Changes in economic status and its effect on hematological parameters in females at menarche

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Abstract

The study was conducted to show the relation and the effect of menarche on some biochemical parameters on blood serum of secondary school girls at menarche. From two different socioeconomic status (48) samples were collected from girls students [18 which live in higher socioeconomic status as (group I) and 30 in low socioeconomic status as (group II) with menstrual cycle and (20) school girls without menstrual cycle from different socioeconomic status as control out of which 8 which live in higher socioeconomic status, 12 in low socioeconomic status to each group] with ages ranges between (12-15) year.The biochemical parameters studied were iron, total iron binding capacity (TIBC), unsaturation iron binding capacity (UIBC), transferrin, haemoglobin (Hb), vitamin C and E. No significant difference between biochemical parameters when measures within group I and II when compared with their controls, but there were significant decrease between group II and I when compare together in all biochemical parameters except that Hb and vitamin E.Also the results showed no correlation between measured parameters and age at menarche and nutrition.

Abreviations: TIBC: Total iron binding capacity, UIBC: Unsaturated iron-binding capacity, DNPH: 2,4-dinitrophenyl hydrazine

Introduction

Menarche is a series of anatomic and physiological events of puberty. It is the first menstrual period, or first menstrual bleeding. From both social and medical perspectives it is often considered the major event of female puberty, as it signals the possibility of fertility. Timing of menarche is affected by both genetic and environmental factors, especially nutritional status(1).When menarche occurs it confirms that the girl has had a gradual estrogen-induced growth of the uterus, especially the endometrium, and that the "out of low tract" from the uterus, through the cervix to the vagina, is open. Nutritional status has an major role in attainment of menarche, as nutritional status improves, age at menarche. Menarche is attained earlier by well nourished adolescents. A minimal amount of body fat is essential for initiation of menarche(2).In adequate iron intake, or lack of dietary iron in a form that can be absorbed, as well as chronic iron loss by excess volume of mestrual fluid or other chronic bleeding, causes iron-deficiency anemia, with decreased rates of erythrocyte formation and haemoglobin synthesis(3).A nutrient is a chemical whose absence from the diet for a long enough time results in a specific change in health, we say that a person has a deficiency of that nutrient. A diet with too little iron will result in iron deficiency anemia[4].Iron deficiency is the most common cause of anemia in United States (Centers for Disease Control and Prevention). Iron deficiency anemia is characterized by a defect of haemoglobin synthesis[5].Early menarche (before age 12.5 years) was significantly more common among taller girl, and those with higher body mass index[6].The aim of this study is to know the influence of nutritional supplementation on the age at menarche, and to determine some parameters such as iron, vitamin C and E for school girls with premenarcheal or postmenarcheal (i.e had not or had experienced menarche respectively).

Materials and Methods

The present study was carried out on two school going girls of different socio-economic status. Group (I) consist of girls who live in higher socioeconomic status, households, as indicated by higher material educations, better housing quality, while group (II) consist of girls who live in lower socioeconomic status, and worse housing quality. The ranging in their ages between (12-15) years. Blood samples from group (I) were collected (18 with menstrual cycle and 8 with no menstrual cycle and were considered as control to comparison in this group).Furthermore (42) blood samples from group (II) were collected (30 girls with menstrual cycle and 12 with no menstrual cycle which were considered as control for the group II). On the other hand, the following information from each school girls for both groups were obtained.

1. Age.
2. Socioeconomic status.
3. Age of first mensurational bleeding.
4. Regulation of cycle.
5. Duration of cycle

Five milliliters of venous blood was taken from each girls and left for (15) minutes at a room temperature for coagulation, serum then were separated by centrifugation at (3000 xg) for (10) minutes. Serum was divided in a liquat and kept frozen at (-20 °C) for the assays of biochemical tests [7].

- Iron was assayed using colorimetric method by kit of Syrbio[8].
- Total iron binding capacity (TIBC) was calculated from iron concentration in the serum (μg/dL) × 3 dilution factor.
- Unsaturated iron-binding capacity (UIBC) was calculated by using the following law

TIBC (μg/dL) – serum iron (μg/dL) = UIBC (μg/dL)

$$\text{Transferrin} = \frac{\text{serum iron}}{\text{TIBC}} \text{x}100$$

- Haemoglobin level was measured by using cyanomethaemo-globinometry[9].
- Vitamin C was determined photometrically using 2,4-dinitrophenyl hydrazine(DNPH)[10].
- Vitamin E was measured according to Emmeric-Engel reaction[11].

Results and Discussion

The results in Table (1) showed the comparison between group (I) with its control. It was found that there is an increase in iron, TIBC, UIBC, transferrin and vitamin C, but this increment is not significant. Also, it was found there is insignificant decrease when measuring haemoglobin and vitamin E in blood serum of school girls in group (I) whom live in higher socioeconomic status and with menstrual cycle when compared with the control group (the school girls without menstrual cycle).

Table (1): The comparison of some biochemical parameters between group (I) and its control in sera of school girls with high socioeconomic status

Biochemical parameters	mean ± SE		p-value
	Control (No. = 8)	Group I (No. = 18)	
Iron (mg/L)	0.821 ± 0.28	1.619 ± 0.35	0.171 (NS)
TIBC (mg/L)	2.454 ± 0.84	4.957 ± 1.05	0.171 (NS)
UIBC (mg/L)	1.645 ± 0.56	3.247 ± 0.70	0.168 (NS)
Transferrin (mg/dL)	205.34 ± 70.09	322.07 ± 66.72	0.303 (NS)
Haemoglobin (gm/L)	14.47 ± 0.33	14.01 ± 0.31	0.385 (NS)
Vit. C (mg/dL)	$0.883 \pm 2.48 \times 10^{-2}$	$0.999 \pm 4.02 \times 10^{-2}$	0.107 (NS)
Vit. E (mg/dL)	$0.477 \pm 3.93 \times 10^{-2}$	$0.427 \pm 4.38 \times 10^{-2}$	0.489 (NS)

NS = non-significant.

