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Content of the Main Components of Protein, Carbohydrate and Lipid Metabolism in Different Blood Groups

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Abstract The purpose of this work is to evaluate the differences in some biochemical parameters in blood plasma of blood groups I (0), II (A), III (B) and IV (AB). Biochemical indicators were determined on a Humastar100 (Germany) biochemical analyzer. The obtained results showed that there are certain statistically reliable differences between the amounts of biochemical indicators such as albumin, glucose, cholesterol, triglyceride and urea in blood plasmas of different blood groups.

Keywords AB0 system, Blood plasma, Total protein, Albumin, Glucose, Triglyceride, Cholesterol, Urea, Creatinine

1. Relevance of the Topic

Currently, the basis of future medicine - personal medicine - is being formed on the basis of such sciences as genomics and proteomics. It is known fact that the specificity of each human organism and each genome leads to wide variability of the physiological reaction to a type of factor that can affect the human organism. And this condition underlies the clinical polymorphism of various diseases. The quality of the diagnosis and the adequacy of the treatment depend on the informativeness of the results obtained through diagnostic studies [1]. At the same time, it is necessary to pay attention for the limits of normal and pathology, which are highly conditional in many cases. So, for this reason, it is very important to study the cellular composition of blood, various indicators of metabolism, which are widely used in clinical laboratory diagnostics and allow to come to the correct clinical solution. This allows person to make the right clinical decisions. The membranes of erythrocyte cells contain antigen structures, and their composition is made up of glycoproteins. They determine blood group belonging to one or another group and play an important role in the life of a person as a biological species. [2]. They are not only markers of blood groups, but also perform various biological functions. These are receptor (exogenous ligands for chemokines, parasites and microbes), transport (aquaporins, glucose, nucleosides, urea, etc.), structural (glycoprotein A, glycoprotein C), regulatory (enzymes), complement activation (CD35, CD55, CD59, etc.) [3,4]. Scientific literature contains an information that there are certain differences in the cellular structure of different blood groups. This allows us to hypothesize that there are differences in the biochemical indicators of erythrocytes belonging to different blood groups. According to this, we studied a number of biochemical indicators of blood erythrocytes according with the point of AB0 system.

The purpose of research. Evaluation of differences between biochemical indicators of erythrocytes of different blood groups.

2. Material and Methods

The blood used as research material was obtained from 156 Uzbek male donors of the Republican Blood Transfusion Center (Tashkent). The consent of these donors was obtained to conduct this research on their blood. Identification of the investigated blood group was carried out using monoclonal antibodies erythrotestcyclones anti-A, anti-B, anti-D Super OOO "Hematolog" and standard erythrocyte set 0 (I), A (II), B (III). Blood plasma belonging to different blood groups was separated from erythrocytes using a Hettich Micro 200 (Germany) centrifuge (1000 g in 15 minutes). The amount of total protein, glucose, cholesterol, triglycerides, urea and creatinine in the isolated plasma specimens was evaluated on a HUMANSTAR 100 biochemical analyzer (Germany). The amount of total protein, glucose, cholesterol, triglycerides, urea and creatinine in the isolated plasmas were determined on a HUMANSTAR 100 biochemical analyzer (Germany).

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Biochemical indicators were calculated for 1 liter of blood plasma and 1 erythrocyte. The reason for calculating in relation to 1 erythrocyte is that, there is also a difference in the number of erythrocytes in 1 liter of plasma. As a comparative group, the total indicators created by combining the numerical data obtained from different blood groups were used. The obtained numerical results were statistically processed based on Student's t-criterion.

3. Analysis of the Obtained Results

We received 156 Uzbek male donors for the study, as mentioned above. The reason why men of Uzbek ethnicity were singled out was not to identify ethnic characteristics, because for this it is necessary to conduct research in a large group. Selecting only representatives of one nationality for research allows to avoid errors that may arise as a result of characteristics specific to the nationality.

The research results showed that the blood groups in the studied group were distributed according to the AB0 system as follows: 0 (I) blood group - 31.1%, A (II) blood group - 32.7%, B (III) blood group - 26.4% and AB (IV) blood group – 9.9% (Fig. 1).

According to the research of D. Kayumova, it was shown that blood group 0 (I) predominates in the city of Tashkent [5]. D. Kayumova's results were obtained as a result of blood analysis of more than 23,000 donors. In our studies, blood group A (II) prevailed. This difference may be due to the small number of donors included in our study.

Biochemical indicators in blood plasma of different blood groups are presented in Table 1. The obtained results showed that the amount of total protein in blood plasmas of different blood groups did not differ from each other (Table 1). The amount of protein varied from 57 g/l to 70 g/l.

