

# Dietary Assessment of Adolescent Girls and Dissemination of Nutrition Education

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## Abstract

**Background:** Iron deficiency anemia is a global problem of immense public health significance. Its prevalence is seen to be high amongst the adolescent girls. The objective of this paper is to assess dietary status of adolescent girls and to impart nutrition education amongst them. The study was conducted on rural adolescent girls (n=100) aged 15-17 years from Palsana, Sikar district, Rajasthan. Socio Demographic details of the subjects were collected. Three day Dietary recall and dissemination of nutrition education was done. The mean age of all the subjects was found to be 15.92 years. Mean intake of all the subjects was 1505.61 kcal. Percent consumption of energy, protein, iron and Vitamin C was found to be lower than the RDA. Nutrition Education was provided to the subjects by lecture method on various aspects of anaemia, healthy dietary habits. Adolescent girls are vulnerable to iron deficiency anaemia especially in the rural settings. Time to time interventions are required for healthy development of the group.

**Keywords:** Adolescent girls, Anaemia, Iron, Vitamin C

## 1. Introduction

Anaemia is a wide spread public health problem associated with an increased risk of morbidity and mortality. Iron deficiency anaemia is a serious public health concern in developing countries. It affects 20-50 percent of the world's population and is common in young children, adolescent girls and expectant and nursing mothers. Various studies from different regions of India have reported the prevalence of anaemia to be between 33 and 100 percent in children and adolescent girls, respectively (Agrawal et al, 1999). Anaemia is characterized by a low level of haemoglobin in the red blood cells. Anaemia usually results from a nutritional deficiency of iron, folate, vitamin B12, or some other nutrients. This type of anaemia commonly referred to as iron deficiency anaemia. It is the most widespread form

of malnutrition in the world, affecting more than 2 billion people. (Stolzfus et al, 1998).

Adolescence is a period of rapid growth, weight gain and blood volume expansion so the overall iron requirement of the body increases during this period. Anaemia is an indicator of both poor health and poor nutrition. The risk of iron deficiency anemia among girls appears to be more due to growth spurt, and it remains same during their reproductive life (Gawarikar et al, 2002). Adolescent girls constitute a vulnerable group of iron deficiency anemia, resulting in a reduced physical work capacity and cognitive function, behavioural disturbances, co morbidity and delay in the onset of menarche which leads to cephalopelvic disproportions. The population of the Indian adolescent girls in 2011 was 109.4 million, out of that 67.8-98.5 million (56-90.1%) adolescent girls were suffering from iron deficiency anaemia. The prevalence of iron deficiency anaemia in Bhopal was 58.4 percent, in Karnataka 45.2 percent and in Wardha city was 31.4 percent. (WHO, 2011)

Anemia, when caused by severe iron deficiency is termed as iron-deficiency anemia. The cut off for normal haemoglobin levels has been given by WHO in 2001, according to that 12.0gm/dl is the normal level for adolescent girls with age 12-18 years.

Low iron level in blood leads to anaemia. The causes for iron deficiency anemia are low iron intake, excessive quantity of iron inhibitors in diet. (E.g. tea, coffee), insufficient quantity of iron enhancer in the diet (Vitamin 'C'), iron loss during menstruation, poor iron stores from infancy and childhood deficiency, increased iron requirement, teenage pregnancy, poor environmental sanitation, unsafe drinking water and inadequate personal hygiene, hookworm infestation.

Absorption of iron from food is influenced by multiple factors. One important factor is the form of the iron. Heme Iron, found in animal sources, is highly available for absorption. The rich sources for heme iron are pork liver, oysters, beef liver, clams, and turkey etc. Non-heme iron on the other hand, found in vegetable sources, is less available in human body. The rich sources for non-heme iron are jaggery, drum stick, lentil, rice flakes, beans etc. The

absorption of Non-heme iron can be improved when a source of heme iron is consumed in the same meal. In addition, the iron absorption- enhancing foods can also increase the absorption of non-heme iron. Some food products like coffee, tea, spinach, red wine, soy products contain compounds like carbonate, oxalate, phosphate, and phytate that hinder with iron absorption and reduce 50 percent absorption, called inhibitors. Avoid eating them with the iron-rich food items to maximize iron absorption (Mahan *et al*, 2008). Vitamin C is known to be an enhancer for iron absorption in vegetarian diet by helping in conversion of iron from ferric to ferrous form. The sources of vitamin C are lemon, guava, strawberries, amla, sprouted pulses etc.

