



Anaemia a Health Burden among Rural Adolescent Girls in District Karnal: Prevalence and Coorelates

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Abstract

Adolescence, a critical segment of society considered to be a most nutritionally vulnerable group. In developing countries adolescence anaemia is reported as greatest nutritional problem. Adolescence anaemia have significant impact on health outcomes at a later stage of life. Nutritional anaemia in adolescent girls have an adverse effect on learning ability, productivity, well-being and resistance to diseases. Anaemia during adolescence is associated with foetal wastage, prenatal mortality, increased incidence of low birth weight babies, increased maternal mortality and subsequent high infertility rates. Hence, an effort has been made in the present study to highlight the problem of anaemia in adolescents and to study the dietary and other factors in its aetiology. Two hundred fifty rural school going adolescent girls (13-15 yrs.) of low socio economic background were randomly selected from rural areas of district Karnal, Haryana, India. Very high anaemia pervasiveness (88%) with various grades was observed in the present research. Most of the girls (53.18%) were vegetarian and one half of the respondents were consuming two meals per day. Only one third of the subjects were in the habit of taking packed lunch in routine and maximum respondents (73.63%) were in the habit of keeping fast. Skipping of meals was common among three fourth of the subjects. Most of the subjects complained of anorexia, headache and breathlessness on exertion, lethargic feeling, pale conjunctiva, pale skin and flat nails. The present study also revealed dietary inadequacies particularly in respect of protein, energy, calcium and all micro nutrients (iron, beta-carotene, folic acid) except vitamin C. A positive significant ($p \leq 0.05$) correlation was observed between haemoglobin and various daily dietary intake of blood forming nutrients. The present study implicit the prominence of including adolescent girls in the risk group as controlling anaemia among adolescent girls (vulnerable group) could significantly reduce infant and maternal morbidity thus improving family, community and national socioeconomic development.

Keywords: Adolescent girls, anaemia, nutrient intake, diet quality, nutrient adequacy ratio.

Introduction

In girls, adolescence is a distinctive period of transition from girlhood to womanhood. Adolescents constitutes one fifth of the world's population and in India, 22.8 per cent of the total population is adolescents. Nutritionally, adolescent period is the most vulnerable period because of increased demand and requirement for rapid growth and development. In India, due to deficient nutrition, poor socio-economic conditions and gender discernment, adolescent girls face serious health problems. In developing countries, nutritional anaemia is the greatest nutritional problem among adolescents. Anaemia is an indicator of both poor health and poor nutrition. In developing countries, incidence of anaemia tends to be three to four times higher than in the developed countries. An appraisal of studies conducted on Indian adolescent girls indicated that more than 70 per cent of adolescent girls of low socio economic group had haemoglobin levels less than 110 g/l and the prevalence rate increased to 80 to 90 per cent when World Health Organization cut off of 120 g/l was applied.

Worldwide, iron deficiency anaemia is the most prevailing nutritional problem. Anaemia has foremost concerns not only on

human health but on social and economic development as well. Anaemia is considered as second leading cause of disability which accounts for about 1 million deaths per year. In terms of lost years of healthy life, IDA causes 25 million cases of Disability Adjusted Life Years (DALYs) which is accountable for 2.4 per cent of the total DALYs worldwide¹. In the World Health Organization rankings, iron deficiency anaemia is the third leading cause of Disability Adjusted Life Years lost for females' (15-44 years age group)². Nutritional anaemia in adolescent girls can have an adverse effect on learning ability, productivity, well-being and resistance to diseases. Anaemia during adolescence is associated with foetal wastage, prenatal mortality, increased incidence of low birth weight babies, maternal mortality rate and subsequent high infertility rates³. Therefore, if adequate iron stores are assured during adolescence, adverse effects of anaemia during pregnancy or in later life can be more easily reduced and controlled⁴. Considering the significance of adolescent phase in human life and paucity of published data on anaemia prevalence among school going rural adolescent girls belonging to low socio-economic group, an effort has been made in the present research, to highlight the problem of anaemia and to study the

dietary and other factors in its etiology among school going rural adolescent girls of low socio-economic group in Karnal district.

