Research Article

PREVALENCE OF ANEMIA AND ITS CORRELATION TO BODY MASS INDEX: STUDY AMONG UNMARRIED GIRLS

*R. Peter[1], R. Kumar[2], L. Sangwan[3] and S. Pandey[4]
[1]Department of Physiology, MAMC, Agroha, Hisar [2]Department of Pediatrics, MAMC, Agroha
[3]HCMS, Haryana [4]Department of SPM, MAMC, Agroha
*Author for Correspondence

ABSTRACT
Anemia among women causes many serious health problems and is pervasive in developing country. In a country like India, adolescent girls face serious health problems due to socioeconomic, environmental conditions, nutrition and gender discrimination. A vast majority of girls in India are suffering from either general or specific morbidities. Aim of study was to provide information to youth about their nutritional clinical picture and changing physical biological and health needs. It was designed to include all eligible aged 16 to 30 years non pregnant, unmarried college going girls. Demographic and socioeconomic data on the subjects (775 girls) were collected using a standard questionnaire. Hemoglobin estimation was done with Sahali's method. Lectures on nutrition, good eating habits and anemia were organized for these girls. Out of 750 girls 155 girls were urban and 620 were rural. In urban girls mean age 19.43±1.94yrs, weight 47.69±7.66kg, height 156±.05 cm, BMI 19.45±2.85 and Hb was 9.35±1.06 gm%. In rural girls mean age 19.29±1.43yrs, weight 46.87±5.66kg, height156±.054cm, BMI 19.02±2.10 and Hb was 9.40±.90gm%. All statistical analysis, correlation coefficient and p-value assessed with the help of SYSTAT version 12 in three BMI groups separately for urban and rural girls. Negative association of BMI to Hb concentration was observed in overweight and obese groups. High prevalence of anemia is found in both urban and rural girls in all BMI groups. Reason for high prevalence of anemia in these girls could be due to age, socioeconomic condition, low food intake, increase tendency to loose weight for zero size combined with menstrual loses.

Key Words: *Anemia, Body Mass Index, Hemoglobin, Rural and Urban*

INTRODUCTIN
Anemia is a global public health problem affecting both developing and developed countries with major consequences on human health as well as social and economic development. Anemia is the result of a wide variety of causes that can be isolated. But more often they co-exist globally. The most significant contributor to the onset of anemia is iron deficiency. The other causes of anemia are heavy blood loss, parasitic infections, acute and chronic infections, micronutrient deficiency and hemoglobinopathies (Kurz KM 1996). Anemia among women causes many serious health problems and is pervasive in developing countries. Anemia can result in adverse pregnancy outcomes, and severe anemia can lead to maternal deaths, reduced work productivity and impaired physical capabilities.(ICRW) Iron deficiency anemia is the third leading cause of DALY(disability adjusted life years) for females aged 15-45 years. In country like in India, adolescent girls face serious health problems due to socioeconomic conditions, nutrition and gender discrimination. A vast majority of girls in India are suffering from either general or specific morbidities (Balasubramaniam, 2005).
Diet and health are synonymous with the well-being of an individual. In absence of proper and adequate nutrition, a person can develop several developmental malformations. Many research studies have documented that malnutrition affects body growth and development, especially during the crucial period of adolescence (Babitha 2003). Under-nutrition among adolescent girls can severely limit their growth spurts (Bahl, 1994). As per report published by International centre for research on women (ICRW 2006), anemia is a very serious problem among adolescent girls in India. Many Indian studies have pointed out that iron requirement increase during adolescence, especially in developing countries because of

Research Article

infections that causes iron loss and because of low bioavailability of iron from diets (Jain SP 1999). Studies carried out under Common Wealth Youth Program ,Chandigarh 1997 and by Centre For Operations Research and training (CORT) 1999 and ICRW (2006) have recommended that there is need for providing information to youth so that they are better informed and better adjusted to their changing physical biological and health needs. In India, the health needs and rights of girls, particularly those who are unmarried, are inadequately addressed.