As occurrence of nutritional problems like iron deficiency anaemia has become widespread problem. For prevention of these problems, World Health Organization has emphasized that the mass information and awareness programmes should be organized to alert government and communities about the importance of health and nutrition. Nutrition education is an essential component to improve the nutritional status of a population and is crucial for the well-being of people. Time to time assessment of various nutritional parameters are required so in to adopt timely intervention programmes. Keeping this as concern the study aimed at assessing the diet of anaemic girls and to provide nutrition education amongst them.

## 2. Methods and Materials

**Research Locale:** The study was conducted on school going, unmarried rural adolescent girls of Sikar, Rajasthan. The locale was selected on the basis of convenience.

**Sampling:** Simple random sampling was done to select the samples from the Tambi Higher Secondary School, Palsana, Sikar, Rajasthan. The school comprised of 739 students out of which 391 were boys and 348 were girls. The strength of 15 to 17 years girls was 183, out of which 100 unmarried, physically fit girls were selected. Total 100 girls participated in the study.

Duration of investigation was from 6 November 2011 to 27 January 2012.

### **Tools and Techniques:**

#### **Rapport Development**

In the initial phase of study permission was sought from the health authorities of Rajasthan, and then the school was selected as a part of work. After that rapport development was done with school authority and they were told for the purpose of the study. Due permission was taken through the consent form, from the parents of all the subjects and research objectives were explained to them. For rapport development

with students, personal interaction was done and where they were informed about the research work.

**General Performa** comprised of set of general questions related to demographic, socio-economic and health profile of the subjects. Data regarding the demographic profile, socio economic profile, health status was collected using different variable like age, family income, education, number of family member, symptom of anemia.

#### **Dietary Assessment**

Dietary assessment was done using 24 hour dietary recall method for consecutively three days that was for two working days and one holiday using a 24 hour dietary recall performa The subjects were asked to recall what food was eaten, how much was eaten, how was the food prepared, when was eaten as other details related to food intake. Probing was done wherever necessary to collect the details of dietary intake. For getting correct information from subjects they were also shown a set of standardized models (of glasses, spoon, katories and different sized chapaties) from which they can select the similar one so as to report the amount they had consumed after which standardization of various recipes was done. The nutrients of food products were calculated by the book 'Nutritive Value of Indian Foods' by Indian Council of Medical Research in 2004.

#### **Nutrition Education**

On the basis of the interaction with subjects nutrition education material was prepared which comprised of messages and a booklet. With due permission of organization messages were pasted on the walls of the classrooms keeping in mind that daily viewing will help in recapitulation of nutrition education provided. The areas of concern were emphasized during the dissemination of messages where lecture method was used for imparting nutrition education. At the end booklet comprising of various aspects of anaemia was also distributed to the subjects for their reference.

## 3. Results and Discussion

### **Demographic and Socio Economic details**

#### **Age**

The age of the subjects ranged from 15 to 17 years. Out of 100 subjects 29 girls were of 15 years, 50 and 21 girls were belong to 16 years and 17 years of age respectively (Table 1). The mean of the age was 15.92 years.

#### **Members in Family**

Majority of subjects (58%) were living with 3 to 5 members, followed by 29 percent of subjects who were having more than eight members in their family and only 13 percent were having 6 to 8 members in family. Rawat *et al* (2001) observed that girls who were living in families having more than three family

**Table 1: Sociodemographic Profile of the subjects**

General Information	Number of Subjects (n=100)
1)Age:	
15 years	29
16 years	50
17 years	21
1)Members in family:	
3-5	58
6-8	13
More than 8	29
2) Siblings:	
2-3	37
4-5	28
More than 5	35
3) Type of family:	
Nuclear family	64
Joint family	36
4) Father's occupation:	
Agriculture	68
Service	20
Business	12
5) Mother's education:	
Literate:	30
Below 10 <sup>th</sup> standard	8
Till 10 <sup>th</sup> standard	5
Till 12 <sup>th</sup> standard	17
Illiterate	70
6) Mother's occupation:	
House wife	98
Teacher	2
7) Working after school:	
Yes	5
No	95

members were having increased prevalence of anaemia.

### Siblings

37 percent of the subjects were having 2 to 3 siblings, 35 percent subjects were having 4 to 5 siblings and 28 percent of subjects were having more than 5 siblings.

### Type of Family

Majority of subjects (64%) were living in nuclear family and 36% of samples were living in joint family. Prevalence of moderate degree of anaemia among subjects of joint family was found to be higher i.e. 78 percent than the subjects living in nuclear family (63%) and a significant association

was found at one percent between the haemoglobin of subjects and their family type. Similarly Rawat *et al* in 2001 also reported that the prevalence of anaemia was significantly higher (45.2 percent) among those girls living in joint families than girls (28.3 percent) living in nuclear families.