Material and Methods

Subjects selection: The research was conducted on school going adolescent girls belonging to the rural areas of district Karnal, Haryana. Purposive sampling was used to select five villages in Karnal district. The government schools of the selected villages cater to low socio-economic group of population. Random sampling technique was employed to select 250 adolescent girls aged between 13-15 years from these rural schools.

Data collection: Adolescent girl's age was determined first by questioning them and later confirmed from school registers. In case of any discrepancy between the two, the date in the school register was taken as accurate. Age in completed years was taken for analysis. A pre-designed and pre-tested performa was used to gather the information on socio-demographic characteristics like age, family size, monthly family income and dietary pattern.

Assessment of dietary intake and dietary quality: To assess the anaemic girl's dietary intake, 24-hour recall method (using standardized containers for three consecutive days) was used. The different food items consumed were converted into their raw equivalents; categorized into their respective food groups and average daily intake of protein, energy, fat, vitamin C, beta carotene, folic acid, iron and calcium were calculated from the values per 100 g of edible portion using MSU nutriguide⁵. The calculated nutrient intake was equated with the RDA (recommended dietary allowances) for the corresponding age group⁶. To evaluate the diet quality of the anaemic respondents nutrient adequacy ratio (NAR) was used. NAR was calculated for each nutrient by each subject using:

$$\text{NAR} = \frac{\text{Subject's nutrient intake of a day}}{\text{RDA of the respective nutrient}}$$

Afterwards, the respondents were characterized as inadequate (<0.66), fairly adequate (0.66 <1.00) or adequate (>1.00) NAR for various nutrients. Data of energy intake was specified as per cent of recommended dietary allowances for respective age group. Accordingly, subjects consuming 25 per cent above the RDA for energy (>125% of RDA) were categorized under excess energy intake whereas when respondent's energy intake was below 25 per cent of the RDA (<75% of RDA) inadequate energy intake was considered.

Haemoglobin estimation: For haemoglobin estimation, in a haemoglobin (Hb) pipette, 20µ of capillary blood was taken and transferred to a pre-numbered glass bottle containing 5ml Drabkins reagent. Cyanmethaemoglobin method⁷ was used for hemoglobin estimation, using a photoelectric colorimeter with

green filter (500-570 nm wavelength) on the same day of sample collection. The severity of anaemia was categorized as severe (<7 g/dl), moderate (7-10 g/dl) and mild (10-12 g/dl)⁸.

Results and Discussion

Present research findings revealed that out of 250 studied subjects, only 12 per cent adolescent girls were having normal haemoglobin value whereas 88 per cent were affected with various grades of anaemia i.e. 15.6 per cent severely anaemic, 51.2 per cent moderately anaemic and 21.2 per cent mildly anaemic.

Table-1
Degree of Anaemia in Adolescent Girls (N=250)

Degree of Anaemia	Haemoglobin (g/dl)*	Number of Subjects
Severe	<7	39 (15.6)
Moderate	7-10	128 (51.2)
Mild	10-12	53 (21.2)
Normal	>12	30 (12.0)

*World Health Organization⁸, Figures in parenthesis indicate percentages

WHO suggested the following cut off points to determine the magnitude of IDA among the population⁹

Prevalence	Public health problem
<5%	Not a problem
5-14.9%	Low magnitude
15-33.9%	Moderate magnitude
40% and above	High magnitude

Findings of present research specified that problem of anaemia among the studied rural adolescent girls was of high magnitude as prevalence rate among them exceeds 40 per cent.

International Centre for Research on Women (ICRW) reported anaemia a extensive nutritional problem and its pervasiveness varied from 32-55 per cent¹⁰. Verma et al.¹¹ reported that the overall prevalence of anaemia among rural youths in northern India was 43.76 per cent. The extensiveness of anaemia among the rural adolescents of Wardha and Lucknow was 59.8 and 56 per cent respectively¹². Prevalence of anaemia ranging from 46 to 98 per cent was also observed from different states of rural India¹³. National Family Health Survey (NFHS)¹⁴ and Gawarikar et al.¹⁵ revealed the prevalence of anaemia to be 65 - 75 per cent in adolescent girls. Kauret al.¹⁶ in their study found that 91.3 per cent of the rural adolescent girls of Kurukshetra, Haryana were anaemic. The observations of the present study support in restating that the anaemia prevalence could be quite high in some segments of the Indian population.