MATERIALS AND METHODS
It was a cross sectional study carried out in government girl's college of Bhodia, Fatehabad district, Haryana. The study was undertaken in month of March 2012. The study was designed to include all eligible aged 16-30 years non pregnant, unmarried college going girls. Ethics approval was received from the college officials, girls and the parents. There were 775 girls who participated in this study. Anemia in the study was defined as Hb <12gm/dl in females age >15 years according to WHO standards (WHO 1975). Lectures on nutrition, good eating habits and on anemia were organized in the college .The girls were advised to increase the number of daily meals from two meals to 3-4 meals or multiple meals at short duration daily and also encouraged to consume vitamin C rich foods in combination with iron rich foods.
Data Collection
Demographic and socioeconomic data on the subjects were collected using a standard questionnaire.
Subjective Parameters
Age was recorded from birthday by calendar to the nearest of year (<6 months and >6 months). Standing height was recorded without shoes and with light cloths on a wall mounted measuring tape to the nearest of centimeters (<5 mm and >5 mm). Weight was recorded without shoes and with light cloths on a Krups weighing machine with a least count of 500 grams.
BMI was calculated by the formula:-BMI = Weight (kg)/ Height (m^2)
International Obesity Task Force (IOTF-2000) has proposed the standards for adult obesity in Asia and India as follows: A cut-off point of 18.5 kg/m2 is used to define thinness or acute under nutrition and a BMI of 23 kg/m2 indicates overweight. A BMI of over 25 kg/m2 refers to obesity.

BMI (Kg/m^2)	Nutritional status
>23 Kg/m^2	Over nutrition
18.5-23 Kg/m^2	Adequate nutrition
<18.5 Kg/m^2	Under nutrition

Physiological Parameter
Hemoglobin was done using the Sahali's hemoglobinometer using standard procedure protocol (Wintrobe MN 1975). The measured values were tabulated according to the urban and rural girls and compared to the standard values of grading of anemia according to WHO guidelines with < 12 gram % of hemoglobin considered as anemic (WHO 1975).
Stastical Analysis
The data analysis was carried out using the SYSTAT version 12. Statistical significance of difference in mean values between groups was assessed using independent samples t-test. The relationship between hemoglobin concentration and BMI was examined by calculating the Pearson's correlation coefficient (r) and the significance of correlation (p).

RESULTS AND DISCUSSION
Total number of volunteer unmarried girls was 755 out of which 155 were urban and 620 were rural. Most of the girls were within the age group of 17 to 25 years and pursuing graduate and post graduate courses. There were no statistically significant differences in anthropomorphic parameters between urban

Research Article

and rural girls. Mean value of hemoglobin in urban girls (9.35±1.06) and in rural (9.40±.90) girls also were not significantly different and less which is expected physiologically (Table 1). Correlation of hemoglobin to grades of BMI showed positive correlation when age was controlled both in urban and rural girls, however none of the correlation showed significance to level of <.05. Overweight and obese girls (BMI >23 kg/m^2) however showed an inverse relationship to hemoglobin (gm %) but the correlation was insignificant. Underweight girls in rural group also showed negative correlation to hemoglobin (Table 3).

99.74% of the study subjects were anemic (Hb < 12 gm %) as per WHO guidelines. 40.64% girls were underweight ,55.48% were normal weight and 3.87 % were overweight in urban group. 43.22% girls were underweight, 55.48% were normal weight and 1.29 % were overweight in rural group (IOTF 2000).

Table 1: Anthropomorphic, Blood Parameters & Diet Type in Urban and Rural Girls

Parameters	Urban Girls (n=155)	Rural Girls (n=620)
Age (years)	19.43±1.94	19.29±1.43
Weight (kg)	47.69±7.66	46.87±5.66*
Height (cm)	156±.051	156±.054*
BMI	19.45±2.85	19.02±2.10*
Hb (gm %)	9.35±1.06	9.40±.90*
Vegetarian	99%	100%
Non-Vegetarian	1%	0%
Worm Infestation	<1%	<1%

BMI: body mass index; Hb: Hemoglobin; *= NS, Significance set at p< 0.05; variables expressed in means, standard deviations and percentage.

