are presented in Table I

TABLE I

TOTAL FAMILY INCOME OF THE SAMPLES

[N=200]

Institutions	BelowRs.1200	Rs.1200-5000	above Rs.5000
I	1	62	37
II	4	42	54

(HUDCO 1993)

I - Avinashilingam Deemed University.

II - SeethaLakshmi Ramaswamy College.

HUDCO (1993) classified below Rs. 1200/- as low income, Rs. 1200/- to 5000/- as middle income and above Rs. 5000/- as High income.

From Table I it is clear that only one sample from institution I belong to low income group, whereas 62 samples belong to middle income group and 37 samples were from high income group.

In institution II, the data clearly indicates that more number of samples (54) were from high income group, 42 were from middle income group and only four were from low income group.

From this data, it is clear that majority of the samples from institution II belonged to high income group.

B. Anthropometric measurement of the samples

Body Mass Index

Body mass index is a recommended method of assessing the nutritional status. Since it is highly correlated with fat and body weight over all ages (Borken et al,1985).

Table II indicates the body mass index of the samples according to the classification of Body Mass Index suggested by Garrow and James (1993). Body Mass Index of the samples are given the Annexure IV.

TABLE II

BODY MASS INDEX OF THE SAMPLES
[N = 200]

Institutions	Less than * 20	20 - 25 **	25 - 30	above 30
I	58	42	--	--
II	63	37	--	--

Garrow and James (1993) standard

Less than 20 - underweight

20 - 25 - Normal Weight

25 - 30 - Obesity grade I

Above 30 - Obesity grade II

* - Below Normal

** - Normal

From the above Table in institution I 58 samples had the body mass index less than 20 and for 42 samples the Body Mass Index was normal between 20 - 25. In institution II, 63 samples had body mass index less than 20 and 37 samples had body mass index between 20 - 25. None of the samples from both institutions had body mass index between 25 - 30 and above 30.

The above data clearly shows that majority of samples (58, 63) were below normal from both institutions respectively.

C. Dietary Pattern of the samples

Dietary pattern of the samples from institution I revealed that 79 samples were non vegetarians, 6 samples were ova Vegetarian and 15 samples were lacto vegetarians. But in institution II 68 samples belonged to non vegetarians, 14 were ova vegetarians and 18 samples belonged to lacto vegetarians. None of the samples from both institutions were pure vegetarians. It is evident that majority of samples from the two institutions were non vegetarians

(i) Types of Non Vegetarian Items

The type of non vegetarian items consumed by the samples are presented in the Table III

TABLE III

TYPES OF NON VEGETARIAN ITEMS CONSUMED BY THE SAMPLES
[N = 200]

Non Vegetarian Items	Institution I			Institution II		
	W	M	R	W	M	R
Meat	15	5	4	11	4	2
Chicken	12	7	2	5	6	2
Beef	-	-	-	-	1	-
Pork	-	-	3	-	-	2
sea foods	4	21	17	2	17	21
Meat/Chicken	33	3	4	37	3	21
Chicken/Sea food	-	3	1	1	1	1
Meat/Sea food	-	-	-	-	-	1
Meat/Pork	-	-	2	-	-	1
Meat/Beef	-	-	1	-	-	1
Meat/Chicken/Beef	-	-	-	-	-	1

W = Weekly, M = Monthly, R = Rarely

The data presented in Table III shows that the type of Nonvegetarian items consumed by the samples. The data from institution I Clearly revealed that majority of samples (33) consumed once in a week meat or chicken, 15 samples consumed only meat, 12 samples had only chicken,and only four consumed seafoods.

Once in a month 21 samples consumped seafoods. 5samples used to take meat. 7 samples consumed chicken and 3 samples had meat or chicken and chicken or sea foods

Occasionally. 17 samples consumed sea foods and other nonvegetarian foods were consumed only by less number of samples

In institution II. 37 samples had chicken or meat weekly. Only meat or chicken was consumed by 11 and 5 samples respectively. Two of them had sea foods and only one sample consumed chicken or sea foods weekly.