General profile: Out of 250 anaemic girls, most of the respondents (59.09%) fitted in 13-14 years age group and rest (40.90%) were 14-15 years old (table-2). The anaemic subjects were predominantly Hindus (63.18%) and all the anaemic subjects belonged to the scheduled casts (45.45%) or other

backward classes (54.54%). Majority of the anaemic subjects were from medium sized families (81.81%) comprising five to seven members and only 18.18 per cent had large families with over seven members. Families of one half of the anaemic girls (50.45%) were involved in agriculture, whereas labour whether

agricultural labour or non-agricultural labour (25%) and service (24.54%) were the earning criteria for rest of the subjects. Most of adolescent girls (59.53%) reported their family income less than Rs. 4000 per month.

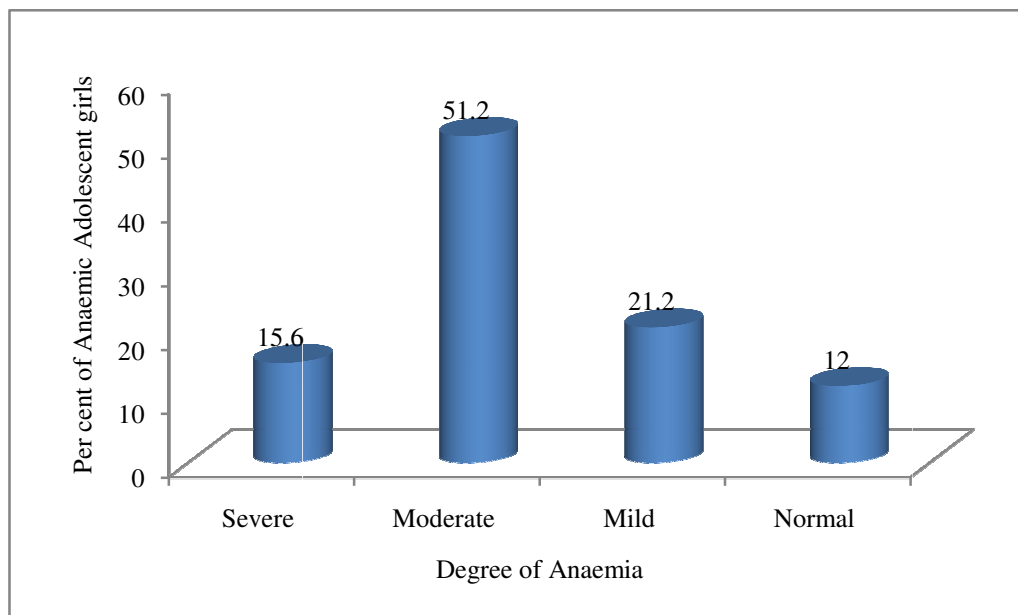


Figure-1
Mean Per Cent Intake of Nutrients by Anaemic Adolescent Girls

Table-2
General Profile of the Adolescent Anaemic Subjects (N = 220)

Variables	Number of subjects
Age group (in years)	
13-14	130 (59.09)
14-15	90 (40.90)
Religion	
Hindus	139 (63.18)
Sikhs	81 (36.81)
Caste	
SC	100 (45.45)
BC	120 (54.54)
Family Size	
Medium	180 (81.81)
Large	40 (18.18)
Family Occupation	
Agriculture	111 (50.45)
Labour	55 (25.0)
Service	54 (24.54)
Family Income (Rs.)	
<3000	85 (38.63)
3001-4000	46 (20.90)
4001-5000	75 (34.09)
>5001	14 (6.36)

Figures in parenthesis indicate percentages

National Family Health Survey¹⁴ (NFHS) also reported 58 per cent anaemia incidence among the women (15-49 years) of low income status. The findings of the present study are in consistent with the observations done in UP, Nagpur and Chandigarh, where extensive anaemia prevalence was reported among the girls of lower socio-economic groups¹⁷⁻¹⁹.