Table 2: Hemoglobin Gm % in Number of Girls in Urban and Rural Groups

Hemoglobin gm%	Urban Girls	Rural Girls
<7	3	4
7-10	117	479
10-12	35	135
>12	0	2
Total	155	620

Table 3: Age Controlled Correlation of Hemoglobin with Grades of Bmi in Urban (155) and Rural (N=620) Girls

BMI	Urban Girls		Rural Girls	
	Correlation coefficient (r)	Significance (p)	Correlation coefficient (r)	Significance (p)
<18.5 kg/m^2	0.243	.055	-.021	0.735
18.5-23 kg/m^2	0.75	.491	.102	0.059
>23 kg/m^2	-0.543	.266	-0.070	0.870

Significance set at p< 0.05.

Iron deficiency is the most common and widespread nutritional disorder in the world. Unfortunately it is not restricted to rural and low socioeconomic status adolescents but shows increased prevalence in developed affluent societies (Yogesh S 2011). Globally anemia covers 24.8% of the population. The

Research Article

highest prevalence is in preschool children (47.4%) and the lowest prevalence is in men (12.7%). WHO regional estimates indicate that the highest proportion is in Africa (47.5-67.6%) while the greatest number of individuals affected is in South East Asia (WHO Global Database on Anemia 2008). In the present study 77.41% urban girls and 77.90% rural girls have been found hemoglobin level <10 gm%. Nutrition Foundation of India (1999) found 9.6% of the urban adolescents girls having the hemoglobin < 10 gram % (Kurz KM 1996). According to NFHS3 2005-06 national estimate of anemia prevalence in non pregnant women is 52% and in adolescent girls is 56%. Average prevalence of anemia of 25-80 % seen in several studies across the Indian subcontinent with study by ICMR in sixteen districts of eleven states reporting a prevalence rate of 90.1% among the adolescent girls of 11-18 years age groups (Teoteja et al. 2002).Higher prevalence of anemia (32%) was reported by Chaudhary & Dhage 2008 among adolescent urban females of Nagpur.

The prevalence of iron deficiency varies greatly according to the host factors like age, gender, physiological causes, pathological causes, nutritional factors, environmental factors and socioeconomic conditions. Present study was done on urban and rural unmarried college going girls with better health conditions. Reason for high prevalence of anemia in these girls could be because of the low food intake, increased tendency to lose weight for zero size, combined with menstrual loses (Yogesh 2012).

A negative association of BMI to Hb concentration was observed in our study among girls who were overweight & obese in both groups. Similar result was observed among non school going adolescents girls by Bully et al 2007 and it was statistically significant. Study by Shatha (2003) on 600 Iraqi adolescents girls also found statistically significant negative association between BMI & Hb (r-0.185, p<0.01) which included both schooling and non schooling population of Baghdad. Negative association in present study could be related to the reduction in levels of estrogen binding protein levels with increasing adiposity (BMI) with concomitant increase in insulin. Therefore level of free estrogen may rise up which may cause suppression of erythropoesis in females (Lukanova 2004).

Concerning the relationship between age and Hb concentration the present study showed that age was directly and highly correlated with Hb concentration. Incidence of anemia increases with the age and are highest among the period of increasing growth and adolescents. Similar to study on Iraqi adolescents females a negative correlation was found with age and BMI, however none of the association was statistically significant (Thomsen K 1986). The present study also points to the fact that most of girls of higher age group were closure to the lower levels of hemoglobin (<12 gm %).

 In the present study, the important correlates of anemia were found to be vegetarian diet, excessive menstrual bleeding, low iron intake and age. However, menarche, BMI, worm infestation, education and socio-economic status did not contribute significantly.

