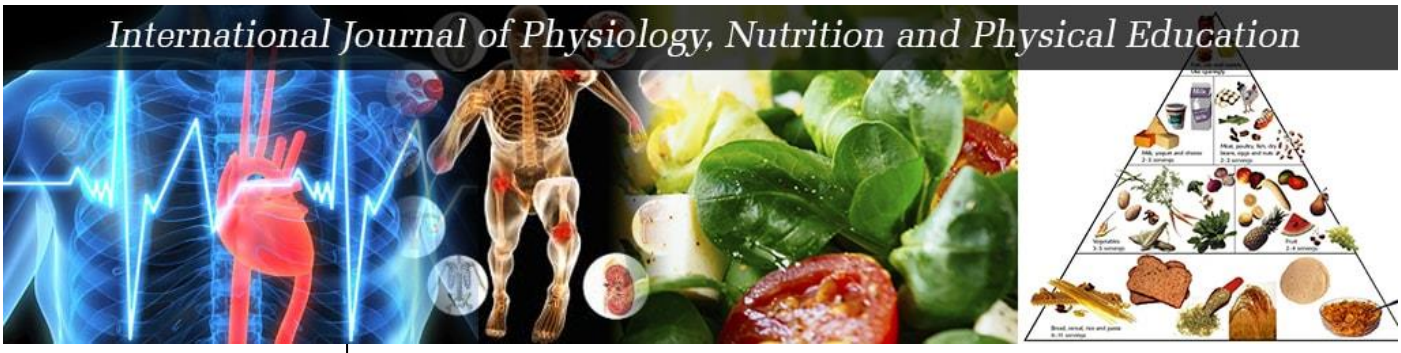

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A study to find out the difference between nutritional status of anaemic and non-anaemic adolescent girls

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Abstract
Adolescent is one of the most challenging periods in human development. The relatively uniform growth of childhood is suddenly altered by a rapid increase in the growth rate. The sudden changes create nutritional needs. Adolescent is considered as especially nutritionally vulnerable period for several reasons. First, they have an increased demand for nutrients because of the dramatic increase in physical growth and development. Second the change in the life style and food habits of adolescent effect nutrients intake and needs. Third adolescence nutrient needs are affected by participation in sports, pregnancy and development of an eating disorder, excess diet, use of alcohol and drugs or some other situations. WHO states that the "world-wide mortality rate of iron deficiency anaemia is 60,404,000 in 2005". High prevalence of iron deficiency anaemia reflects their poor status of nutrition because of their rapid growth combined with poor eating habits and menstruation (Wongs, 2009). Estimates suggest that over one third of the world's population suffers from anaemia, mostly iron deficiency anaemia. India. Prevalence of anaemia in India is high because of low dietary intake, poor availability of iron and chronic blood loss due to hook worm infestation and malaria.

Keywords: anaemia, adolescent, nutrition, iron deficiency

Introduction
Adolescence is a n important time to gain in height as well as weight. While muscles and fat increase the requirement of energy as well as protein increase considerably during this period, energy and protein needs to correlate more closely with the growth pattern than with the chronological age. Thus, the energy requirements of adolescents are designed to maintain health. Promote optional growth and maturation and support a desirable level of physical activity. Nutritional status can have an immediate impact on the health of adolescent, contribute to obesity, susceptibility to illness and general health. Also, there is increasing evidence that adult with nutrition in childhood and adolescence.
Adolescence is a particularly unique dynamic period in life because it is the "second and last growth spurt" in the life of a human being. The adolescence is considered vulnerable nutritionally as there is an increased demand for nutrients especially iron.

Objectives of the study
The topic of the present investigation was "a study to find out the difference between nutritional status of anaemic and non-anaemic adolescent girls"
1. To find out the general information on the adolescent girl.
2. To find out the anthropometric measurements of the adolescent girls.
3. To find out the school lunch of the adolescent girls
4. To find the iron deficiency anaemia among the adolescent girls.

Methodology
Sample area and Sample size
The study was performed in a government Inter-college of Aligarh district. 100 adolescent girls were selected from government Inter-college by random sampling method

Tools and techniques of the study

For the present study, a questionnaire was prepared. It includes general information regarding name, age, family, educational status, economic status, clinical sign and symptoms and school lunch. Anaemia was examined with the help of a pharmacist. The data collected was tabulated and analyzed statistically. Respondents were categorized into 2 categories: Anaemic and Non-anaemic.