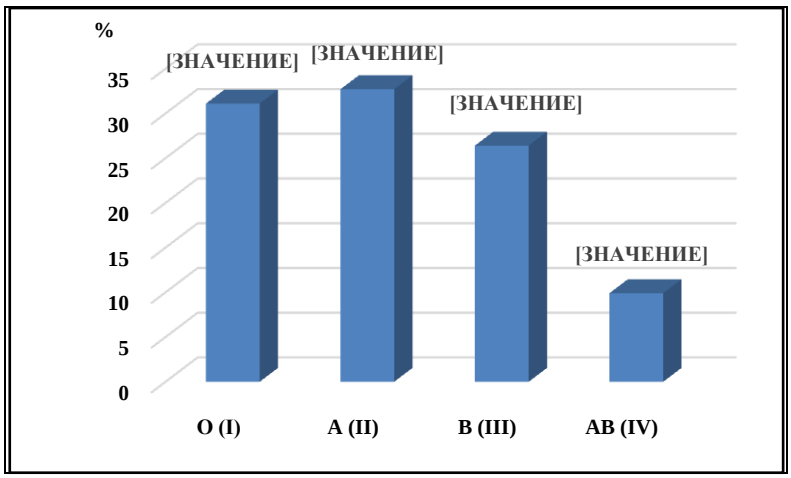

Figure 1. Distribution of the blood of Uzbek male donors according to the AB0 system

Table 1. Analysis of some biochemical indicators in plasma of different blood groups according to the AB0 system (per 1 liter of plasma)

Indicators, dimensionality	Statistical parameters	Total	Blood groups			
			0 (I)	A (II)	B (III)	AB (IV)
Total protein, g/l	M ± m	63,38±1,17	62,25±2,78	60,50±1,26	65,75±2,17	65,00±2,68
	Min÷Max	57 ÷ 70	57 ÷ 70	57 ÷ 70	62 ÷ 70	59 ÷ 70
Albumin, g/l	M ± m	44±1,41	40,25±1,11	42,25±0,63	47,5±3,2	46±4,12
	Min÷Max	37 ÷ 53	37 ÷ 42	41 ÷ 44	41 ÷ 53	37 ÷ 53
Glucose, mmol/l	M ± m	5,06±0,44	5,98±0,57	6,20±0,40	4,10±1,04	3,95±0,99[a]
	Min÷Max	2,3 ÷ 7,6	5,1 ÷ 7,6	5,0 ÷ 6,7	2,3 ÷ 6,4	2,3 ÷ 6,4
Cholesterol, mmol/l	M ± m	3,65±0,15	4,06±0,39	3,11±0,18[*,a]	3,88±0,08	3,53±0,29
	Min÷Max	2,62 ÷ 5,03	3,38 ÷ 5,03	2,62 ÷ 3,50	3,69 ÷ 4,10	2,67 ÷ 3,87
Triglycerides, mmol/l	M ± m	1,75±0,16	1,87±0,41	1,87±0,36	1,91±0,07	1,27±0,06[*,а,б,в]
	Min÷Max	0,95 ÷ 2,71	0,95 ÷ 2,59	1,17 ÷ 2,71	2,79 ÷ 3,15	1,16 ÷ 1,35
Urea, mmol/l	M ± m	5,46±0,35	5,13±0,58	6,38±0,38	5,23±0,97	5,13±0,92
	Min÷Max	3,2 ÷ 7,6	3,7 ÷ 6,4	5,9 ÷ 7,5	3,9 ÷ 7,6	3,2 ÷ 7,6
Creatinin, mkmol/l	M ± m	80,43±2,33	79,25±3,59	79,00±2,61	81,50±13,50	78,33±8,51
	Min÷Max	67 ÷ 95	72 ÷ 88	75 ÷ 86	68 ÷ 95	67 ÷ 95

*Note: * - R <0.05 in relation to the total; a - R <0.05 0 (I) in relation to group; b - R <0.05 A (II) group; v - R <0.05 V (III) group;*

There was a tendency to decrease in the amount of albumin in blood group 0 (I), and to increase in blood group B (III) and AB (IV).

Despite the fact that the amount of glucose in blood groups 0 (I) and A (II) was for 18.2 and 22.5% higher than in the general group, this difference was statistically insignificant. In B (III) and AB (IV) blood groups, compared to the general group, on the contrary, the amount of glucose decreased by 19.0 and 21.9%, but this decrease was not statistically reliable either. At the same time, the amount of glucose in group AB (IV) was statistically significantly lower by 36.3% compared to group A (II).

Cholesterol content in plasma of A (II) blood group was for 14.8 and 23.4% lower than total and 0 (I) blood groups statistically reliably, respectively.

When the amount of triglycerides in the plasma of different blood groups was studied, amount in AB (IV) blood group was for 27.4, 32.1, 32.1, 33.5% in 0 (I), 0 (I), A (II) and B (III) blood groups.

No statistically reliable changes were detected between the compared groups in the level of molybdenum in the plasma of different blood groups. At the same time, the absolute amount of urea was the highest in blood group A (II).

And finally, the study of the amount of creatinine in the blood plasma of different blood groups did not show significant differences in the amount of this substance between the compared blood groups.