Monthly. 17 samples used to take sea foods. whereas only four samples had meat and six chicken.Three samples had chicken or meat and only one consumed beef and chicken or sea foods

In institution II Majority of samples (21) consumed sea foods rarely. only 2 used to take meat. chicken and pork. Meat or chicken was taken by 21 samples and only one sample consumed chicken or beef. meat or beef. meat or pork. meat or sea foods. meat or chicken or seafoods occasionally.

The above data clearly indicates that majority of the samples use to take meat. poultry and fish than the other non - vegetarian items such as pork. beef and other sea foods.

(ii) Meal pattern

Table IV indicates the usual meal pattern of the samples

TABLE IV

MEAL PATTERN OF THE SAMPLES
[N = 200]

Meal Pattern	Institution I	Institution II
Early Morning		
Tea	66	58
Coffee	21	32
Milk	3	7
Others	10	3
Breakfast		
Idli/dosai	75	80
Pongal	40	52
uppuma	15	20
Chappathi/puri	81	63
Lunch		
Rice, Sambar/rasam		
curd with vegetables	92	97
Variety Rice	25	33
Tiffin items	10	16
Tea Time		
Tea	71	63
Coffee	25	32
Milk	--	2
Others	4	3
Snacks	74	86
Dinner		
Rice, Sambar/rasam		
curd with vegetables	55	48
Tiffin items	60	62
Bed time		
Milk	20	31

Analysis of usual meal pattern of the samples from institution I showed that majority of the samples (66) consumed Tea, 21 had coffee and 3,10 samples had milk and other drinks respectively for early morning. Again for tea time, tea was consumed by 25 samples and four consumed other drinks. But none of them had milk for tea time. Snacks were taken by 74 samples

For Breakfast rice preparations such as idli or dosai, pongal and uppuma were consumed by 75,40,15 samples respectively. But wheat items such as chappathi or puri was consumed 81 samples.

Mostly rice preparation was consumed by larger number of samples for lunch . Ninety two samples used to take rice, sambar or rasam or curd with vegetables, followed by variety rice which was consumed by 25 samples. Only 10 of the samples used to take tiffin items for lunch.

But for dinner, tiffin items was consumed by greater number of samples (60) then rice preparation (55). Only 20 samples used to take milk at bed time.

The data analysed in Institution II showed that, 58 samples had tea early morning, 32 samples consumed coffee and only 7 and 3 samples were used to take milk and other drinks respectively for early morning.

For break fast, 80 of them took idle, or dosai, and pongal was consumed by 52 samples, 20 samples were used to take uppuma and 63 had chappathi or puri.

Ninety seven samples had rice, sambar or rasam or curd with vegetables for lunch and 48 for dinner. Thirty three took variety rice for lunch. Only 16 consumed tiffin items for dinner.

For bed times, only 31 samples drank milk. None of them had anything for midmorning. Majority of samples (63) used to take tea for tea time, 32 had coffee and only few samples 2 and 3 had milk and other drinks respectively. Eighty six samples consumed snacks for tea time.

From this data, it could be clearly concluded that majority of samples were used to take rice preparation items than wheat preparations. Only few of them were used to take both rice and wheat preparation equally.

(iii) Type of iron rich foods

Table V depicts the type of iron rich foods consumed by the samples.