Table 1: Age wise distribution of respondents

Age in years	Anaemic girls		Non-anaemic girls		Total	Percentage of anaemic	*p value
	Number	Percentage	Number	Percentage			
15	6	5.3%	4	2.3%	10	60%	0.245 (NS)
16	11	9.8%	8	7.95%	19	57.8%	
17	20	18.3%	15	18.9%	35	57.1%	
18	19	16.5%	17	19.3%	36	52.7%	
Total	56		44		100		

*p<0.05 shows the significant results, x2 = 1.205

Out of 100 respondents 56% were found anaemic. The lowest percentage among the anaemic (5.3%) was from the age group of 15 years and the highest {18.3%) belonged to age group of 17 years. Almost same scenario was seen in the normal respondents wherein almost 16.5% were recorded from age group of 18 years and highest in the age group of 17 years considering the age wise distribution of anaemic respondents. Table 1 reveals that highest percentage (60%) of anaemic respondents were falling in the age group of 15 years. In order to ascertain whether there is any statistically significant association between the two groups with respect to age or not, chi-square test was employed. The association was statistically insignificant (x2= 1.205, p=0.245) between the two groups.

Table 2: Distribution of respondents according to type of family

Type of family	Anaemic girls		Non-anaemic girls		Total	Percentage of anaemic	*p value
	Number	Percentage	Number	Percentage			
Nuclear	37	32.5%	21	23%	58	63.07%	0.008 (S)
Joint	18	16.4%	24	25%	42	42.6%	
Total	55		45		100		

*p<0.05 shows the significant results, x2 = 2.94

The nuclear family setup has emerged as the main pattern of families during current years. Group analysis figures show that majority of girls (32.5%) in the anaemic group were belonging from nuclear type of family whereas in the normal group respondents were distributed equally.

Group comparison revealed that the prevalence of anaemia was highest (63.07%) in girls falling in the nuclear family setup. The association between the two groups with respect to type of family was found statistically significant as the p value (p= 0.008) is less than level of significance (0.2.94).

Table 3: Distribution of respondents according to type religion

Religion	Anaemic girls		Non-anaemic girls		Total	Percentage of anaemic	*p value
	Number	Percentage	Number	Percentage			
Hindu	15	17.5%	27	30°/o	42	35.7%	0.295 (NS)
Muslim	38	39.5%	20	22.4°/o	58	65.5%	
Total	53		47		100		

*p<0.05 shows the significant results, x2 = 0.319

The table 3 gives distribution of respondents to the religion. The respondents within group analysis figures show that majority (17.5%) of girls in the anaemic group were Hindu. Group of comparison revealed that the prevalence of anaemia was highest (65%) in Muslim girls. The association between the two groups with respect to type of religion was found statistically significant as the p value (p=0.295) is less than level of significance (0.319).

Table 4: Distribution of respondents according to the educational status of their parents

Age in years	Anaemic girls		Non-anaemic girls		Total	Percentage of anaemic	*p value
	Number	Percentage	Number	Percentage			
Both Illiterate	45	82.1%	27	60.2%	72	63.4%	0.000 (5)
Single Literate	9	17.0%	13	28.4%	22	43.2%	
Both literate	1	0.9%	5	10.4%	6	9.1%	
Total	55		45		100		

*p<0.05 shows the significant results, x2 = 16.02

The figures in table 4 is testimony to this fact that almost 82.1% of the girls among anaemic group were those having both the parents as illiterate and negligible percentage (0.9%) was of the respondents in the anaemic group whose both parents were literate. It can also be seen from the table that there is a sharp decline in the percentage of anaemic girls when both the parents are illiterate and when at least one of them is literate. Inter group comparison shows that in total, the highest percentage 63.4% of anaemic respondents had both parents as illiterate. To justify the fact statistically whether educational status of parents does influence the anaemic condition or not, chi-square test was employed which shows that there is significant association (p=0.000).

