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Influence of Pregnancy Semester on Hematological and Biochemical Profile in Woman

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Abstract

The hematological and biochemical profile during pregnancy provides information on the health of the body. Hematological and biochemical parameters during pregnancy were influenced by the pregnancy semester. Hematocrit showed large variations under the influence of the semester of pregnancy, semester II (32.04 ± 0.45) and semester III (40.57 ± 0.60). Glucose varied between (55.28 ± 0.83) in the first semester of pregnancy and (86.30 ± 2.19) in the third semester of pregnancy.

Key words: hematological, biochemical profile, woman, semester of pregnancy.

1. Introduction

Blood is a liquid tissue composed of two major components, a liquid one, or plasma, and the other one represented by the cells suspended in plasma, the shaped elements. Unsaturated organic substances are carbohydrates and lipids and intermediates of their metabolism. Blood performs a number of functions that are vital to the body.

By the blood the substances absorbed in the intestine are transported to all cells of the body, so it performs a nutritional function [6]. Nutrition is an important factor with significant influence on the health of pregnant women and the newborn [7].

The maternal hematological and biochemical profile during pregnancy influences the normal development of the newborn [6, 9].

The hematocrit measures the ratio between the volume of erythrocytes and the total blood volume. Hematocrit is dependent on red blood cell count, mean red blood cell volume and plasma volume. Usually, when hematias are of normal size, the changes in hematocrit follow those of the erythrocytes [6, 8]. Vulnerability to illness is related to development disturbances and neonatal life.

The regulation of development depends largely on maternal biochemical signals. All biochemical and metabolic signals serve to guide normal development [4, 5, 9].

The origin of the development of health and illness is a fundamental paradigm for the investigation and understanding of many metabolic diseases of modern humans [2, 3].

Environmental signals have the potential to change the developmental pathways of a young organism as a physiological result for adults and on
metabolism that is heavily affected by these life signals. Thus, the physiological state of an adult is influenced by intrauterine life until childhood. Obesity, diabetes, hypertension, cardiovascular disease, asthma, allergies and other conditions all have potential origins in early life, both pre and postpartum. The purpose of this paper was to evaluate haematological and biochemical parameters of blood in pregnant women under the influence of the pregnancy semester.

2. Material and Method

A total of 30 women aged between 25 and 30 years have been studied. These women are not smokers and have not used alcohol during pregnancy. Blood samples were collected from women according to the pregnancy semester (first, second and third semester pregnancy). Blood samples were subject to hematological and biochemical analysis. Hematologic blood parameters analyzed are:

- Leukocytes, neutrophils, eusinophils, basophils, erythrocytes, hemoglobin, hematocrit, mean red blood cell volume, mean red blood cell hemoglobin, mean hemoglobin/erythrocyte concentration, platelet count, mean volume of platelets.

Hematologic parameters were analyzed by flow cytometry using the Abbott Cell-Dyn Ruby apparatus.

The blood biochemical parameters analyzed are: blood glucose, urea, AST, ALT, creatinine, HDL, cholesterol, LDL, cholesterol, uric acid, total calcium, magnesium, iron, sodium, calcium ion. Biochemical parameters in the blood were analyzed by spectrophotometric method using the Abbott Architect Ci 8200 analyzer.

3. Results and Discussions

Table 1 presents hematological parameters in women during pregnancy (1st, 2nd and 3rd semester pregnancy).