Government of India launched National Nutritional Anemia Prophylaxis Programme (NNAPP) in 1970 as a part of National family planning programme. The programme was then revised and named National Nutrition Anemia Control Programme. The 11th five year plan (2007-2012) aims to reduce the prevalence of anemia by 50% by the end of plan. Millennium Development Goals also aims to reduce anemia prevalence to achieve majority of the MDG goals.

REFERENCES
Babitha B (2003). Nutritional status of adolescent girls and impact of short term food supplementation with special reference to vitamin A and hemoglobin. *Journal of Community Guidance and Research* **20** 121-131.
Bahl L (1994). Nutritional status, social awareness and attitude towards marriage of adolescents in a tribal ICDS Block of Himachal Pradesh. *Indian Pediatrics* **31** 1094-1097.

Research Article

Balasubramaniam P (2005). Health needs of poor unmarried adolescent girls. A community based study in rural Tamilnadu. *Indian Journal of Population education* **28 29** 18-33.

Bulliyy G, Mallick G, Sethy GS and Kar SK (2007). Hemoglobin status of non school going adolescent girls in three districts of Orissa, India. *International Journal of Adolescent Medical Health* **19** 395-406.

Bruno DB, Erin M, Ines E and Mary C (2008). Worldwide prevalence of anaemia 1993-2005: WHO global database on anaemia. WHO 1-40.

Das DK and Biswas R (2005). Nutritional Status of Adolescent Girls in a Rural Area of North 24 Parganas District West Bengal. *Indian Journal of Public Health* **49** 18-21.

Hallberg L, Hulten L, Lindestedt G, Lundberg PA and Mark A (1993). Prevelance of iron deficiency in Sweden adolescents. *Pediatric Respiratory* **34** 680.

ICRW (2001). Reducing anemia and changing dietary behaviors among adolescent girls in Maharashtra,India. *(http://www.org/files/images/)*

ICRW (2006). Intervention needed to break Silence on reproductive health. A report.

Jain SP (1999). Body weight and nutritional status of adolescesnt School children in rural north India. *Indian Pediatrics* **36** 810-815.

Kurz KM (1996). Adolescent nutritional status in developing countries. *Proceedings of Nutrition Society* **55** 321-331.

Lukanova A, Lundin E and Zeleniuch-Jacquotte A (2004). Body mass index circulating levels of sex-steroid hormones IGF-I and IGF-binding protein-3: a cross-sectional study in healthy women. *European Journal of Endocrinology* **150** 161-171.

Rajni D (2011). An assessment of health status adolescent Gujjar tribal girls of Jammu district. *Study of Tribes and Tribals* **9**(2) 133-138.

Sanjeev MC and Vasant RD (2008). A study of anemia among Adolescent Females in the Urban Area of Nagpur. *Indian Journal of Community Medicine* **33** 243-245.

Shatha S, AI-Sharbatti, Nada J, AI-Ward, Dhia J and AI-Timmi (2003). Anemia among Adolescents. *Saudi Medicine Journal* **24** 189-194.

Teoteja GS and Singh P (2002). Micronutrient profile in Indian population (Part-1). *Indian council Medical Research* 131-140.

Thomsen K, Riis B, Kerbbe S and Christiansen C (1986). Testosterone regulates the hemoglobin concentration in male puberty. *Acta Paediatrica Scandanvian* **75** 793-796.

Verma M, Chattwal J and Kaur G (1998). Prevalence of anemia among urban school children of Punjab. *Indian Pediatrics* **35** 1181-1186.

WHO/IASO/IOTF (2000). The Asia Pacific Prespective: Redefining obesity and its treatment. *Health communications Australia Pvt Ltd.*

Wintrobe MN (1975). Clinical Hematology 7th edition Philadelphia LEA and Febiger 114-115.

World health organization (1968). Nutritional anemia: Report of a WHO scientific Group Technical report series **405** 1-40.

World health organization (1975). Control of nutritional anaemia with special reference iron deficiency: Report of an IAEA/USAID/WHO joint meeting technical report series 508. Geneva: world health organization.