ASSESSMENT OF ANTHROPOMETRIC AND HAEMATOLOGICAL PARAMETERS IN HEALTHY FEMALE STUDENTS

Monika bhardwaj[1]* and Rajiv Joshi[2]

[1]Department of Zoology, B.B.K.D.A.V. College for Women, Amritsar, Punjab.
[2]Department of F. Medicine, G.G.S. Medical College, Faridkot, Punjab.

E-mail: monikajoshi2007@rediffmail.com

ABSTRACT

Objectives: This study was conducted to investigate into the status of various haematological parameters for healthy adult female students of Amritsar. Method: This study was under taken in reference to adult female students in the area of Amritsar, Punjab. A total 121 healthy volunteers whose ages ranged between 18–23 years, were investigated. All laboratory analysis was conducted under standardized conditions at the Haematology Section, Department of Zoology, B.B.K.D.A.V. College for Women Amritsar. Results: The mean Haemoglobin concentration (Hb) of students was 11.63 g/dl and Haematocrit (HCT) value was 38.82 %. The mean Red Blood Cell (RBC) count, Mean Corpuscular volume (MCV), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC) and mean White Blood Cell count (WBC) in females was 4.78 $x10^{12}$/l, 83.9 fl, 28.27 pg, 30.72 g/dl and 8.02x 10^9/l respectively. The mean platelet count was 255 $x10^9$/l. The female students from three age groups i.e.18-19 yrs, 20-21 yrs and 22-23 yrs did not differ significantly w.r.t various complete blood count (CBC) parameters. Females from age group 22-23 yrs had highest (12.05g/dl) mean Haemoglobin (Hb). The three BMI groups differed significantly w.r.t R.B.C. Count only.

Keywords: Haematological parameters, CBC, Female-students, Anthropometric.

INTRODUCTION

The body mass index has been associated with various haematological indices (Akramipour, Rezaei and Rahimi, 2008; Andrews, Ullrich, and Fleming, 2009).However, the haematological values are found to vary in different populations belonging to different geographical areas (Gilles, 1981).The variations are usually due to age, sex, attitude (Hawkins et al.,1954; Viteri et al.,1972 and De Gruchy, 1989) , environmental factors and social differences (Sharper, and Lewis ,1971;Woodliff et al., 1971 and Garn et al., 1975).

Assessment of haematological indices and body mass index (BMI) gives significant information on the nutritional and health status of individuals. Screening of students for haematological and metabolic abnormalities at an earlier stage can save them from possible impacts during the critical stage of academic studies and can be very rewarding for society in general.

The current study was carried out to determine body mass index, and haematological parameters (CBC) in female students, in order to incline them towards health care program suitable to their present status.

MATERIAL AND METHODS

Study Sample:

The present study was carried out in 121 apparently healthy female students of age group 18-23 years, selected from local colleges at Amritsar district of Punjab, India. Prior permission was taken from the ethical committee of the institutes. Informed consent was obtained from the students. The detailed history of the subjects was taken to exclude any genetic disorders like thalassemia, sickle cell anaemia and G6PD deficiency.

Study Design:

Blood samples were collected in morning hours between 8.30- 9.30 AM in K2 EDTA vials and processed for complete blood count (CBC) i.e. Haemoglobin (Hb) concentration, Haematocrit (HCT) ratio, Red Blood Cell (RBC) count, Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC), Platelet count and White Blood Cells (WBC) count. Measurement of haematological parameters was carried out within 2 hours of sample collection using Orion-30, automated haematology analyser. The height and body weight of the students was recorded with a stature meter and a digital weighing scale.BMI (kg/m^2) was calculated and the students were categorized into three groups viz. underweight (<5th percentile), Normal (5th -84.9th percentile) and overweight (> or=85th percentile).

Statistical Analysis:

Statistical analysis was performed using commercially available statistical software (SPSS 16.0). Descriptive statistics were presented as means ± standard deviation (SD). Differences were assessed using a one-way analysis of variance (ANOVA). A minimum *p*-value of 0.05 was the necessary condition for statistical significance.

RESULTS AND DISCUSSION

The mean & standard deviation of Hb, RBC Count, HCT, WBC Count, MCV, MCH, MCHC and RDW of all 121 cases has been shown in Table No. 1.