Dietary habits: Most of the anaemic adolescent girls were vegetarian (53.18%). Pattern of meals consumption per day indicated that about one half of the respondents were consuming only two meals per day. The trend for packed lunch was not so common in the subjects. Only one third (31.36%) of the females were in the habit of taking packed lunch in routine, whereas, 21.36 per cent used to take lunch sometimes. Out of 220 subjects, maximum (73.63%) were in the habit of keeping fast and the purpose of keeping fast was religion oriented among 72.83 per cent of the subjects. However, 27.16 per cent of the respondents used to keep the fast in general with no objective. In India for getting a good husband, an adolescent girl may need to observe fast once or twice a week²⁰. Because of lower energy intake, dieting, social discernment and pregnancy, girls are probably more exposed to deficient intakes than boys. Skipping of meals was common in three fourth of the girls (75%). Ensuing analysis of the data indicated that 84.24 per cent of the anaemic females were skipping meals usually. There were only 15.75 per cent of the subjects who were in the habit of skipping the meal sometimes. Commonly skipped meal was lunch,

breakfast and dinner among 48.48, 38.78 and 12.72 per cent of the subjects, respectively. The factors responsible for skipping the meals were meal not tasty (29.09%) to save time (23.03%), not feeling hungry (21.81 %), to some extent dieting (15.15%) and anger (10.90%). Maximum anaemic girls (77.57%) reported weakness on skipping of meals and due to this 59.37 per cent of the respondents ate more in the next meal, whereas, 40.62 per cent did not bother at all.

Table-3
Dietary Habits of the Adolescent Anaemic Subjects
(N = 220)

Variables	Number of subjects
Food habits	
Vegetarian	117 (53.18)
Non – vegetarian	60 (27.27)
Ovatarian	43 (19.54)
Frequency of consumption (per day)	
2 times	110 (50)
3 times	68 (30.90)
4 times	42 (19.09)
Packed lunch	
Yes	69 (31.36)
No	104 (47.27)
Sometimes	47 (21.36)
Fast keeping	
Yes	162 (73.63)
No	58 (26.36)
Purpose of fast keeping (n = 162)	
Religion	118 (72.83)
General	44 (27.16)
Skipping of meals	
Yes	165 (75)
No	55 (25)
If yes, which one (n = 165)	
Breakfast	64 (38.78)
Lunch	80 (48.48)
Dinner	21 (12.72)
Frequency of skipping meal (n = 165)	
Usually	139 (84.24)
Sometimes	26 (15.75)
Purpose of skipping meals (n = 165)	
Dieting	25 (15.15)
Not tasty	48 (29.09)
Not feeling hungry	36 (21.81)
To save time	38 (23.03)
Due to anger	18 (10.90)
Skipping of meals leads to weakness (n = 165)	
Yes	128 (77.57)
No	37 (22.42)
If yes, what will you adopt (n = 128)	
Eat more	76 (59.37)
Do not bother	52 (40.62)

Figures in parenthesis indicate percentages

Clinical manifestation of anaemia: Problem of anorexia and headache was experienced respectively, by 34.54 and 65.45 per cent of the anaemic girls (table-4). About 59.09 per cent anaemic girls felt breathlessness on exertion and amongst them majority (85.38%) used to experience moderate breathlessness, whereas 14.61 per cent suffered from severe breathlessness on exertion. Most of the subjects (78.18%) had lethargic feeling. The data as a whole indicated extensive prevalence of pale conjunctiva (90.90%), dryness of eyes on high exposure (63.63%), pale but uncoated tongue (32.27%), pale skin (73.63%), pigmented skin (23.18%), flat (49.09%) and spoon shaped nails (10.45%) amongst the anaemic adolescent girls.

Table-4
Clinical manifestations of Anaemia in the Subjects (N = 220)

Variables	Number of subjects
Feeling of anorexia	
Yes	76 (34.54)
No	144 (65.45)
Incidence of headache	
Yes	144 (65.45)
No	76 (34.54)
If yes, frequency of headache (n = 144)	
Daily	82 (56.94)
Alternate days	32 (22.22)
Weekly	20 (13.88)
fortnightly	10 (6.94)
Breathless on exertion	
Yes	130 (59.09)
No	90 (40.90)
If yes, (n = 130)	
Moderate breathlessness	111 (85.38)
Severe breathlessness	19 (14.61)
Feeling of lethargy	
Yes	172 (78.18)
No	48 (21.81)
Eyes	
Pale conjunctiva	200 (90.90)
Dry on high exposure	140 (63.63)
Tongue colour	
Normal	106 (48.18)
Pale but not coated	71 (32.27)
Skin	
Pale	162 (73.63)
Slight pigmentation	51 (23.18)
Nothing	30 (13.63)
Nails	
Flat	108 (49.09)
Spoon shaped	23 (10.45)
Brittle, ridged nails	41 (18.63)
Normal	31 (14.09)