| Analyzed parameter                  | Unit of measurement | First semester of pregnancy | Second semester of pregnancy | Third semester of pregnancy |
|-------------------------------------|---------------------|-----------------------------|------------------------------|-----------------------------|
| Leukocytes                          | 1000/μL             | X±s, V%                     | X±s, V%                      | X±s, V%                     |
| Lymphocytes                         | %                   | 5.76±0.24, 9.48             | 8.06±0.14, 3.98              | 5.66±0.09, 3.66             |
| Neutrophils                         | %                   | 27.10±0.32, 2.64            | 16.96±0.20, 2.62             | 32.34±0.67, 4.66            |
| Eosinophils                         | %                   | 64.22±0.29, 1.01            | 76.1±0.54, 1.59              | 58.40±0.89, 3.39            |
| Monocytes                           | %                   | 0.55±0.04, 15.48            | 0.61±0.01, 4.49              | 1.30±0.03, 4.52             |
| Basophils                           | %                   | 8.08±0.23, 6.27             | 6.38±0.09, 3.01              | 7.62±0.15, 4.49             |
| Erythrocytes                        | 1000/μL             | 0.92±0.01, 2.92             | 0.77±0.04, 11.51             | 0.66±0.02, 7.67             |
| Hemoglobin                          | g/dL                | 4.59±0.04, 1.72             | 3.69±0.02, 1.40              | 4.81±0.05, 2.34             |
| Hematocrit                          | %                   | 13.62±0.25, 4.07            | 11.44±0.16, 3.19             | 13.78±0.15, 2.37            |
| Corpuscular volume                  | fL                  | 38.48±0.53, 3.06            | 32.04±0.45, 3.16             | 40.57±0.60, 3.33            |
| Corpuscular hemoglobin              | pg                  | 88.10±0.33, 0.83            | 87.46±0.68, 1.75             | 84.32±0.57, 1.50            |
| Corpuscular hemoglobin concentration| g/dL                | 29.14±0.29, 2.21            | 32.18±0.75, 5.18             | 28.66±0.43, 3.39            |
| Blood platelet count                | 1000/μL             | 36.06±0.47, 2.89            | 35.06±0.59, 3.75             | 33.88±0.38, 2.48            |
| Platelet volume                     | fL                  | 217±1.30, 1.34              | 170.20±2.78, 3.66            | 244±0.95, 0.87              |
|                                     |                     | 7.50±0.17, 5.03             | 7.84±0.10, 2.97              | 7.64±0.09, 2.70             |

During the last pregnancy, leukocytes varied between 5.66 ± 0.09 (1000/μL) and showed the highest level in the second semester of pregnancy, respectively presenting values of (8.06 ± 0.14) (1000/μL). These values fall within the reference range for this parameter.

The highest values of lymphocytes were detected in the last pregnancy (32.34 ± 0.67) and the lowest in the second period of pregnancy (16.96 ± 0.20). Eusinophiles varied as follows: (0.55 ± 0.04) in the first semester of pregnancy and (1.30 ± 0.03) in the third semester of pregnancy.

Hemoglobin showed the lowest mean values in the second semester of pregnancy, respectively (11.44 ± 0.16). Hematocrit presented the lowest values in the first and second pregnancies (38.48 ± 0.53) and 32.04 ± 0.45 respectively, and the highest values are in the third semester of pregnancy (40.57 ± 0.60).
± 0.60) (Table 1). These values are falls within the characteristic limits for these parameters. The hematological profile greatly influences the pregnancy and the progression of the newborn. There are studies, which demonstrate the influence of the pregnancy trimester on haematological indexes in pregnant women [1, 5]. It refers to a progressive decrease in Hb concentration from the first to the third trimester, but a slight increase in PCV in the third trimester.