Table No. 1: Haematological parameters of entire study group (N=121).

CBC Parameters	Minimum	Maximum	Mean	S.D
Hb	7.60	13.90	11.63 g/dl	1.12
RBC	3.40	12.80	$4.78 \times 10^{12}/l$	1.66
HCT	11.20	92.50	38.82 %	7.62
WBC	3.70l	12.80	$8.02 \times 10^9/l$	1.76
MCV	24.10	115.60	83.90 fl	12.89
MCH	18.80	91.40	28.27 pg	8.54
MCHC	25.50	51.30	30.78 g/dl	2.67
PLT	190.00	490.00	$255.36 \times 10^9/l$	83.93

The mean Haemoglobin concentration (Hb) of students was 11.63 g/dl and Haematocrit (HCT) value was 38.82 pg. The mean Red Blood Cell (RBC) count, Mean Corpuscular volume (MCV) ,Mean Corpuscular Haemoglobin (MCH) , Mean Corpuscular Haemoglobin Concentration (MCHC) and mean White Blood Cell count (WBC) in females was 4.78 x10^{12}/l, 83.9 fl, 28.27 pg, 30.72 g/dl and 8.02 x 10^9/l respectively.

The mean platelet count was x 255x10^9/l. Considering the data age-wise (Table: 2), the mean Haemoglobin concentration (12.05 g/dl) was the highest in older group i.e. 22-23 yrs. In the younger groups, the mean Haemoglobin level was below the cutoff point of 12g/dl.

Table- 2 depicts that female students from three age groups i.e.18-19 yrs, 20-21 yrs and 22-23 yrs did not differ significantly w.r.t various haematological and anthropometric parameters. In other words BMI, Hb conc., RBC Count, WBC Count ,HCT, MCV, MCH, MCHC and RDW did not exhibit any significant difference w.r.t. age.

Table No. 2: Age-Wise Comparison of BMI and Haematological parameters (N=121)

Anthropometric & Haematological Parameters	(18-19YRS) n=46		(20-21YRS) n=54		(22-23 YRS) n=21		F	Sig.
	Mean	S.D	Mean	S.D	Mean	S.D		
BMI	20.04 kg/m^2	3.60	20.49 kg/m^2	3.70	20.60 kg/m^2	4.34	.233	.792
Hb	11.69 g/dl	1.61	11.60 g/dl	1.23	12.05 g/dl	.80	1.183	.310
RBC	4.65x10^{12}/l	1.47	4.80x10^{12}/l	1.82	5.02x10^{12}/l	1.65	.365	.695
HCT	39.71 %	8.83	38.55 %	6.79	37.59 %	6.85	.618	.541
MCV	87.70 fl	11.46	88.18 fl	14.37	87.26 fl	12.40	.042	.959
MCH	26.72 pg	3.02	28.75 pg	9.08	30.40 pg	13.68	1.508	.226
MCHC	30.52 g/dl	3.46	30.97 g/dl	2.19	30.84 g/dl	1.65	.369	.692

However, females from age group 22-23 yrs had highest (12.05g/dl) mean Haemoglobin (Hb). A comparison of Haemoglobin status w.r.t. BMI revealed that the overweight group had highest mean Hb (figure 1). The three BMI groups differed significantly w.r.t R.B.C. Count only (Table 3) as overweight group had the highest R.B.C. Count.

Table No. 3: Descriptive statistics & Comparison of CBC parameters w.r.t BMI

BMI Groups	Frequency	Percent
Underweight	46	37.7
Normal	61	50.0
Overweight	14	11.5
Total	121	99.2

As regards the Hb concentration, our finding corroborates with the earlier study reported by Pandey and Singh (2013) where BMI was found to be directly associated with Hb concentration. Yu Chin et.el. (2013) also reported that overweight women had higher Hb concentration than the underweight and normal weight Chinese females. As per WHO guide lines of cut-off values of Hb, the overall prevalence of anaemia was 22.90 %. Toteja GS et al (2002) showed the prevalence of anaemia in adolescent girls as 90.1%, Kapoor & Aneja et al (1992) as 50.8% & NFHS-3 as 55% .The prevalence of anaemia is

less in our study as compared to above studies as the cases belonged to urban & educated class. On grading anaemia as per WHO cut-off values of Hb there were 38.01 % cases in mild category (Hb 10-11.9g/dl), 8.26% in moderate (Hb 7.0-9.9g/dl) and 0% cases in severe category (Hb <7.0g/dl).

