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Bio-Chemical Changes in Women during Normal and Menstruation Periods

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There are many common misconceptions associated with women actively involved in various strenuous activities as well as participating in sports activities during menstruation. Many findings show that for the majority of young athletes. physical performance itself is not materially affected by the menstrual period. The bio-chemical changes which take place during the phase of the cycle in women is being discussed

INDTRODUCTION

The menstruation cycle varies in women, each having her own menstrual pattern; it may be said that a cycle of 21 to 35 days is within normal limits, the majority menstruating every 28 days with a variation of 2 or 3 days. The flow lasts normally from two to seven days, frank blood at first but later a brownish discharge. The total amount lost at a normal menstruation is about 50 mL. but the variations from one normal woman to another is enormous, some losing as little as 6 mL and the others as much as 170 mL; clots occur when the loss is heavy.

There is a slight lowering of general efficiency just preceding menstruation; the body temperature and pulse rate show a regular wave, reaching the maximum just before and minium slightly after menstruation. These changes are too slight to affect general metabolism and do nothing more than influence the general feeling of well-being.[1]

Haemoglobin (Hb) is the compound found in red blood cells that carries most of the oxygen from the lungs to the skeletal muscles. The lower Hb concentration of the adult female is sometimes associated with iron deficiency anemia.[2] The need for food iron is greater in women than in men because of the blood loss during the monthly menstrual periods.[3]

The bio-chemical changes that occur during normal and menstruation periods between normal women and those who involve actively in sports are being compared. In the bio-chemical variables glucose is the primary source of energy and it is used by the muscles during muscular activity. The females are more susceptible to iron deficiency than are males due to the loss of iron through

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menstruation. Female athletes in particular may be further affected because of the possibility of a greater iron need during physical training.This variable seems to influence and determine the menstrual cycle.

EXPERIMENTAL

To find out whether there would be any significant difference in bio-chemical variables during normal and menstruation periods between trained and untrained women, 20 college women subjects, ten trained and ten untrained having almost the normal menstrual cycle were selected by personal interview from Annamalai University. Their age ranged from 20 to 23 years. Subjects who have represented the University in any game/sports and undergone systematic training were considered as the trained subjects. Each subject was tested during 2 phases of the cycle namely menstrual phase, that is within 24 h after the onset of the menses and the ovulatory phase which fell 13–14 days from the onset of the cycle.

Blood sample was taken from each individual under fasting conditions in the morning hours between 7.30 and 8.30 am.

To find out blood sugar Buehnnger Mannheim was used and Enzymatic Colorimetric Method was used. 2 mL of blood was collected and was poured in the oxalated test tube; 1 mL of buffer (reagent) was taken in a test tube and 10 microlitre of plasma was added and shaken well and kept in the incubator at 37°C for 15 min to speed up the reaction. Finally the light orange colour was measured. The blank, standard and test samples were taken in cuvettes and optical density was measured by placing the cuvettes in the instrument. The optical density of the blank was displayed on the screen. To calculate the amount of sugar present in the sample the following formula was used.

$$\text{mg \% of sugar} = \frac{\text{O.D. of the test} - \text{O.D. of the blank}}{\text{O.D. of the standard} - \text{O.D. of the blank}} \times 100$$

O. D. = optical density

To find out haemoglobin level in the blood, Acid Sahli-Haemoglobinometer was used by Haematic method or Sahli method.

20 mL of the anticoagulated venous blood was taken in the calibrated tube of the haemoglobinometer with 0.1 hydrochloric acid. The blood specimen was drawn into the Sahli pipette and care was taken that no air bubble enters into the blood while taking the sample. The blood was blown into the acid solution inside the graduated tube. Content of the pipette was washed out by repeated drawing in and blowing out of the diluting fluid 3 times. The mixture in the tube was kept at room temperature for 10 minutes and thereafter was placed in the haemoglobinometer. The colour of the diluted blood in the tube was compared with the reference tube. When the colour was same, the haemoglobin concentration of 4 g/dL was reported. If the colour of the test solution was darker than the reference tube, the test solution was diluted with 0.1 N HCl drop by drop, by stirring with a glass rod till the colours of the two tubes matched. The haemoglobin concentration was read directly from the mark. The reading may be in % of normal or in g/100 mL. 14.68/dL was considered as normal.[4]

RESULTS AND DISCUSSION

To determine whether there is a significant difference between trained and untrained during normal and menstrual periods on glucose and haemoglobin levels Hotelling T^2 statistics is used. Hotelling* T^2 statistics is used to test the equality of mean vectors, whose components are glucose and haemoglobin levels of two different groups of women.

The Hotelling T^2 statistics is given by

$$T^2 = \frac{N_1 N_2}{N_1 + N_2} (\bar{x} - \bar{y})^1 s^{-1} (\bar{x} - \bar{y})$$

and $$F = \frac{T^2}{N_1 + N_2 - 2} \frac{N_1 + N_2 - P - 1}{P} \text{ N F}(P_1 N_1 + N_2 - b - 1) \text{ df}$$

where $\bar{x}$ is the mean vector of the first group

$\bar{y}$ is the mean vector of the second group

N_1 is the sample size in the first group

N_2 the sample size in the second group

P is the number of components in the mean vector

(Here p = 2)

S is the variance-covaniance matrix (pooled sample)

Observations made on these subjects are as follows:

(1) Testing the equality of mean vectors of trained women between the normal and menstrual periods:

Mean vector for normal period is	80.4 and 12.7
Mean vector for menstrual period is	98.20 and 12.08
Pooled variance-covariance matrix is	121.56 3.66
	3.66 2.49
Hotelling T^2 value is	15.889
F value is	7.5

Therefore, the mean vectors of trained women between the period are significantly different.

i.e., glucose and haemoglobin levels differ and are based upon the period.

(2) Testing the equality of mean vectors of untrained women between the normal and menstrual periods:

The mean vectors for the normal and menstrual periods are respectively given by

82.60 and 90.50
13.30 and 12.20

The variance-covariance matrix is 42.54 and 0.567
0.567 and 1.289

*Instead of D^2, Hotelling T^2 were computed. T^2 is also very similar to D^2 in all the senses, including the interpretations of the results.

T^2 value is 13.080 and F value is 6.177

∴ The mean vectors of untrained women between the periods are significantly different.

(3) Testing the equality of mean vectors between the trained and untrained women during the normal period:

Mean vectors for trained and untrained women are respectively given by

80.40 and 82.6
12.70 and 13.3

Variance–covariance matrix is 50.89 and 3.256

3.256 and 1.862

T^2 value is 9.0956 and F value is 4.518

Therefore, there is significant difference between the women during the normal period

i.e. there is significant difference in glusose and haemoglobin levels during the normal period

(4) Testing the equality of mean vector between the trained and untrained women during the menstrual period.

Mean vectors for trained and untrained women during the Menstrual period are respectiely given by

	98.20	90.50
	12.08	12.00
Variance–covariance matrix is	113.12	0.972
	0.972	1.913

T^2 value is 8.4812 and F value is 4.266

There is significant difference between the trained and untrained women during menstrual period.

In both the groups, the mean haemoglobin has a decrease from normal period to menstrual period and untrained women have a greater mean value than the trained women in both normal and menstrual periods.

The study also reveals that the glucose level rises significantly in the menstrual period above the normal period for both the trained and untrained women. There is a significant rise in glucose level for the trained above the untrained women during normal and menstrual periods.

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