### Table 2. Biochemical parameters of serum

| Analyzed parameter | First semester of pregnancy | Second semester of pregnancy | Third semester of pregnancy |
|--------------------|-----------------------------|------------------------------|-----------------------------|
|                    | X±s | V%  | X±s | V%  | X±s | V%  |
| Glucose (mg/dL)   | 55.28±0.83 | 3.36 | 79.44±1.23 | 3.47 | 86.30±2.19 | 5.68 |
| Urea (mg/dL)     | 22.22±1.02 | 10.23 | 25.34±0.79 | 7.01 | 29.22±0.38 | 2.92 |
| Total Cholesterol (mg/dL) | 185.60±4.21 | 5.08 | 175.22±3.63 | 4.63 | 185.8±5.99 | 7.20 |
| AST (U/L)        | 26.76±0.54 | 4.52 | 28.36±0.43 | 3.36 | 29.60±0.25 | 1.87 |
| ALT (U/L)        | 28.82±0.19 | 1.44 | 31.18±0.56 | 4.03 | 33.28±0.26 | 1.69 |
| Creatinine (mg/dL) | 0.84±0.04 | 11.89 | 0.97±0.01 | 3.26 | 1.22±0.05 | 9.63 |
| HDL cholesterol (mg/dL) | 43.17±0.34 | 1.75 | 46.04±0.12 | 0.58 | 55.24±0.45 | 1.80 |
| LDL cholesterol (mg/dL) | 140.98±1.83 | 2.90 | 152.12±2.72 | 3.99 | 159.7±2.5 | 3.5 |
| Uric Acid (mg/dL)   | 2.55±0.07 | 6.51 | 3.69±0.13 | 7.93 | 5.82±0.16 | 6.23 |
| Total Ca (mEq/L)   | 4.64±0.09 | 4.38 | 5.16±0.08 | 3.21 | 5.22±0.08 | 3.21 |
| Mg (mEq/L)         | 1.71±0.02 | 2.91 | 1.97±0.03 | 3.37 | 2.57±0.04 | 3.35 |
| Iron (µg/dL)      | 58.20±1.53 | 5.88 | 61.6±3.12 | 11.34 | 76.8±1.83 | 5.32 |
| Na (mmol/L)       | 145±1.38 | 2.13 | 147.4±1.44 | 2.18 | 149.4±0.76 | 1.13 |
| Ionized Ca (mmol/L) | 1.03±0.03 | 5.58 | 1.12±0.03 | 5.10 | 1.17±0.05 | 10.13 |

Data obtained for glucose (Table 2) after investigations are considered normal values during the pregnancy, it can be noticed a slight increase during the three trimesters of pregnancy, recording the values: 55.28 ± 0.83 mg/dl for the first trimester, 79.44 ± 1.23 for second trimester and 86.30 ± 2.19 for the third trimester of pregnancy, values below the maximum limit required for a normal pregnancy are 105 mg/dL. HDL does not show significant elevations (Table 2), in the first trimester this parameter presented 43.17 mg/dL, during the second trimester being characterized by an average increase 46.04 mg/dl and in the third trimester, the numbers are reaching 55.24 mg/dl.

LDL cholesterol numbers presents an increase during the pregnancy, a more important increase occurs in the second trimester (152.12 mg/dL) and in the third semester of pregnancy where the values will increase to (159.70 mg/dL). ALT and AST are detected in the third semester respectively (29.76 U/l and 33.28 U/L).

The data regarding AST and AST for the first six months of pregnancy are 26.76 U/L and 28.82 U/L. Following the measurements (Table 2), it can be noticed the numbers of these three biochemical indices, meaning that these parameters belong to normal ranges: urea shows the lowest amount in the first semester of pregnancy (22.22 ± 1.02) and the highest level is observed in the last semester (29.22 ± 0.38). In the case of creatinine the lowest amount was obtained in the first semester of pregnancy (0.84 ± 0.04), during the last semester the numbers were higher (1.22 ± 0.05); Uric acid showed similar results presenting the lowest numbers in the first semester of pregnancy (2.55 ± 0.07) and the highest values above normal detection limit were observed in third semester (5.82 ± 0.16). Data obtained from total cholesterol is presented in (Table 2), showing the numbers of 185.60 mg/dl in the first semester of pregnancy, during the second semester it drops to 175.22 mg/dl, and during the last semester rises to 185.8 mg/dL, a higher amount than in the first six months of pregnancy.

Total amount of Ca represents a slight increase in the first semester from 4.64 mEq/L to 5.16 mEq/L and as in the second semester of pregnancy, the highest values are present in the last trimester reaching 5.22 mEq/L. Magnesium also showed a slight elevation throughout pregnancy, reaching values of 1.71 mEq/L in the first semester, 1.97 mEq/L in the second semester, and in the last semester of pregnancy the recorded numbers were 2.57 mEq/L.

Analyzes of ALT and AST enzymes are required for the timely detection of possible liver and
health problems that pregnant women may pose throughout their pregnancy.

4. Conclusions

Most hematological measurements showed variations depending on the period of pregnancy and are within the reference range for these parameters. In the case analyzed enzymes, it can be noted that both types of enzymes are in a slight growth throughout the pregnancy, the highest values for hematological and biochemical parameters of blood were also evaluated during the breastfeeding, after sampling of colostrum and milk samples for investigations, showed similar counts to those obtained during pregnancy.

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