### Father's occupation

The data revealed that majority (68%) of the subject's fathers were engaged in agricultural work, 20 percent were doing services and only 12% were self employed. In relation to father's occupation Rawat *et al* (2008) also presented data in which girls whose fathers were labourers were more anaemic than those whose fathers working in agriculture.

### Mother's Education

The data revealed that only 30 percent subject's mothers were literate out of which 27 percent were qualified to 12<sup>th</sup> standard, 17 percent were to 10<sup>th</sup> standard, 23 percent were to 8<sup>th</sup> standard and 33 percent mothers were educated to 5<sup>th</sup> standard whereas 70 percent mothers were illiterate.

### Dietary Assessment:

The 3 day 24 hour dietary recall of various nutrients results are discussed as following.

**Table 2: Mean Dietary Intake of Nutrients**

Nutrients	Mean ±SE
Energy (kcal)	1505.61 ±697.83
Protein (gm)	40.89 ±10.11
Iron (mg)	14.62 ±5.56
Vitamin C (mg)	20.50 ±8.94

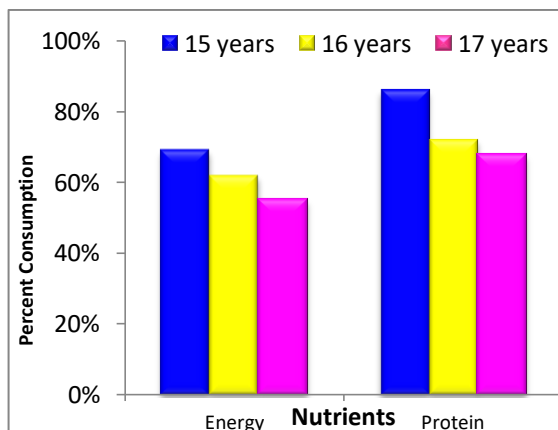
### Energy

The mean energy intake of all the subjects was found to be 1505.61 kcal (Table 2). On age wise evaluation, mean consumption amongst 15 year, 16 year and 17 year girls was found to be 1610.31 kcal, 1511.34 kcal and 1347.4 kcal respectively. On analysis with RDA the percent consumption of energy among 15 year girls was found to be 69.11%, among 16 years 61.94% and 55.22% in 17 years girls. All the age groups were consuming less than the RDA (Figure 1). Thus in the present study it was seen that as the age was increasing the percent consumption with respect to RDA was found to be

decreasing. Akkamahadevi in 1996 studied the nutrient intake of adolescent girls and it was found that the mean energy (1532 kcal) was lower than the ICMR recommendations. Sajjan *et al* in 2008 found that the mean intake of energy among school going adolescent girls of 13 years to 16 years was 1645.89 kcal.

### Protein

It can be seen from table 2 the mean intake of protein of all the subjects is 40.89 gm. The mean consumption of protein among 15 year old girls was 44.67 gm, 40.03gm and in 16 year old and 37.73 gm among 17 years old girls. It was seen that girls of 15 years age group consumed 86.06% of protein of RDA of their age followed by 72.12% by 16 year age group and percent consumption was 67.98% by 17 year old girls. As per the Sajjan *et al* in 2008 also found that the mean intake of protein among school going adolescent girls of 13 years to 16 years was 45.03 gm which was lower than the ICMR recommendations. Similarly Akkamahadevi in 1996 found the protein intake (38.77gm) less than the RDA (1989).

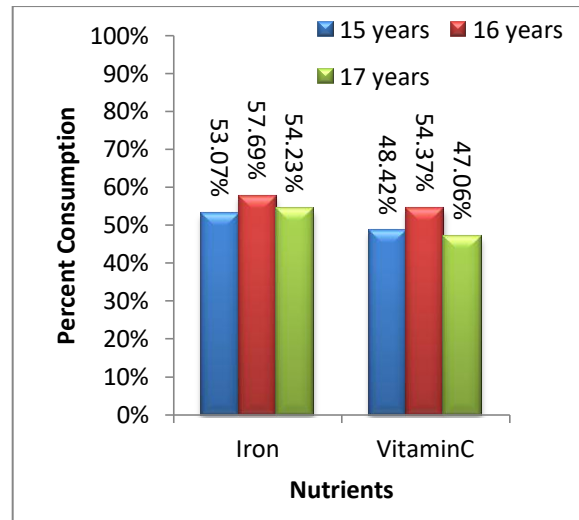


\*RDA, 2010

Fig 1: Percent Consumption of energy and protein.