Table 5: Distribution of respondents according to the income of their family

Socio economic status	Anaemic girls		Non-anaemic girls		Total	Percentage of anaemic	*p value
	Number	Percentage	Number	Percentage			
Low & lower middle Class (<5000)	50	44.6%	39	43.7%	89	56.17%	0.695 (NS)
Average Middle (5000 to 10000)	6	5.3%	5	6.25%	11	54.5%	

Source: Socio-economic Status Scale by Dr. A.G. Madhosh and K.P. Rafique,
*p<0.05 shows the significant results, x2 = 0.15

Table 5 shows the distribution of respondents according to the monthly income of their family. There is not much difference in the percentages of anaemic and normal respondents as far as the income of family is concerned. In both the groups, whether the income is less than Rs.5000 or more the percentage is almost proportional. No doubt that the number of anaemics is higher in low-income group, but at the same time normal are also equally high in this income group. A slight difference in percentages cannot be taken as important which is evident from chi square value and p value (p=0.695) of the test of association.

Table 6: Descriptive statistics of Height (cm) of respondents

Age	Anaemic Mean ± SD	Normal Mean ± SD	*p-value	Recommended values (cm)
15 years	144.0±17.9	152.63±6 .9	0.421 (NS)	157
16 years	148.3±12.3	152.2±14.3	0.408 (NS)	157
17 years	145.1±13.8	153.4± 10.9	0.008 (NS)	160
18 Years	148.6±12.7	152.2±12.2	0.182 (NS)	160

Source: Food and Nutrition Board of India, National Academy of Science Designed for the Maintenance of Good Nutrition,*p<0.05 shows the significant difference.

Heights were measured for all the 100 respondents and mean and standard deviations for different age groups were calculated and the same is presented in table- 6 to test whether the respondents meet the standard values or not. T-test for single mean was used. In case of respondents belonging to age group of 17 years, there was statistically significant difference between the standard heights given by the National Nutrition Bureau and the respondents in that particular group wherein as per National Nutrition Bureau standards height should be on an average 160cm but our study group had much lower height than that. (p = 0.008).

Table 7: Descriptive statistics of weight (Kg) of respondents

Age	Anaemic Mean ± SD	Normal Mean ± SD	*p-value	Recommended value (Kg) ICMR
15 years	42.25±6.54	38.50±7.05	0.414 (NS)	46.7
16 years	44.24±5.53	44.36±5.54	0.951 (NS)	46.7
17 years	45.13±7.14	43.22±5.61	0.214 (NS)	46.7
18 years	46.58±5.19	47.76±8.59	0.445 (NS)	49.9

*p<0.05 shows the significant difference

Weights, mean and standard deviations for all the 100 respondents from different age groups were calculated and the same is presented in the tabular form as in table 7. To test whether the respondents meet the standard values given by ICMR or not, t-test for single mean was used. There was statistically insignificant difference between the standard weights given by ICMR and weights of the respondents.

Table 8: Clinical Signs and Symptoms of the respondents

Clinical Signs		Anaemic girls		Non-anaemic girls		Total	Percentage of anaemic	*p value
		Number	Percentage	Number	Percentage			
Body appearance	Small	24	22.9%	18	20.8%	42	57.1%	0.817
	Average	26	23.5%	22	26.0%	48	54.1%	
	Large	7	6.2%	3	5.2%	10	70%	

* p<0.05 shows the significant results, x2 = 0.20

Table 8 shows that clinical signs and symptoms of the respondents. In case of anaemic group, the lowest percentage i.e., 6.2% had large body appearance and highest percentage i.e., 23.5% had average body appearance. While in normal group, the lowest percentage 5.2% had large body appearance and highest percentage i.e., 26.0% had average appearance. Thus, it is found that highest percentage of anaemic i.e., 70% had large body appearance. The p-value (0.817) shows that there is no significant association between the groups.

Table 9: Clinical Signs and Symptoms of the respondents

Clinical Signs		Anaemic girls		Non-anaemic girls		Total	Percentage of anaemic	p value
		Number	Percentage	Number	Percentage			
Eyes	Normal	28	24.5%	26	30.7%	26	52.1%	0.22 (NS)
	Watery	8	7.15%	5	5.7%	7	14 .1%	
	Dry	21	18.3%	12	13.65%	17	34.3%	
	Total	57		43		100		
Lips	Normal	31	28 .15%	21	23.85%	52	59.6%	0.232 (NS)
	Marked	25	21.9%	23	26 .15%	48	52.08%	
	Total	56		44		100		
Tongue	Normal	33	29.45%	19	21.6%	52	63.4%	0.082 (NS)
	Pale	14	12.5%	16	18.2%	30	46.6%	
	Red	9	8.05%	9	10.25%	18	50.0%	
	Total	56		44		100		

