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Assessment of nutritional status of expectant mothers through selected haematological parameters

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Abstract

Thirty healthy pregnant women from each trimester of pregnancy were analysed for haemoglobin, packed cell volume, red blood cell count and red cell absolute values. Regarding haematological status, it was noticed that stage of pregnancy had an inverse relationship with Hb, PCV and RBC count. Red cell absolute values showed an irregular trend during the gestation period. Majority of the experimental subjects particularly control group showed lower values of biochemical measurements when compared to reported standards. Hence, a need is felt to increase the nutritional status of adolescent girls and pregnant women of this area.

Key words: Expectant mothers, nutritional status, haemoglobin, packed cell volume, red cell count, red cell absolute values.

Introduction

Pregnancy is a state of physiological stress characterised by profound metabolic changes that serves to meet the demands of the rapidly growing foetus. As the foetus receives its nutrition from the mother, good maternal nutrition plays an important role in improving the foetal growth and development in pregnant women (Mowafy and Youssef,1990). One of the major nutritional problems in expectant mothers in our country is pregnancy anaemia which is much more prevalent than other types of anaemia and is severe in late than in early pregnancy. This is because of the fact that the requirement of most of the nutrients increases during pregnancy because of the progressive haemodilution that begins early and reaches to its maximum extent in the third trimester thereby decreasing the concentration of many nutrients in the plasma.

Anaemia is associated with a decrease either in number and size of red cells or haemoglobin content. Knowledge of haemoglobin level is important not only in identification of anaemia but it can be used as an indicator of the necessity for a more extensive haematological examination or made the sole basis for institution of iron therapy (Worthington and William,1993). To assess the degree of malnutrition with respect to anaemia, the determination of haemoglobin, packed cell volume, red blood cell count, serum iron, etc. have been found useful. It was, therefore, proposed to assess the nutritional status of expectant mothers of this area through selected haematological parameters.

Material and Methods

Thirty healthy pregnant women from each trimester of pregnancy in the 20 - 30 years of age were selected randomly as experimental subjects from areas of Palampur sub-division of Himachal Pradesh. An additional group of thirty normal healthy females (non- pregnant, non- lactating) of similar age was also selected as control. The areas under study were located at an altitude of 1200 -1500 metres above mean sea level. The anti- coagulated blood of the experimental subjects was analysed for different haematological parameters viz. haemoglobin, packed cell volume and red blood cell count as suggested by Mukherjee (1992). Red cell absolute values namely mean cell volume(MCV), mean cell haemoglobin (MCH) and mean cell haemoglobin concentration (MCHC) were calculated by the following expression as given by the same author.

$$MCV\ (fl) = \frac{Haematocrit\ (\%)}{RBC\ count\ in\ millions} \times 10$$

$$MCH\ (pg) = \frac{Haemoglobin\ (g\ /\ dl)}{RBC\ count\ in\ millions} \times 10$$

$$MCHC = \frac{Haemoglobin\ (g / dl)}{Haematocrit\ (\%)} \times 100$$

Results and Discussion

Haemoglobin

Figure 1 shows a progressive decrease in mean haemoglobin levels with value of 11.89 g/dl for first trimester, 11.40 for second trimester and 10.87 g/dl for the third trimester. The control subjects recorded the lowest value of 10.50 g/dl. Analysis of variance showed significant difference among the selected subjects. Mean haemoglobin content was significantly higher in the first and second trimesters as compared to control and pregnant women in third trimester. The pregnant women however recorded lower haemoglobin values during this period. Low levels of Hb have been reported from many parts of India. Kumari and Singh (2004) carried out a survey on health and nutritional status of pregnant women in Bihar. They found that majority (75%) of women were moderate anaemic, 5 per cent were mild anaemic while 20 per cent were suffering from severe anaemia. The results of the experiment conducted by Leela (2004) showed that among the total number of subjects 29.9 per cent were non-anaemic while the remaining 70.4 per cent were considered anaemic. Among the anaemic mothers, 23 per cent had severe anaemia.

Haemoglobin concentration of blood below values is a sign of anaemia. It further drops during pregnancy due to haemodilution (a proportionately greater increase in plasma volume as compared to the increase in red cell mass). Hence the course of supplementation as well as intake of nutritious foods should be regular in order to achieve a desirable nutritional status.