TABLE V

TYPE OF IRON RICH FOODS CONSUMED BY THE SAMPLES
(N = 200)

Iron rich foods	Institutions							
	I				II			
	D	TW	W	R	D	TW	W	R
Ragi	--	4	10	49	--	--	11	35
Rice flakes	13	11	13	26	6	6	11	27
Rice puffed	1	1	17	16	--	--	6	14
Roasted bengal gram	8	11	21	31	10	27	23	31
Soyabeans	--	4	10	37	--	--	2	10
Dates	10	9	18	29	9	13	16	33
Jaggery	--	4	14	33	2	7	19	33
Water Melon	1	1	1	40	1	--	2	32
Liver	--	6	6	14	--	--	12	11
Mutton Muscles	--	--	39	10	--	--	54	12
Egg	16	6	19	31	11	10	20	28

D - daily, TW - Twice in a week, W - weekly, R - Rarely

From Table V it is understood that in Institution I, 13 samples were used to take rice flakes, Eight samples had roasted bengal gram. Dates and egg was consumed by 10 and 16 samples respectively. Only one had rice puffed and water melon. None of them had ragi, soyabeans, Jaggery, liver or mutton muscles daily.

Twice in a week, four of them used to take ragi, soyabeans and jaggery, 11 of them had rice flakes, roasted bengal gram, six of them consumed liver and egg, nine samples consumed dates and only one had rice puffed and water melon.

Once in a week Thirty nine samples were used to take mutton muscles and 19 had egg. Ten of them had ragi and soyabeans. Rice flakes and rice puffed was consumed by 13 and 17 samples respectively. Twenty one had roasted bengal gram, 18 had dates and 14 consumed jaggery. Only meagre samples (1 and 6) consumed liver and water melon, Once in a week.

Forty nine samples used to take ragi, 26 had rice flakes, 16 consumed rice puffed, 31 used to take roasted bengal gram, 37 took soyabeans, 29consumed dates, 33 had jaggery and 40 samples used to take water melon only rarely. Liver and mutton muscles were consumed by 14 and 31 samples respectively. Egg was consumed by 31 samples once in a week.

In Institution II showed that six samples used to take rice flakes daily. Roasted bengal gram was consumed by 10 samples, 10 had dates, 11 used to take egg and few samples (two and one) had jaggery and water melon respectively. Again few items such as rice flakes, roasted bengal gram, dates, jaggery and egg were consumed by 6,27,13,7,10 samples twice in a week respectively.

Once in a week, 11 of them used to take ragi and rice flakes. Rice puffed was consumed by 6 samples, 23 took roasted bengal gram and two had soyabeans. Dates and jaggery consumed by 16 and 19 samples respectively. Only two samples had water melon. But more number of samples 12,54,10 used to take liver, mutton muscles and egg repectively.

Thirty five of them had ragi rarely. Twenty seven samples consumed rice flakes, 14 took rice puffed and 31 had roasted bengal gram and soyabeans was consumed by 10 samples. Thirty three of them had dates and jaggery and 32 had water melon. Mutton muscles and liver was consumed by 12 and 11 samples. Twenty eight of them had egg.

The above data clearly indicates that, majority of the samples took rarely iron rich foods in the two institutions.

D. Food Habits of the Samples

(i) Food preference

The food preference of the samples of two Institutions are presented in the Table VI.

TABLE VI

FOOD PREFERENCE OF THE SAMPLES OF TWO INSTITUTION
(N = 200)

Type of food	Institutions	
	I	II
Fast foods	12	6
Junk foods	22	29
Complete meals	61	64
Beverages	5	1

From the Table VI Institution I indicates that majority of the samples (61) preferred to have complete meals and 22 samples preferred Junk foods. Twelve samples preferred fast foods. But only meagre samples 5 perferred to take beverages.

The consumption of complete meals was preferred by greater number of samples (64). Institution II also followed by 29 samples prefering junk foods and 6 samples chose fast foods and the preference for beverages was only by one sample.

II Meals Skipped

Meals skipped by the samples are depicted in the Table VII

TABLE VII

MEALS SKIPPED BY THE SAMPLES

Institutions	Skipping Meals		If yes		
	Yes	No	breakfast	lunch	dinner
I	38	62	26	5	7
II	43	57	29	3	11

The analysis of the data from two Institutions showed that only less number of samples skipped meals. Especially breakfast was skipped by many samples. In Institution I, out of 38,26 skipped breakfast, lunch by five and seven skipped dinner.