### Iron

The mean intake of iron of all the subjects was found to be 14.62 mg. Age wise data revealed that consumption of iron of 15 year old girls was 14.33mg, 15.0 mg for 16 year old girls and 14.10 mg of 17 year old girls. The percent consumption of RDA for various age groups was found to be 53.07%, 57.69% and 54.23% for 15 year, 16 year and 17 year old girls respectively, thus all the adolescent girls belonging to various age groups were consuming iron less than the RDA. Akkamahadevi (1994) also found that the consumption of iron among adolescent girls was 14.7mg.



\*RDA, 2010

Fig 2: Percent Consumption of Micronutrients

On assessing the knowledge of subjects about sources of iron majority (55%) reported it to be green leafy vegetable followed by 28 percent who reported niger seeds, jaggery and green leafy vegetable all to be the source of iron whereas none of the subjects were aware about iron content of niger seeds. Only 24% were subjects were aware about the promoters that are needed for the absorption of iron that is vitamin C, whereas majority of them (63 percent) were having misconception that vitamin A is a nutrient that required for iron absorption.

As anaemia is the major problem seen amongst the adolescent girls and iron is essential for the formation of haemoglobin in the blood thus for revealing the necessary dietary habits additional information was gathered which highlighted that all the subjects were vegetarian and thus there was no source for consumption of heme iron in their diet.

On asking further for consumption of tea as it contains tannin which acts as inhibitor for absorption of iron, it was found that 67% of subjects had tea daily out of which majority (66%) of the girls had one to two time a day followed by 44% who were having 3 to 4 times whereas 33% did not like tea. Further on finding their tea consumption pattern the data revealed that 34% of them did not have tea before and after food, 22% were having tea half an hour before food, 3% of subjects had half an hour after food and 8 percent had tea with food. Majority of the girls consumed green leafy vegetable twice in a month and there were only 20 girls who consumed green leafy vegetable on daily basis. As per the NFHS-2 survey on the food consumption of unmarried women, two-thirds of women consumed green leafy vegetables every day

**Table 3: Eating Pattern of Subjects**

Statement	Number of Subjects (n)
1) Consumption of meal in a day:	60
2-3 times	32
3-4 times	8
4-5 times	0
More than 5 times	
2) Food habits:	0
Vegetarian	100
Non vegetarian	
3) Consumption of green leafy vegetables:	20
Once in a day	12
Twice in a week	60
Twice in a month	8
Never	
6) Consumption of tea:	
1-2 times	44
3-4 times	23
More than 4 times	0
Don't like	33
7) Time of consumption of tea:	
With food	8
After food	3
Before food	22
Any other time	34

### Vitamin C

For all the subjects the mean consumption of vitamin C was 20.5mg. It was found that the mean intake among 15 years old girls was 19.41mg, 21.75 mg and 19.04 mg among 16 years and 17 years old girls respectively. When compared with RDA percent consumption for this nutrient was 48.42%, 54.37% and 47.60% in 15 years, 16 years and 17 years old girls respectively. In a study of Akkamahadevi ascorbic acid intake of adolescent girls was found to be 23.28 mg/d. More than half of the subjects (57%) reported correctly about the sources of Vitamin C. Only 9% of the subjects consumed fruits every day. As lemon is the vegetable which contain good amount of vitamin C and it can be included in diet through salad or lemonade thus the information regarding lemon consumption was also seeked and it was found that only 9 percent of girls was having lemon every day, while majority of subjects (83%) consume lemon rarely (Table). In various studies it was revealed that consumption of micronutrients is very less among adolescent girls. NFHS-2 survey also observed that fruits were eaten daily by only 8 percent of women. While checking consumption pattern of fruits of the subjects, minority of the subjects (4%) ate half fruits at a time and rest ate

later, 82% subjects consumed cut fruits out of which 44% subjects ate fruit slowly after cutting fruits.

### 4. Conclusion

On the basis of results it can be concluded that adolescent girls with age group of 15 years to 17 years is more vulnerable to iron deficiency anaemia especially in rural areas. The prevalence of iron deficiency anaemia was found to be significantly related with family type and education of mother. Majority of the girls were found to be aware about anaemia but there is a need for implementation nutrition and health programmes through school so as to improve awareness on healthy eating habits and side effects of supplementation to overcome the misconceptions.

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