Figures in parenthesis indicate percentages

Nutrient intake and diet quality: Adequate nutrition during adolescence is imperative for supporting the proper physical growth of the body, upkeep of muscles and for preventing future health problems. The mean daily energy consumption of anaemic adolescent girls was 68.93 per cent of the Recommended Dietary Allowances (RDA) and that of protein was 57.04 per cent (table-5). Subsequent analysis of the data indicated that more than one half of the girls (54.3%) had inadequate energy intake (<75% of RDA) whereas none of the subject had excessive energy intake (> 125% of RDA). Saibaba, et al.²¹ reported deficient intake of energy (1600 ±531.12 kcal) and protein (39 ±17.28 gm) by the adolescent girls (10-17 yrs)of Hyderabad. Comparable to the outcomes of present research, Goyle, et al.²² also specified inadequate protein intake (56.5%) by the school children (13-15 yrs.) in Jaipur. However, fat intake in the present investigation was slightly satisfactory as the intake was about three-fourth of the requirement. Kaur et al.¹⁶ and Varsha et al.²³ also stated that compared to other nutrients, fat intake was found to be acceptable to some extent.

Data of vitamin and mineral consumption indicated that with the exemption of vitamin C, the intake of all other nutrients was not at par with the RDA. The iron and folic acid intake among anaemic adolescent girls was nearly half of the RDA. β-carotene intake was about three fourth of the RDA. Calcium intake among anaemic adolescent girls was 58.33 per cent of the RDA. Inadequate nutrient intake in the current investigation accords with the results stated by Kaur et al.¹⁶ and Prashant, et al.²⁴ who also observed deficient intake of iron and calcium by the adolescent girls. Kaur, et al.²⁵ in their exploration among rural adolescent girls of Himachal Pradesh, observed deficient mean per cent intake of iron i.e. 39.9 per cent of the RDA. Iron is very vital nutrient for adolescent girl as they need extra iron for

menstruation in addition to growth and development. Anaemia in adolescent girls proceed to high prenatal mortality, increased incidence of low birth weight babies and high maternal mortality rate in later life²⁶.

Table-5
Mean nutrient intake and diet quality of Anaemic Adolescent girls

Nutrient	13-15 years (N=220)		
	RDA	Mean + SD	%adequacy
Energy (Kcal)	2060	1420 ± 280	68.93
Protein (g)	65	37.08 ± 9.89	57.04
Fat (g)	22	15.02 ± 8.68	70.40
Calcium (mg)	600	350 ± 61.23	58.33
Iron (mg)	28	12.68 ± 5.23	45.28
B-carotene (µg)	2400	1720 ± 310.81	71.66
Vitamin C (mg)	40	48.13 ± 13.82	120.32
Folic Acid (mg)	100	53.4 ± 19.89	53.4

RDA: Recommended Dietary Allowances; SD- Standard Deviation.

Results revealed that maximum of the anaemic adolescent girls had fairly adequate (>0.66) and adequate (>1.0) NAR with respect to fat (89.54%), protein (86.35%) and vitamin C (100%). More than one half of the subjects (56.81%) had adequate or fairly adequate NAR for calcium. With respect to iron intake, most (91.81%) of the subjects had inadequate nutrient adequacy ratio, while none of the anaemic adolescent girls had adequate NAR. Only 14.54 per cent and 15.90 per cent of the subjects, respectively were categorized under adequate and fairly adequate NAR for folic acid and β-carotene.