Our findings are in consonance with the study reported by Sanjeev Chaudhari et al (2008) where among the females from urban area, 69.2% had mild anaemia while 30.8% had moderate anaemia but none of the subjects had severe anaemia. Pandey and Singh (2013) had a similar finding as anaemia was found to be more prevalent among the underweight students from Chhattisgarh, whereas overweight students had lesser prevalence of anaemia. In view of these findings it is evident that a significant proportion of the apparently healthy female students belonging to the higher socio-economic classes suffer from anaemia and may have latent iron deficiency even if not anaemic. The possible reason for this could be the poor bio- availability of iron in the Indian diets (Desai and Chaudhary, 1993). The teenagers prefer junk food and are missing out on high fibre and proteinaceous diet. Moreover, iron fortified foods are not readily available in Punjab .Studies have reported the higher prevalence of anemia among vegetarian children (Verma et al,1999) which further adds

Figure 1: Haemoglobin (Hb) conc. w.r.t. BMI
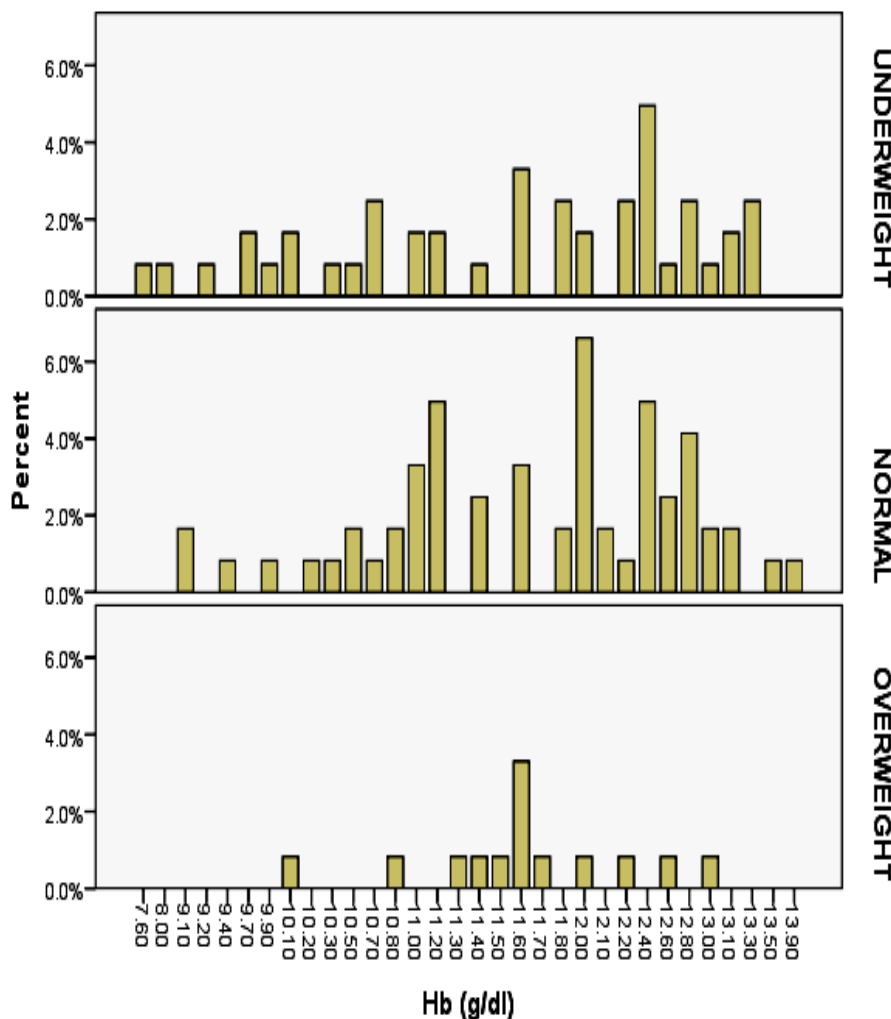
to the already existing evidence indicating that vegetarian diets are a poor source of iron.

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