In Institution II, 48 used to skip meals. Out of 48,29 skipped breakfast. Only 3 skipped lunch and 11 skipped dinner.

From this data it is clear that majority of the samples skipped breakfast from both Institutions.

E. Medical history of the samples

(i) Major illness: The prevalence of major illness among the samples are presented in the Table VIII.

TABLE VIII

PREVALENCE OF MAJOR ILLNESS AMONG THE SAMPLES

(N = 200)

Major illness	Institutions	
	I	II
Tuberculosis	---	---
Breathing troubles	6	5
Ulcer	2	5
Constipation	3	3
Anaemia	9	5

From Tables VIII, Institution I showed that 6 samples had breathing trouble, 2 suffered from ulcer, 9 had constipation and 9 were anaemic. But none of them suffered from tuberculosis. Institution II indicated that, none of them had tuberculosis, five of them suffered from breathing troubles, ulcer and Anaemia. Only 3 had consipoation.

The above data evident that anaemia was greater in Institution I [9] when compared to Institution II [5].

II Minor illness

Table IX indicates the prevalence of minor illness among the samples.

Table IX

PREVALENCE OF MINOR ILLNESS AMONG THE SAMPLES
[N - 200]

Minor illness	Institutions	
	I	II
Common cold	50	44
Fever	16	13
Stomach pain	26	24
Headache	29	26
Bleeding gums	7	2

From Table IX, Institution I showed that 50 samples were affected by common cold, 16 samples suffered from fever, 26 had stomach pain and 29 of them had headache. Only 7 of them suffered from bleeding gums.

The Table IX indicates clearly that in Institution II, 44 samples suffered from common cold, 13 were affected by fever, 24 of them suffered from stomach pain and 26 had head ache. Only one had bleeding gums. From this data it is clearly depicted that, more number of samples from both Institutions were suffered from common cold.

iii Menstrual problem

Table X shows the menstrual problem of the samples

TABLE X

MENSTRUAL PROBLEM OF THE SAMPLES
[N - 200]

Instituions	Menstrual problem		Type of problem		
	Yes	No	regular	over flow	any other
I	27	73	8	9	14
II	34	66	11	9	18

Analysis of data in Institution I indicates that majority samples had no menstural problem. Only 27 had menstrual problem. Out Of 27, 8 had irregular menstruation, 9 had over bleeding and 14 of them suffered from other problems like stomach pain, tiredness, backpain etc.

The data presented in the Table X shows that in Institution II 34 had menstrual problem. Out of 34,11 of them had other problems such as stomach pain and tiredness.

G. Mean nutrient intake of the selected sub samples

Table XI includes the mean nutrient intake of selected sub samples from two Institutions along with recommended dietary allowances (ICMR 1993).

TABLE XI

MEAN NUTRIENTS INTAKE OF SELECTED SUB SAMPLES
(N= 16)

Nutrients	Institutions		
	RDA	I (n=8)	II (n=8)
Energy (Kcal)	2060	1652	1804
Protein (gm)	63	50.4	56
Fat (gm)	22	17.6	19.1
Calcium (mg)	500	660	643.2
Iron (mg)	30	19.6	18
B-carotene (mg)	2400	1728	2513.89
Thiamine (mg)	1.0	1.3	1.4
Riboflavin (mg)	1.2	0.8	0.9
Nicotinic acid(mg)	14	14.48	16.6
Ascorbic acid(mg)	40	48.8	83.3

Mean nutrient intake of the selected sub samples from two Institutions are persented in the Table XI shows that in Institution I, the mean nutrient intake was less for all the nutrients than that of the recommended dietary allowance expect for calcium, thiamine, niacin and ascorbicacid. In Institution II, the mean nutrient intake of energy, protein, fat,iron,ribolavin were less than the recommended dietary allowance. Whereas nutrients such as B-carotene, thiamine, niacin and ascorbic acid were greater than the recommended dietary allowance.