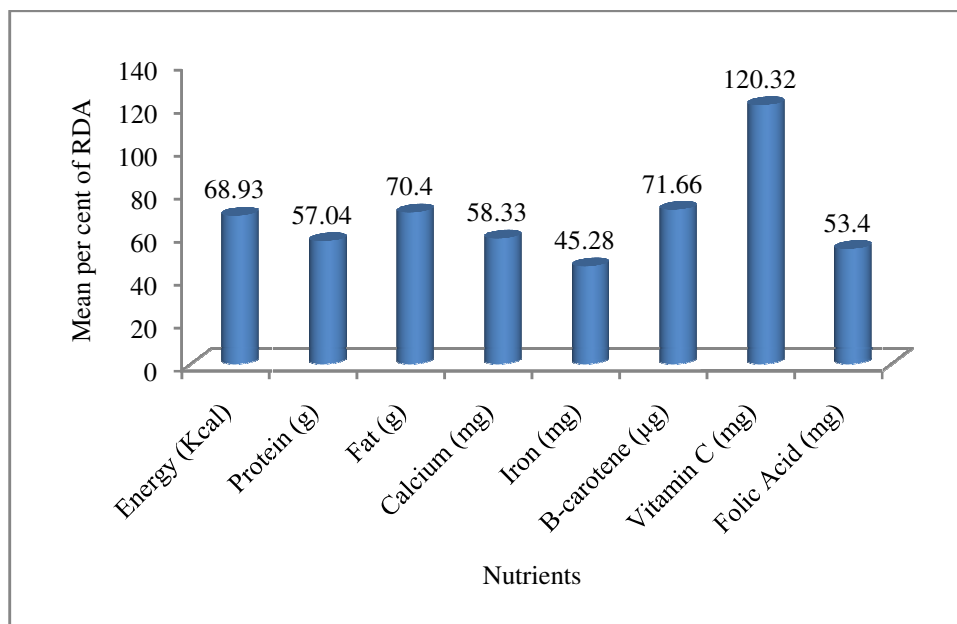


Figure-2
Mean Per Cent Intake of Nutrients by Anaemic Adolescent Girls

Table-6

Mean Nutrient Intake of Anaemic Adolescent Girls (N=220)

Nutrient	Nutrient Adequacy Ratio (NAR)		
	Inadequate (<0.66)	Fairly adequate (0.66 - <1.0)	Adequate (>1.0)
Protein	30 (13.63)	160 (72.72)	30 (13.63)
Fat	23 (10.45)	131 (59.54)	66 (30)
Calcium	95 (43.18)	65 (29.54)	60 (27.27)
Iron	202 (91.81)	18 (8.18)	
B-carotene	185 (84.09)	24 (10.90)	11 (5)
Vitamin C	-	52 (23.63)	168 (76.36)
Folic Acid	188 (85.45)	23 (10.45)	9 (4.09)

Table-7

Correlation coefficient (r) showing association between haemoglobin status and various daily dietary intake of blood forming nutrients of adolescent girls

Nutrient	Correlation
Protein (g)	0.362*
Iron (mg)	0.606*
β-carotene (ug)	0.454*
Vitamin C (mg)	0.626*
Folic Acid (mg)	0.533*

*Correlation is significant at 0.01 (two tailed)

Figures in parenthesis indicate percentages

These findings correspond with the results of Venkaiah et al.²⁷ and Malhotra and Passi²⁸ who also stated deficient nutrient intake by the adolescents. Kauret al.¹⁶, Varsha et al.²³ and Saibaba et al.²⁰ also specified gross deficient intake of nutrients by their subjects. Similar findings were obtained by Srijaya and Jhansirani²⁹ and Tatia and Taneja³⁰.

The present study revealed the association of poor dietary intake of several hematinic nutrients with haemoglobin status. The daily nutrient intake of blood forming nutrients by adolescent girls further revealed highly significant ($p \leq .01$) and positive correlation coefficient between haemoglobin status and vitamin C intake ($r=0.626$). Highly significant ($p \leq .01$) and positive correlation was also observed respectively, for iron and folic acid versus haemoglobin ($r=0.606$; 0.533). Ensuing of the data further revealed positive and significant ($p \leq .01$) correlation coefficient between haemoglobin versus beta carotene and protein ($r = 0.454$; 0.362).