We also calculated the amount of biochemical indicators studied above in relation to 1 erythrocyte. The reason for this is that 1 liter of blood usually does not contain a specific number of erythrocytes, that is, even if there is a little difference in their number, a difference is observed. Amounts of biochemical parameters in blood plasma of different blood groups calculated per 1 erythrocyte are presented in Table 2.

The obtained results showed that the amount of total protein in blood plasmas of different blood groups did not differ from each other (Table 2). Protein content ranged from 13.48 g/RBC to 17.07 g/RBC.

The decrease of albumin amount in plasma was not statistically reliable when calculated. When the amount of albumin was calculated per 1 erythrocyte, it was found that it was statistically reliably decreased by 10.8% in blood group 0 (I) compared to the general group. The amount of albumin calculated per erythrocyte in blood group B (III) plasma was statistically reliably higher by 20.7% compared to blood group 0 (I).

When the amount of glucose in the plasma of different blood groups was calculated per 1 erythrocyte, the amount of glucose in blood groups A (II) was statistically reliably 24.8% higher than in the general group. When the amount of glucose is calculated per 1 erythrocyte, its amount in AB (IV) blood group was statistically reliably lower by 37.8% compared to A (II) blood group.

The amount of cholesterol in A (II) blood group, calculated per 1 erythrocyte, was 13.8 and 21.1% lower in comparison with the total and 0 (I) blood groups, respectively. When calculated for 1 erythrocyte, the amount of cholesterol in erythrocytes of group B (III) was statistically reliably higher by 22.7% compared to group A (II).

When the amount of triglycerides in the plasma of different blood groups is calculated per 1 erythrocyte, the total amount of triglycerides in blood group AB (IV), in groups 0 (I), A (II) and B (III) is statistically reliably 26.2, 29.6, 31.1 and 31.1%.

Table 2. Analysis of some biochemical indicators in plasma of different blood groups according to the AB0 system (per 1 erythrocyte)

Indicators, dimensionality	Statistical parameters	Total	Blood groups			
			0 (I)	A (II)	B (III)	AB (IV)
Total protein, g/RBC	M ± m	15,11±0,32	14,50±0,74	14,70±0,50	15,65±0,52	15,60±0,81
	Min÷Max	13,48÷17,07	13,48÷16,67	13,86÷16,15	14,76÷16,67	13,72÷17,07
Albumin, g/RBC	M ± m	10,5±0,37	9,37±0,30*	10,27±0,37	11,31±0,76а	11,06±1,11
	Min÷Max	8,60÷12,93	8,81÷10,00	9,55÷11,28	9,76÷12,62	8,60÷12,93
Glucose, mmol/RBC	M ± m	1,21±0,11	1,40±0,15	1,51±0,11*	0,98±0,25	0,94±0,23б
	Min÷Max	0,55÷1,81	1,11÷1,81	1,10÷1,67	0,55÷1,52	0,56÷1,52
Cholesterol, mmol/RBC	M ± m	0,87±0,04	0,95±0,10	0,75±0,04*,а	0,92±0,02б	0,85±0,08
	Min÷Max	0,62÷1,20	0,73÷1,20	0,66÷0,82	0,88÷0,98	0,62÷0,94
Triglycerides, mmol/ RBC	M ± m	0,42±0,04	0,44±0,10	0,45±0,08	0,45±0,02	0,31±0,01*,а,б,в
	Min÷Max	0,25÷0,62	0,25÷0,62	0,28÷0,62	0,42÷0,47	0,28÷0,32
Urea, mmol/RBC	M ± m	1,31±0,09	1,20±0,15	1,55±0,09*,а	1,24±0,20	1,23±0,23
	Min÷Max	0,74÷1,85	1,02÷1,52	1,34÷1,79	1,00÷1,82	0,74÷1,85
Creatinine, mkmol/RBC	M ± m	19,08±0,52	18,10±0,55	19,17±0,57	19,40±3,21	18,71±2,29
	Min÷Max	15,58÷23,17	17,14÷19,52	17,86÷20,51	17,38÷22,62	15,8÷23,17

*Note: RBC (red blood cells) – erythrocyte (red blood cells), * - P <0,05 in relation to the total; а - P <0,05 0 (I) in relation to group; б - P <0,05 A (II) in relation to group; в - P <0,05 B (III) in relation to group;*

When calculated in relation to 1 erythrocyte, the amount of urea in blood group A (II) was statistically significantly higher than the amount in groups 0 (I) by 18.3 and 29.2%, respectively.

Finally, the study of creatinine amount in the blood plasma of different blood groups in relation to 1 erythrocyte did not show significant differences in the amount of this substance between the compared blood groups.

4. Summary

Thus, the studies conducted showed that there are certain statistically reliable differences between the amounts of a number of biochemical indicators such as albumin, glucose, cholesterol, triglyceride and urea in the blood plasma belonging to different groups according to the AB0 system. showed These results allow in the future to determine the normal limits of biochemical parameters, taking into account the blood group approach, as well as to individualize the normal values of biochemical parameters.

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