From the above data it is very clear that the mean nutrient intake of Institution II was greater than the Institution I.

F. Haemoglobin values of selected sub samples before and after supplementation

Haemoglobin values of selected sub samples before and after supplementation of iron rich foods, dates along with iron tablets in Institution I and iron tablets alonein Institution II are presented in the Table XII.

Fig I shows the mean haemoglobin values of the selected sub samples in Annexure V in two institutions and the individual values are given

TABLE XII

HAEMOGLOBIN VALUES OF SELECTED SUB SAMPLES BEFORE AND AFTER SUPPLEMENTATION
(N = 50)

Institutions	Haemoglobin values g /dl		t value	WHO standard (1982)
	Before mean + S.D	After mean + S.D		
I	9.50 + 1.017	9.88 + 0.940	6.97	12g/dl
II	9.48 + 1.156	9.74 + 1.333	3.37	12g/dl

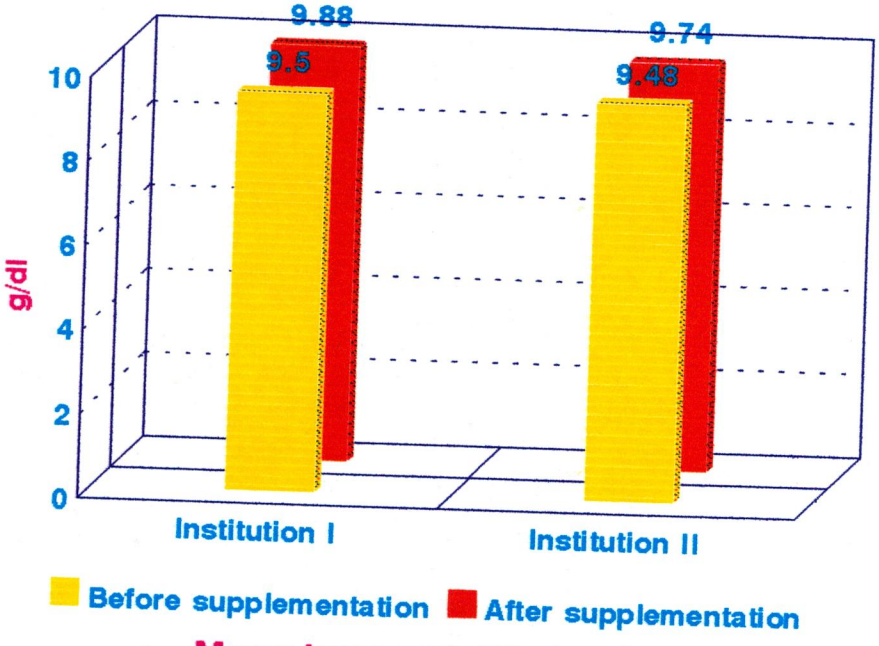
t** 1 percent significance

From the Table XII Institution I indicates that, the mean Haemoglobin value of selected sub sample was found to be 9.50 + 1.017 g/dl before supplementation and it was found to be increased to 9.88 + 0.940 g/dl after supplementation. Institution

II, showed the mean Haemoglobin value of the selected samples to be 9.48 + 1.156g/dl and 9.74 + 1.333g/dl before and after supplementation which were below the WHO standard values (1982) of 12 g/dl.

The calculated t - value (6.97 and 3.37) of two Institutions I and II were greater than the standard t value of 1 percent significant level (2.580), the null hypothesis is rejected thus proving the fact that supplementation improves the Haemoglobin level of selected samples.

Even though there was Haemoglobin some difference seen between the two Institutions, it was only negligible amount. Thus the difference between the consumption of dates and tablets together and tablets alone does not have significant variation.