*p<0.05 shows the significant results,
(Eyes X2 = 3.00, Lips X2 = 1.43, Tongue X2 = 4.99)

Table 9 shows the clinical signs and symptoms of the respondents. In case of anaemic group, the lowest percentage i.e., 7.15% had watery eyes and highest percentage i.e., 24.5% had normal eyes. While in normal group, the lowest percentage i.e., 5.7% had watery eyes and highest percentage 30.7% had normal eyes. It is found that a higher percentage of anaemic 34.3% had dry eyes.

In case of anaemic group the lowest percentage i.e., 21.9% had marked lips and highest percentage i.e., 28.15% had normal lips. While in case of normal group the lowest percentage i.e., 23.85% had normal lips and highest percentage i.e., 26.15% had marked lips. Thus, it is found that a higher percentage of anaemic i.e., 59.6% had normal lips.

Further, in anaemic group the lowest percentage i.e., 8.05% had red tongue and highest percentage i.e., 29.45% had normal tongue. While in case of normal group, the lowest percentage i.e., 10.25% had red tongue and highest percentage i.e., 21.6% had normal tongue. Thus, it is found that a higher percentage of anaemic i.e., 63.4% had normal tongue .

In order to ascertain whether there is any association between the two groups with respect to the clinical signs and symptoms or not(eyes, lips and tongue), chi-square test was employed which shows that there is statistically insignificant association (p=0.22, p=0.23 and p=0.08} between the two groups.

Table 10: Presence of Major Symptoms of Anaemia

Health status		Anaemic girls		Non-anaemic girls		Total	Percentage of anaemic	*p value
		Number	Percentage	Number	Percentage			
Breathlessness	Present	4	3.55%	11	12.5%	15	26.6%	0.000 (S)
	Absent	52	46.4%	33	35.5%	85	61.17%	
Weakness	Present	8	7 .5%	8	9 .1%	16	50.0%	0.560 (NS)
	Absent	48	42.8%	36	40.9%	84	57.1%	
Tiredness	Present	19	16.5%	16	17.6%	35	54.2%	0765 (NS)
	Absent	37	33.5%	28	32.4%	65	56.9%	
Irritability	Present	25	22 .3%	17	19.3%	42	59 .5%	0.394 (NS)
	Absent	31	27.7%	27	30.7%	58	53 .4%	

*p<0.05 shows the significant results
(Breathlessness X2 = 12.32, Weakness x2= 0.55, Tiredness X2 = 0.10, Irritability X2 = 0.73)

Table 10 gives the health status of the respondents. In case of anaemic group the lowest percentage i.e., 3.55% had breathlessness and highest percentage i.e., 46.4% had no such symptoms. In case of normal group, lowest percentage i.e., 12.5% had breathlessness and highest percentage i.e., 35.5% had no such symptoms. Thus, the results revealed that 26.6% of the respondents had breathlessness and 61.17% had no such symptoms.

Again in case of anaemic group, the lowest percentage i.e., 7.15% had complained of body weakness present and highest percentage i.e., 42.8% had no such symptoms. In case of normal group, lowest percentage i.e., 9.1% had weakness and highest percentage i.e., 40.9% had no such symptoms. Thus, it is found that a higher percentage of anaemic i.e., 57.1% between the two groups had no complaints of body weakness.

Further, in case of anaemic group the lowest percentage i.e., 16.5% had body tiredness and highest percentage i.e., 33.5% had no complaints of tiredness. Again in the case of normal group, lowest percentage i.e., 17.6% had tiredness and highest percentage i.e., 32.4% had no such complaints. Thus, it is found that highest percentage of anaemic is 56.9% between the two groups who had no complaint of tiredness.

However, in case of anaemic group the lowest percentage i.e., 22.3% could feel irritability quite often and highest percentage i.e., 27.7% had no such complaints. In case of normal group, lowest percentage i.e., 19.3% had complained of irritable nature and highest percentage i.e., 30.7% had no such symptoms. Thus, it is found that highest percentage of anaemics that was found between the two groups who had complaints of irritability is 59.5%.