Packed Cell Volume

Mean packed cell volume was found to be significantly lower during the third trimester of pregnancy as compared to control and first trimester group whereas, that of second trimester was at par with rest of the groups. Values registered by the control group and women during three trimesters of pregnancy were 34.5, 34.8, 33.4 and 31.8 per cent, respectively which showed gradual fall with the increase in gestation period (Figure 1).

Lower values may be the result of lower red blood cell count in expectant mothers because both parameters are inter-related to each other. Packed cell volume is known to be a reasonable index of the red cell population. Further a decrease in its value is a suitable measurement for detection of anaemia. The gradual fall of packed cell volume may be the result of hydraemia (excessive fluid in the blood as occurs in pregnancy). However, in comparison to other haematological parameters, pregnant women recorded lower haematocrit than the controls.

Red Blood Cell Count

Significant variation was seen in the red blood cell count of the studied group. During pregnancy, mean count during second and third trimesters was significantly lower than the count of first trimester group and was at par for the control and second and third trimesters of pregnancy. The mean values in case of control and pregnant women in three trimesters of pregnancy were 369.7, 382.6, 360.2 and 352.7 X 10^4 cells/µl of blood respectively (Figure 1).

In the present study, for control women, the mean value was below the range of 4.0-4.8 million/ mm^3 as reported by Shills and Young (1988). A glance at the figure discloses a significant decline in the mean erythrocyte values with increasing duration of pregnancy.

Red cell absolute values

Mean Cell Volume

Figure 2 shows an irregular trend of Mean Cell Volume (MCV) during pregnancy with the highest value occurring during second trimester (93.01 fl), followed by first (91.22 fl) and third (90.75 fl) trimesters. Non-pregnant subjects recorded the value of 93.43 fl. The mean values registered for the first, second and third trimesters fell within the range while that of control group was above the range of 77-93 fl as suggested by Penington *et al.* (1986). Increased MCV is a sign of macrocytosis, which may be related to anaemia due to deficiency of vitamin B_{12} and/or folic acid with the occurrence of megaloblasts in the bone marrow. Deficiency of vitamin B_{12} and/or folic acid hampers the division of red cell precursors.

Mean Cell Haemoglobin

A low Mean Cell Haemoglobin (MCH) is found in anaemias associated with microcytic and/or hypochromic red cells. Increased MCH is found with macrocytic red cell morphology. MCH was significantly higher in pregnants as compared to