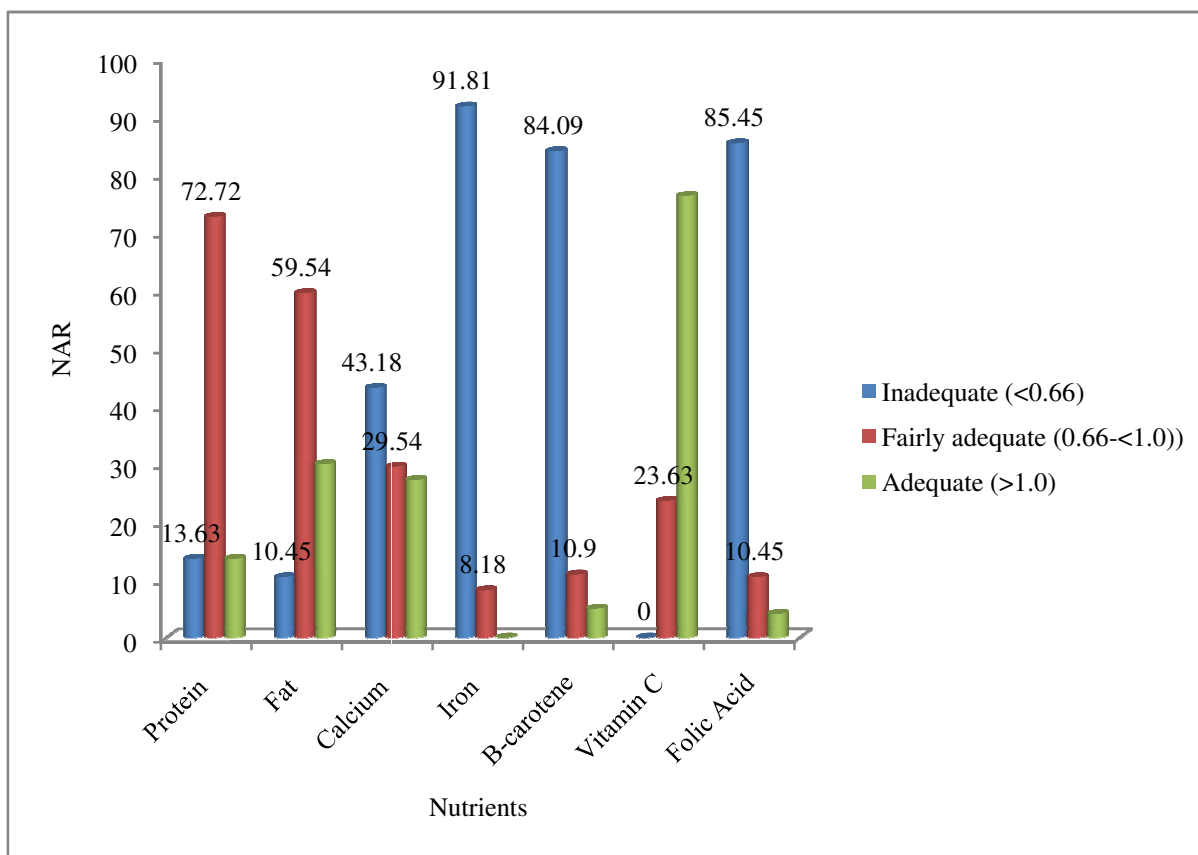


Figure-3
Mean Nutrient Adequacy Ratio (NAR) by Anaemic Adolescent Girls

Conclusion

The present investigation was conducted on 250 rural school going adolescent girls (13-15 years) selected randomly from district Karnal, Haryana state, India. The study revealed very high anaemia pervasiveness (88.00%) in the adolescent girls of low socio economic status. The present research also revealed dietary deficiency of the anaemic girls predominantly in respect of protein, energy and all micronutrients except vitamin C intake.

The present study implicit the importance of including adolescents girls (would-be-mothers) in the risk group as controlling anaemia among adolescent girls (vulnerable group) could considerably decrease infant and maternal morbidity. It would also enhance intellectual and work capacity, thus improving family, community and national socioeconomic development. To improve their iron status, there is a prerequisite for effective publicity for the recognition of the problems associated with anaemia among adolescent girls and planning intervention programmes through prophylaxis treatment, dietary modification/supplementation of hematinic nutrients as well as nutrition education which would improve the haemoglobin levels amongst the anaemic girls.

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