According to the association between the two groups with respect to health status of the respondents (breathlessness, weakness, tiredness and irritability), chi-square test was employed, which shows that in case of breathlessness there is statistically significant association (p=0.000) between the two groups.

Table 11: School lunch consumed by the respondents

School lunch taken	Anaemic girls		Non-anaemic girls		Total	Percentage of anaemic	*p value
	Number	Percentage	Number	Percentage			
Yes	24	22.0%	20	21.6%	44	54.5%	0.863 (NS)
No	32	28.0%	24	27.9%	56	57.14%	

*p<0.05 shows the significant results, x2 = 0.03

Table 11 shows the packed school lunch consumed by the respondents. Among the anaemic group the lowest percentage i.e., 22.0% had packed school lunch and highest percentage i.e., 28.0% had no packed school lunch. In case of normal group, the lowest percentage i.e., 21.6% had packed school lunch and highest percentage i.e., 27.9% had no school lunch.

In order to ascertain whether there is any association between the two groups with respect to the packed school lunch by the respondents or not, chi square test was employed which shows that there is statistically insignificant association (p=0.863) between the two groups.

Table 12: Consumption of fruits and milk by the respondents

Consumption of fruits and milk		Anaemic girls		Non-anaemic girls		Total	Percentage of anaemic	*p value
		Number	Percentage	Number	Percentage			
Fruit	yes	40	37.05%	30	33 .9%	70	57.1%	0.331 (NS)
	No	15	12 .9%	14	16 .1%	29	51.7%	
Milk	yes	14	12.5%	10	10.9%	24	58.0%	0.853 (NS)
	No	42	37.5%	34	38 .05%	75	55 .2%	

*p<0.05 shows the significant results, (Fruits x2 = 0.94, Milk x2=0.03)

Table 12 shows consumption of fruits and milk by the respondents. In anaemic group the lowest percentage i.e., 12.9% consumed no fruits and 12.5% consumed milk and highest percentage i.e., 37.05% consumed fruits and 37.5% consumed no milk. Also, the highest percentage among both groups i.e., 57.1% consumed fruits and 58.0% consumed milk.

In order to ascertain whether there is any association between the two groups with respect to the consumption of fruits and milk taken by the respondents or not, chi-square test was employed which shows that there is statistically insignificant association (p=0.331 and 0.853) between the two groups.

Discussions

The demographic pictures of two school going adolescent girls in the age group of 15-18 years were selected by random sampling method from district Srinagar of J&K state. Out of 100 subjects, 64% were found anaemic. While the same study was conducted in Haryana on 110 adolescent girls who belonged to low socio - economic group, it was found that anaemia was more prevalent in girls who were more than 14 years of age by Biradar S. Shipa *et al.* (2012). Maximum percentage of anaemics was found in subjects belonging to nuclear setup where as 45.7% subjects belonged to joint family setup. The findings were similar to studies where 45.71% of the population belonged to joint families and higher i.e., 55.28% of the population belong to nuclear families by Akhter (2003).

Anthropometric Data in adolescent girls of both normal and anaemic group had less height and weight as compared to recommended values in all the age groups (15-18 years). While analyzing heights it was observed, that in both the groups anaemic and normal there was significant difference between the standard heights given by National Nutrition Bureau and adolescent girls in the particular age group i.e. 15 years. Similar results were found by Sachan *et al*, (2012) who reported that the mean weight and mean height in both urban and rural schools showed significant difference with the ICMR mean weight for respective ages except in age group of 18 and 19 years in urban school girls and in age group of 10 and 19 years in rural school girls. The mean height in all age groups in both urban and rural schools showed significant difference with the ICMR mean height for respective ages except in age group of 18 and 19 years in urban schools and in age group of 16, 17, 18, and 19 years in rural schools.

While analyzing BMI it was found that maximum percentage was of anaemics.

The study revealed that the presence in degree of anaemia can be estimated clinically by well-trained compounder. Majority of the respondents 61.7% could feel irritability followed by 53.4% of the respondents who experienced tiredness. 50.0% of the subjects were suffering from weakness and 6.67% of the subjects were found to feel breathlessness.

Dietary Information revealed in our study that the majority of the adolescent girls and among both groups consumed tap water and highest percentage of anaemic of the adolescent girls consumed unbilled water. It was also found that the maximum number of the respondents had school lunch, fruits and milk.

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