Mean haemoglobin levels

Fig. 1

Summary and Conclusion

V. SUMMARY AND CONCLUSION

Anaemia is being considered today as a major public health hazard affecting millions of women belonging to reproductive age group, children and is most common in adolescent girls. The main objectives of the present study entitiled "Anaemia prevalence among university students and impact of an iron rich supplement" are to assess the prevalence of anaemia, select anaemic girls, supplement with iron tablets and iron rich food for a period of 2 months and to study the impact of the supplementation.

The institutions selected for supplementation were Avinashilingam Institute for Homescience and Higher Education for women, coimbatore and seetha lakshmi Ramaswamy college, Trichy. Questionnaire was used as a tool to ellucidate background information. One hundred samples were selected randomly from each institution. Among the randomly selected samples 25 from each institution who were anaemic were choosen purposively as subjects. The three day recall method was carried out among the selected sub samples to know the nutrient intake and supplement with tablets and dates. The haemoglobin content of the selected sub samples were analysed before and after supplementation and the data obtained from the two institutions were statistically analysed to know their impact of the iron supplementation.

The findings of the study are

1. The background information of the samples showed that ajority of the samples from the Institution II belonged to high income.

2. The Body Mass Index of the samples indicated that many girls were below normal from both Institutions.

3. Dietary pattern of the samples revealed that majority of samples from two institutions were non-vegetarian. None of them from both Institutions belonged to pure vegetarians.

4. Type of non-vegetarion items consumed by large number of samples were meat, poultry, and fish than the other non-vegetarian items such as pork, beef and other seafoods.

5. Meal pattern of the samples indicated that majority of samples were used to take rice preparation items than wheat preparation. Only few of them took both rice and wheat preparation equally.

6. The selected samples from the two institutions rarely consumed iron rich foods.

7. The samples preferred mostly complete meals than fast foods, junk foods and beverages.

8. Meals skipped by the samples showed that majority of the samples from both the institutions skipped breakfast.

9. Anaemia was prevalent among more samples in Institution I than in Institution II.

10. Prevalence of minor illness among the samples depicted that more number of samples from both Institutions suffered from commoncoled.

11. Majority of the samples had menstrual problems in both the Institutions.

12. The mean nutrient intake of the selected sub samples showed that mean nutrient intake of the institution II was greater than the institution I when compared to Recommended Dietary Allowances.

13. Haemoglobin values of the selected sub samples before and after supplementation indicate improved haemoglobin levels.

Thus both iron tablets along with iron rich food bring about significant increase in Haemoglobin level in adolecent girls.

RECOMMENDATION

1. In order to know the impact of iron rich supplement, longitudinal studies can be carried out with different iron rich supplements.

2. Since prevalence of Iron deficiency anaemia among reproductive age group is more, it is recommended to have intervention programmes with iron rich foods by the Government.

3. Similar studies can be carried out in different parts of the country to assure at consclusions to improve iron status of adolescent girls.

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Appendices

ANNEXURE - I

AVINASHILINGAM INSTITUTE FOR HOMESCINECE AND HIGHER EDUCATION FOR WOMEN (DEEMED UNIVERSITY) COIMBATORE 641 043.

Questionnaire to elicit information about the life

life style, food habits and Dietary pattern

Name:

Age:

Sex:

Educational Status:

Address:

FAMILY BACKGROUND

Name	Age	Sex	Education	Occupation	Monthly Income

Total monthly Income of the family

ANTHROPOMETRIC MEASUREMENT

Height :

Weight :

BMI :

DIETARY PATTERN

Pure Vegetarian [ ] Ova Vegetarian [ ]
Non-Vegetarian [ ] Lacto Vegetarian [ ]

If non-vegetarian means

Type	FREQUENCY OF CONSUMPTION			
	Daily	Weekly	Monthly	Rare
Meat				
Chicken				
Pork				
Beef				
Sea foods				

What is your usual Meal pattern

Early Morning	
Breakfast	
Mid Morning	
Lunch	
Evening	
Dinner	
Bed time	

Do you take any of the following iron rich foods

	FREQUENCY				
	Daily	Twice in Week	Weekly	Rarely	Amount (gm)
Ragi					
Rice flakes					
Rice puffed					
Bengal gram roasted					
Soyabeans					
Dates					
Jaggery					
Egg					
Water melon					
Liver					
Mutton muslces					

FOOD HABITS : What type of food you prefer mostly

Fast foods [ ]
Junk foods [ ]
Complete meals [ ]
Beverages [ ]

Do you have the habit of skipping meals?