The results in Table (2) showed the comparison between group (2) and its control which was found that there is no significant differences in iron, TIBC, UIBC, transferrin, haemoglobin, vitamin C and E in sera of school girls with menstrual cycle in lower socioeconomic status and without menstral cycle which were considered as control.

Table (2): The comparison of some biochemical parameters between group (II) and its control in sera of school girls with low socioeconomic status

Biochemical parameters	mean ± SE		p-value
	Control (No. = 12)	Group II (No. = 30)	
Iron (mg/L)	$0.563 \pm 8.91 \times 10^{-2}$	$0.564 \pm 6.19 \times 10^{-2}$	0.999 (NS)
TIBC (mg/L)	1.694 ± 0.26	1.690 ± 0.18	0.982 (NS)
UIBC (mg/L)	1.127 ± 0.17	1.140 ± 0.12	0.954 (NS)
Transferrin (mg/dL)	140.863 ± 22.28	140.864 ± 15.49	1.000 (NS)
Haemoglobin (gm/L)	13.90 ± 0.22	13.77 ± 0.22	0.75 (NS)
Vit. C (mg/dL)	$0.924 \pm 2.80 \times 10^{-2}$	$0.896 \pm 1.51 \times 10^{-2}$	0.353 (NS)
Vit. E (mg/dL)	$0.492 \pm 5.73 \times 10^{-2}$	$0.479 \pm 4.34 \times 10^{-2}$	0.868 (NS)

NS = non-significant.

On the other hand, the results in Table (3) showed the comparison between the different socioeconomic status (i.e between group (I) and group (II)) which indicated that there were a significant decrease in iron, TIBC, UIBC, transferrin and vitamin C, while there is no significant differences in haemoglobin and vitamin E.

Table (3): The comparison between different socioeconomic status group (I) and (II) at age of menarche

Biochemical paramet	mean ± SE		p-value
	Group I (No. = 18)	Group II (No. = 30)	
Iron (mg/L)	1.619 ± 0.35	$0.564 \pm 6.19 \times 10^{-2}$	0.000*
TIBC (mg/L)	4.857 ± 1.05	1.690 ± 0.18	0.000*
UIBC (mg/L)	3.247 ± 0.70	1.140 ± 0.12	0.000*
Transferrin (mg/dL)	322.07 ± 66.72	140.864 ± 15.49	0.002*
Haemoglobin (gm/L)	14.01 ± 0.31	13.77 ± 0.22	0.356
Vit. C (mg/dL)	$0.999 \pm 4.02 \times 10^{-2}$	$0.896 \pm 1.51 \times 10^{-2}$	0.018*
Vit. E (mg/dL)	$0.427 \pm 4.38 \times 10^{-2}$	$0.479 \pm 4.34 \times 10^{-2}$	0.435

*significant at $p < 0.001$

These results (Table 3) were similar with previous reports which they noted a significant differences between these parameters (11). The higher consumption of meat may explain the higher levels of iron, TIBC, UIBC and transferrin levels of the school girls with higher socioeconomic status. This is in accordance with the dietary traditions(12).The low levels for iron of group (II) which they live in lower socioeconomic status is due to the increased need for iron due to rapid growth, more physical activity and menarche, low intake of iron-rich foods, in appropriate dietary choices, all or in various combination(13).On the other hand, the results of Vit. C (Table 3) indicated that it was shown the significantly differences between the two socioeconomic status. This result is due to the food constituents, metabolic consequences of eating, and the temporary changes in the patterns of feeding habits may participate in developing of puberty. Postmenaposal risks in the elderly may also depend as much on diet in early life puberty as on current eating practices(14). Greater food availability does not necessarily equal better nutrition or health status(13).In this study, the correlation between nutrition and the levels of some parameters were measured in serum of school girls with different socioeconomic status. The results in Table (4) showed that there is no correlation between the nutrient intake, age of starting menarche and biochemical parameters. These results were in accordant with other studies(15). These results are probably due to the wide range of genetic, social, and other environmental factors, can influence the timing of puberty, in addition the low number of participant in this study could not give us that correlation of present.

Also, the results in Table (4) showed that there were no correlation between the level of some parameters and the age at menarche. On the other hand, the correlation between nutritional and the age at menarche was done in this study but the results indicated that there were no correlation between them (Spearman correlation coefficient at -0.046). Previous studies have shown the age at menarche which was not associated with intake of energy or with energy-adjusted intake of protein, fat, or carbohydrate(15). Another investigation suggest that the some of the least understood environmental influences on timing of puberty are social and psychological. Nearly all of the research on these effects has concerned girls, partly because female puberty requires greater physiology resources and partly because it involves a unique event (menarche) that makes survey research into female puberty much simpler than male(16).

Table (4): The Pearson correlations coefficient between feed, age start menarche and biochemical parameters in sera

Parameter I	Biochemical parameters	Pearson correlation coefficient	p-value
Feed	Iron	- 0.32	NS
	TIBC	- 0.32	NS
	UIBC	- 0.32	NS
	Transferrin	- 0.14	NS
	HB	- 0.26	NS
	Vit. C	- 0.10	NS
	Vit. E	- 0.04	NS
Age start menarche	Iron	- 0.16	NS
	TIBC	- 0.16	NS
	UIBC	- 0.17	NS
	Transferrin	- 0.31	NS
	HB	- 0.07	NS
	Vit. C	- 0.22	NS
	Vit. E	- 0.08	NS

NS = non-significant

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