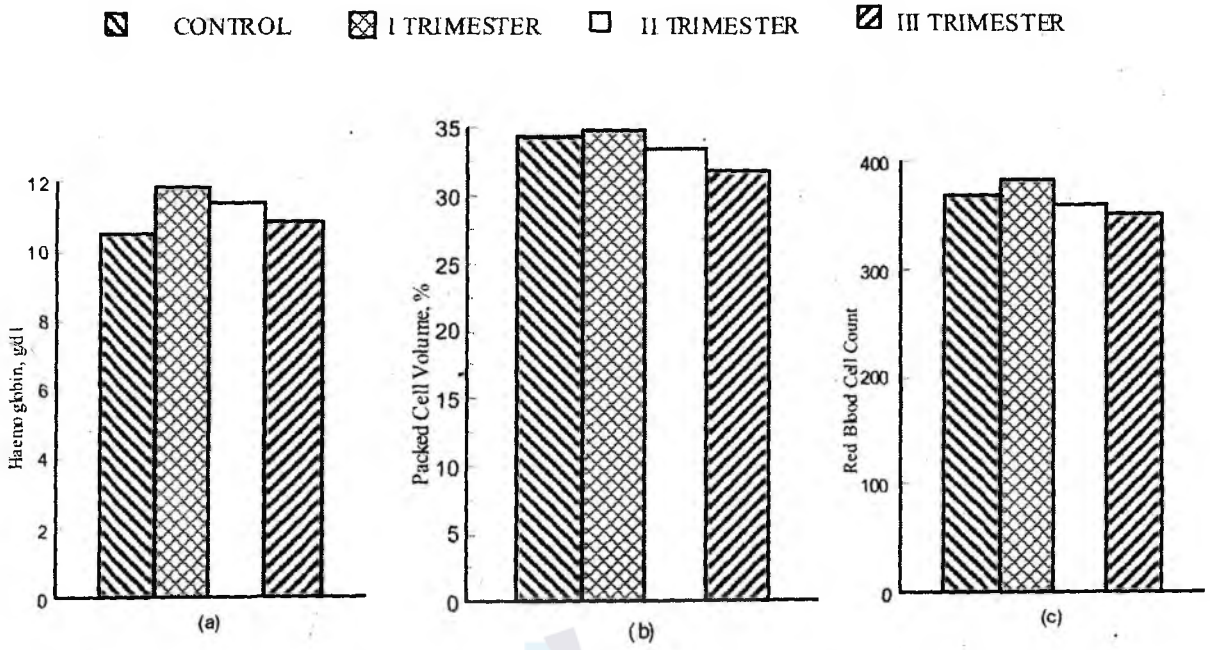


Figure 1. Haemoglobin (a), Packed Cell Volume (b) and Red Blood Cell Count (c) of Control and pregnant subjects

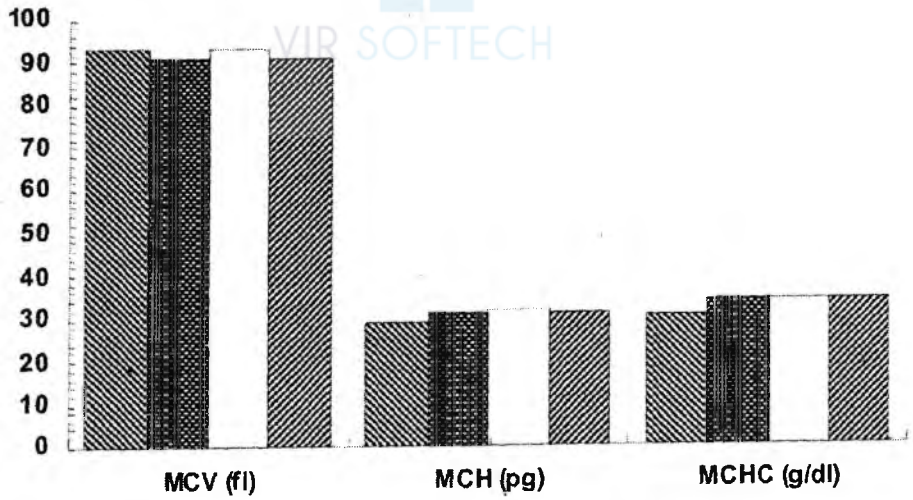


Figure 2. Mean Cell Volume (MCV), Mean Cell Haemoglobin (MCH) and Mean Cell Haemoglobin Concentration (MCHC) of control and pregnant subjects

control while values among different trimesters were at par. Between first (31.17 pg) and second trimesters (31.70 pg) it showed an increasing trend and a decrease in the last trimester (30.95 pg). Control subjects reported lowest value of 28.63 pg.

Mean Cell Haemoglobin Concentration

The value of Mean Cell Haemoglobin Concentration (MCHC) is normal or slightly decreased in macrocytic anaemia, while a severe fall (below 25 per cent) is seen in microcytic hypochromic anaemia and hence is the most valuable index of iron deficiency. Significantly higher MCHC in pregnants was observed as compared to control group. It represented an irregular trend with progression of pregnancy. Values recorded for non-pregnant group was 30.80 g/dl. Expectant mothers during three trimesters showed values of 34.38, 34.18 and 34.28 g/dl respectively.

Conclusion

In the present study, majorities of the experimental subjects particularly control group showed lower values of biochemical measurements when compared to reported standards. The subnormal status of pregnant as well as non- pregnant women reflects that there may be several important nutritional and non- nutritional factors, which could be affecting their nutritional status very adversely. It henceforth, stresses the importance of increasing the nutritional status of adolescent girls and women of this area. If not corrected, the problem may accentuate during their expectancy period leading to poor pregnancy outcome.

In our country, the diets of the expectant mothers are poor and their reserves are minimum. To meet the needs of growing foetus, the maternal reserves are exhausted and the later becomes nutritionally deprived leading to high mortality rate of such women in addition to the unborn child. So, continued efforts to develop feasible and effective ways of improving maternal nutrition during pregnancy are required. Since most ladies are not aware of increase in nutritional requirements during pregnancy, nutrition education during antenatal visits should be considered as an important activity.

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