Yes [ ] No [ ]

If yes, Which meal you skip ?

Break fast [ ]
Lunch [ ]
Dinner [ ]

MEDICAL HISTORY

Do you have any of the following ?

MAJOR ILLNESS

Tuberculosis	[ ]
Breathing Troubles	[ ]
Ulcer	[ ]
Constipation	[ ]
Anaemia	[ ]

MINOR ILLNESS

Common cold	[ ]
Fever	[ ]
Stomach pain	[ ]
Head ache	[ ]
Bleeding gums	[ ]

Do you have Menstrual problem

Yes [ ] No [ ]

If yes, What problem do you face?

Irregular	[ ]
Overflow	[ ]
Any other problem	

ANNEXURE - II

MEAN NUTRIENT INTAKE OF THE SELECTED SAMPLES

INSTITUTION I

NUTRIENTS	1	2	3	4	5	6	7	8
Energy (Kcal)	1655	1631	1866	1599	1473	1626	1590	1780
Proteins(g)	47	46.6	56.4	48.24	48.63	51.3	50.04	54.8
Fat(g)	19	21.5	18.2	13.5	16.35	18.3	12.84	21
Calcium(mg)	577.3	691.79	554.43	739.24	726.24	828	553.8	608
Iron(mg)	15.2	16.4	18	24.15	21.61	24.04	18	19.11
B-cartene(mg)	1049.8	2715.31	1425.5	2291.1	2069.3	2017.04	980	1272
Uitamin B1(mg)	1.07	1.5	1.4	1.2	1.1	1.24	1.25	1.3
Uitamin B2(mg)	.09	0.8	0.7	1.092	0.6	0.7	0.8	0.8
Niacin(mg)	13.4	15.2	16.2	14.267	12.6	14.82	14.82	15.12
Vitamin C(mg)	40.09	92.06	34.7	50.97	43.13	42.03	42.03	55

NUTRIENTS	1	2	3	4	5	6	7	8
Energy(Kcal)	1766	1711	1913	1965	1861	1964	1780	1473
Proteins(g)	56.95	59.05	56.36	59	61	58.7	54.8	41.4
Fat(g)	19	17	21.35	17.44	21.2	17.4	21	18.4
Calcium(mg)	621	544	474	768.2	845.31	776	608	509
Iron(mg)	18	17	14.2	19.11	16.55	20	19.11	19
B-cartene(mg)	2314	2873.3	2357	2559.06	4692.4	2547	1272	1496.34
Uitauirm B1(mg)	1.43	1.3	1.44	1.6	1.5	1.6	1.3	1.0
Uitauirm B2(mg)	0.72	0.8	0.8	0.8	1.6	0.8	0.8	0.7
Niacin(mg)	15.4	15	17	16.23	25	16.2	15.12	13.11
Vitamin C(mg)	44.4	64	158	103.5	92.32	104	55	45.03

ANNEXURE - III

ESTIMATION OF HAEMOGLOBIN

PRINCIPLE

The blood is diluted in acid solution converting the haemoglobin to acid haematin. The test solution is matched against a colour glass reference.

MATERIALS

Sahil haemoglobinometer
Sahil pipette graduated to 0.02ml
(20mm2 or 20 ul)
Small glass rod
Droping pipette
Absorbent paper (filter)

METHOD

1. Fill the graduated tube to the 20 mark for the mark 3 gllooml with 0.1N Hcl.
2. Draw capillary (or venous) blood to the 0.02ml mark of the sahil pipette. Do not allow air bubbles to enter.
3. Wipe the out side pipette with absorbent paper check that the blood is still on the mark.
4. Blow the Blood from the piptte in to the graduated tube of the acid solution. Rince the pipetle by drawing in and blowing out the acid solution 3 times.
   The mixture of blood and acid gives brownish colour. Allow to stand for 5 minutes.
5. Place the graduated tube in the heamoglobinometer. Stand facing a window.

Compare the colour of the tube containing diluted blood with the colour of the reference tube. If the colour is the same or lighter than that of the reference tube the haemoglobin value 40 g/l ca less.

6. If the colour is darker than that of reference tube cotinueto delute by adding 0.1N Hcl drop by drop. Stir with glass rod after adding each drop. Remove the rod and compare the colour of 2 tubes. Stop when the colour matched. Distilled water can also be used at this step instead of 0.1 N Hcl to continue the dilution of the blood.

7. Note the mark reached Depending on the type of haemoglobin ometer, this gives the haemoglobin concentration either in g/100ml or as a percentage of normal. To convert g/100ml to g/l multiply by 10. To convert percentage to g/l miltiply 1.46.

ANNEXURE IV

BODY MASS INDEX OF THE SAMPLES

S.NO	I	II	S.NO	I	II
1	20.54	17.29	26	22.33	15.35
2	20	19.74	27	19.56	17.70
3	21.33	16.59	28	19.83	16.59
4	21.15	21.72	29	16.80	18.76
5	20.34	18.73	30	16.80	18.77
6	19.17	15.82	31	21.63	16.82
7	18.97	19.58	32	17.11	17.11
8	18.84	21.36	33	16.44	17.57
9	16.64	18.36	34	23.43	20.54
10	16.43	18.94	35	16.02	16.88
11	17.31	16.79	36	18.66	19.97
12	19.97	18.49	37	24.24	17.74
13	20.02	17.85	38	22.10	20.50
14	14.19	15.82	39	19.77	20.81
15	18.03	20.39	40	15.79	18.66
16	19.02	19.38	41	17.18	17.58
17	17.36	21.91	42	19.73	19.02
18	17.38	21.48	43	16.88	17.89
19	19.89	21.75	44	21.77	18.97
20	16.65	21.29	45	18.73	19.05
21	20.85	17.36	46	17.38	21.09
22	21.33	19.55	47	19.90	20.50
23	18.76	18.90	48	21.35	21.20
24	20.81	21.90	49	18.35	20.17
25	16.15	20.00	50	18.94	19.90

Annexure V

Annexure V

HAMOGLOBIN VALUES OF SELETED SAMPLES [n = 25]
BEFORE AND AFTER SUPPLEMENTION

S.No.	Institution I		Institution II	
	Before	After	Before	After
1.	8.2	8.5	10.4	10.5
2.	8.6	8.8	9.1	9
3.	9.5	9.6	10	10.5
4.	9.3	10	8.2	8.5
5.	9.7	10.1	8.3	9
6.	11	11.5	8.3	8.3
7.	8.4	8.9	9.5	10
8.	8	8.5	8	8.2
9.	10.5	11	11	10.9
10.	9.3	9.8	9.2	9.2
11.	8.7	9.2	10.4	10.5
12.	9.1	10	8.8	8
13.	11.7	11.7	9.8	9.9
14.	8.4	8.7	11.2	12
15.	10.2	10.9	9.2	9
16.	9.2	9.6	10.6	11.5
17.	11.2	11	7.9	8
18.	9.5	10	11.4	12
19.	8.7	8.9	8	8.2
20.	9.8	10.4	10.6	11.2
21.	10.7	10.7	11	11.6
22.	9.9	10.3	9.1	10
23.	10	10.3	8.9	9.3
24.	8	8.7	7.8	7.9
25.	10.1	10	10.4	10.5